FROM THE OFFICE OF GREGG SIMS, ARCHITECT

PROJECT MANUAL

FOR

CITY OF DALTON, GEORGIA

REDEVELOPMENT OF THE
JOHN DAVIS RECREATION CENTER

CIVIL ENGINEERING:	MARCH ADAMS & ASSOCIATES, INC.
MEP ENGINEERING:	MARCH ADAMS & ASSOCIATES, INC.
STRUCTURAL ENGINEERING:	MARCH ADAMS & ASSOCIATES, INC.

DATE: 02/14/24

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INDEX OF SPECIFICATIONS: GENERAL CONTRACT FOR REDEVELOPMENT OF THE JOHN DAVIS RECREATION CENTER FOR THE CITY OF DALTON

INDEX OF DRAWINGS: GENERAL CONTRACT FOR REDEVELOPMENT OF THE JOHN DAVIS RECREATION CENTER FOR THE CITY OF DALTON

010100: SUMMARY OF WORK

1. GENERAL

A. Scope: Provide all labor, material and equipment necessary to perform all the work shown or implied on the Contract Documents.

(1) Existing Conditions:

(a) Prior to submission of bids, bidders shall visit the site and acquaint themselves with existing conditions and the scope of the work.
(b) Contractor and/or subcontractors shall verify all dimensions, conditions, and quantities on the site.
(c) Contractor to notify the Architect immediately if existing conditions are incompatible with the Contract Documents.

(2) Contractor Use of the Premises: The Owner may access part of the premises during construction. The Contractor shall make every effort to communicate with the Owner regarding potentially dangerous, noxious, noisy or inconvenient processes and activities made necessary by the execution of the work and seek to carefully schedule, with the Owner's agreement, and minimize by all means possible such dangers and inconvenience to the Owner.

(3) Owner-Furnished Items: Owner provided items that are wall mounted must have necessary blocking installed by the Contractor during construction. See drawings for locations of Owner provided items.

B. Codes and Standards Compliance: See 010900: Reference Standards and Local Codes and Ordinances. Contractors and subcontractors will meet all local, state and federal codes.

C. Qualifications: General Contractor must have been in business under its present name for the past five years unless variance granted by Owner and/or Architect.

D. Submittals: See 013000: Contractor Submittal Requirements, 017000: Contract Completion Requirements and individual specifications.

010500: FIELD ENGINEERING

1. GENERAL

   A. Scope: Work described in this section includes Contractor's responsibilities for verifying existing grades indicated on the drawings, establishing and maintaining bench marks and reference lines and laying out the improvements to the site.

   B. Code and Standard Compliance: IBC, IEC, IGC, IMC, IPC, IECC, IFC, IEBC, IEC

   C. Qualifications of Craftsmen: Those responsible for field dimensions, layout, grading marking shall have a minimum of three (3) years experience, a demonstrated skill with surveying instruments, and supervised by the superintendent of the project.

2. PRODUCTS:

   A. Use only high-quality instruments to determine grading, surveying, and dimensional information.

   B. Ensure instruments have been calibrated and tested prior to field work.

3. EXECUTION

   A. Contractor shall perform the following:

      (1) Verify existing grades prior to beginning site preparation. If existing grades are at variance with drawings, notify Architect and receive instructions prior to proceeding.
      (2) Verify limits of site preparation and earthwork operations. Locate adjacent buildings, appurtenances and trees to remain.
      (3) Establish the designated mark trees with orange engineering tape. Establish another bench mark located on the project site, as widely separated as possible from the designated BM as an alternate.
      (4) Verify locations and levels of buildings and appurtenances; including structural and facing components. Note variation from indicated locations and levels.
      (5) Verify batter boards at building corners.
      (6) Verify utility locations, including new construction and existing active and inactive encountered during construction activity.
      (7) Verify outside building lines to ensure correct position on project site. Make required surveys to fix and verify foundation locations and elevations, column centerlines, piers, walls, pits, and trenches.
      (8) Measure settlement, if any, of building during construction operations.
      (9) Measure deflection, if any, in structural members.

   B. Prepare, during the course of the Work, a log containing all data observed as a result of field engineering. Maintain log for reference by the Architect.

   C. Notify Architect, in writing of on-site conditions which are at variance with the Contract Documents. Compare variations in locations, level, plumbness and deflections with allowable tolerance given in the Contract Documents. Failure to notify Architect of known variations may result in disapproval of work.

010700: OFFICE STANDARDS

1. GENERAL

A. Definitions: The current edition of AIA "Glossary of Construction Industry Terms" shall be used to define terms within these Contract Documents. The General Contractor is responsible to notify and ask the Architect for clarification on any and all terms not understood by the Contractor or Subcontractors. It shall be assumed by the Architect and the Owner that the Contractor understands all terms, symbols, acronyms, and abbreviations used herein if not otherwise notified.

B. Specification Format: The following format shall be used generally in all Divisions unless modifications are required by specifications.

(1) This Office classifies all specifications using the Sweet's 50 division/6-digit code that is compatible with the AIA Master Spec numbering system.

(2) 000000: Section

1. GENERAL:
   A. Scope
   B. Code and Standards Compliance
   C. Quality Assurance
   D. Submittals
   E. Warranties and Guarantees
   F. Cross References
   G. Jobsite Safety
   H. Definitions
2. PRODUCTS:
   A. Quality or Performance Standard
   B. Product Characteristics and Types
   C. Components
   D. Finish/Color
3. EXECUTION:
   A. Fabrication, if Applicable
   B. Storage and Handling of Materials and/or Equipment (if applicable)
   C. Environmental Conditions Criteria (if applicable)
   D. Preparation of Work
   E. Protection of Adjacent Work
   F. Manufacturer's Instructions and/or Literature
   G. Workmanship and Installation
   H. Completion of Work
   I. Cleaning and Protecting Installed Work

(3) In paragraph 1.B. of the specification format Code and Standards Compliance shall be interpreted to mean that the general contractor must comply with the codes having jurisdiction in the area of the project and must perform the work in accordance with the established standards of a particular trade.

C. Abbreviations and Symbols:

(1) General Abbreviations: See Drawings
(2) Trade Organization Abbreviations: Attached
(3) Governmental Agency Abbreviations: Attached
(4) Registration or Certification Abbreviations: Attached
(5) Code Abbreviations: Attached
(6) Symbol Abbreviations: See Drawings

D. Cross Reference: The six (6) digit specification section code is referenced on the drawing where amplification and clarification is needed. However, the absence of this code reference on the drawings does not relieve the General Contractor from the requirements of these specifications.

E. Certain Definitions:

(1) "Provide" or "include(s)" shall mean furnish, install and connect completely.
(2) "Work" shall be understood to mean the materials completely installed, including labor, tools and equipment required to complete project.
(3) "Plans and Specifications" shall be understood to mean the project manual and drawings. "With the Contracts" mean the Contract Documents including addenda, if any.

1. TRADE ASSOCIATIONS ABBREVIATIONS

AA	ALUMINUM ASSOCIATION
AAMA	AMERICAN ALUMINUM MANUFACTURERS ASSOCIATION
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
ACI	AMERICAN CONCRETE INSTITUTE
AGA	AMERICAN GAS ASSOCIATION
ARI	AIR-CONDITIONING AND REFRIGERATION INSTITUTE
ADC	AIR DIFFUSION COUNCIL
AMCA	AIR MOVEMENT AND CONTROL ASSOCIATION
AHMA	AMERICAN HARDWARE MANUFACTURERS ASSOCIATION
AI	ASPHALT INSTITUTE
AIA	AMERICAN INSTITUTE OF ARCHITECTS
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AITC	AMERICAN INSTITUTE OF TIMBER CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
ALSC	AMERICAN LUMBER STANDARDS COMMITTEE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APA	AMERICAN PLYWOOD ASSOCIATION
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS, INC.
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS, INC.
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ASPA	AMERICAN SOD PRODUCERS' ASSOCIATION
AWS	AMERICAN WELDING SOCIETY
AWPA	AMERICAN WOOD PRESERVERS ASSOCIATION
AWPI	AMERICAN WOOD PRESERVERS INSTITUTE
AWI	ARCHITECTURAL WOODWORK INSTITUTE
AGCA	ASSOCIATED GENERAL CONTRACTORS OF AMERICA
BIA	BRICK INSTITUTE OF AMERICA
CISPI	CAST IRON SOIL PIPE INSTITUTE
CSSB	CEDAR SHAKE AND SHINGLE BUREAU
CTI	CERAMIC TILE INSTITUTE
CLFMI	CHAIN LINK FENCE MANUFACTURERS INSTITUTE
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
CSI	CONSTRUCTION SPECIFICATION INSTITUTE
CABO	COUNCIL OF AMERICAN BUSINESS OFFICIALS
EIMA	EIFS INDUSTRY MEMBERS ASSOCIATION
EJMA	EXPANSION JOINT MANUFACTURERS ASSOCIATION
FM	FACTORY MUTUAL RESEARCH CORPORATION
FGMA	FLAT GLASS MARKETING ASSOCIATION
GA	GYPSUM ASSOCIATION
HPMA	HARDWOOD PLYWOOD MANUFACTURERS ASSOCIATION

HVI	HOME VENTILATION INSTITUTE
IES	ILLUMINATING ENGINEERING SOCIETY
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS
LPI	LIGHTENING PROTECTION INSTITUTE
ML/SFA	METAL LATH/STEEL FRAMING ASSOCIATION
NAAMM	NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS
NBGQA	NATIONAL BUILDING GRANITE QUARRIES ASSOCIATION
NCMA	NATIONAL CONCRETE MASONRY ASSOCIATION
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NFoPA	NATIONAL FOREST PRODUCTS ASSOCIATION
NPA	NATIONAL PARTICLEBOARD ASSOCIATION
NPCA	NATIONAL PEST CONTROL ASSOCIATION
NSPE	NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
NWWDMA	NATIONAL WOOD WINDOW AND DOOR MANUFACTURERS ASSOCIATION
PPI	PLASTIC PIPE INSTITUTE
PDI	PLUMBING AND DRAINAGE INSTITUTE
PCA	PORTLAND CEMENT ASSOCIATION
PTI	POST TENSIONING INSTITUTE
PCI	PRESTRESSED CONCRETE INSTITUTE
RCSC	RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS
RFCI	RESILIENT FLOOR COVERING INSTITUTE
SIGMA	SEALED INSULATING GLASS MANUFACTURERS ASSOCIATION
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS
SPI	SOCIETY OF THE PLASTIC INDUSTRY, INC.
SFPA	SOUTHERN FOREST PRODUCTS ASSOCIATION
SPIB	SOUTHERN PINE INSPECTION BUREAU
SDI	STEEL DECK INSTITUTE
SDI	STEEL DOOR INSTITUTE
SJI	STEEL JOIST INSTITUTE
TCA	TILE COUNCIL OF AMERICA
UL	UNDERWRITERS' LABORATORIES, INC.
CPSC	US CONSUMER PRODUCT SAFETY COMMISSION
WA	WATERBOARD ASSOCIATION
WWPA	WESTERN WOOD PRODUCTS ASSOCIATION0
WRI	WIRE REINFORCING INSTITUTE, INC.

3. GOVERNMENTAL AGENCY ABBREVIATIONS:

ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
ADA	2010 ADA STANDARDS FOR ACCESSIBLE DESIGN
BI	BUILDING INSPECTOR
DOC	DEPARTMENT OF COMMERCE
DOE	DEPARTMENT OF ENERGY
DOJ	DEPARTMENT OF JUSTICE
DOT	DEPARTMENT OF TRANSPORTATION
EPA	ENVIRONMENTAL PROTECTION AGENCY
EDA	ECONOMIC DEVELOPMENT ADMINISTRATION
FAA	FEDERAL AVIATION AGENCY
FHA	FEDERAL HOUSING ADMINISTRATION
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY
FS	FEDERAL SPECIFICATIONS
FM	FIRE MARSHALL
HUD	HOUSING AND URBAN DEVELOPMENT
MUTCD	MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS
NBS	NATIONAL BUREAU OF STANDARDS
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PS	PRODUCT STANDARDS, NBS

4. REGISTRATION AND CERTIFICATION ABBREVIATIONS

CBI	CERTIFIED BUILDING INSPECTOR
CBO	CERTIFIED BUILDING OFFICIAL
CCI	CERTIFIED COMBINATION INSPECTOR
CEI	CERTIFIED ELECTRICAL INSPECTOR
CHI	CERTIFIED HOUSING INSPECTOR
CMI	CERTIFIED MECHANICAL INSPECTOR
CPI	CERTIFIED PLUMBING INSPECTOR
RA	REGISTERED ARCHITECT
PE	REGISTERED PROFESSIONAL ENGINEER

5. CODE ABBREVIATIONS

CBC	COUNTY OR CITY BUILDING CODE
CEC	COUNTY OR CITY ELECTRICAL CODE
CGC	COUNTY OR CITY GAS CODE
CHAC	COUNTY OR CITY HEATING AND AIR CONDITIONING CODE
CHC	COUNTY OR CITY HOUSING CODE
CPC	COUNTY OR CITY PLUMBING CODE
FGI	FACILITY GUIDELINES INSTITUTE
GBC	GEORGIA BUILDING CODE
IBC	INTERNATIONAL BUILDING CODE
IFGC	INTERNATIONAL FUEL GAS CODE
IMC	INTERNATIONAL MECHANICAL CODE
IPC	INTERNATIONAL PLUMBING CODE
IEC	INERNATIONAL ELECTRICAL CODE
IFC	INTERNATIONAL FIRE CODE
IECC	INTERNATIIONAL ENERGY CONSERVATION CODE
IRC	INTERNATIONAL RESIDENTIAL CODE
LSC	LIFE SAFETY CODE (NPFA 101)
NBC	NATIONAL BUILDING CODE
NEC	NATIONAL ELECTRIC CODE
NGC	NATIONAL FUEL GAS CODE

010900: REFERENCE STANDARDS

1. GENERAL

   A. Scope: See the drawings and 010700: Office Standards for list of abbreviations, acronyms, and names of trade associations, agencies, and codes whose standards are use throughout the Contract Documents of this project.

   B. Code and Standards Compliance:

      (1) For products or workmanship specified by association, trade, or federal standards, comply with requirements of the standard except where more rigid requirements are specified herein, or might be required by governing codes.
      (2) The date of the standard is that one in effect as of the bid date, or date of Owner-Contract-Agreement where there are no bids, unless a date is specified.
      (3) It is the intent of the Architect of this project to insure it is constructed in accordance with the ICC/IBC. Where, in the opinion of the Contractor or Contractors on this project, these documents vary form this code, he/she shall notify the Architect and shall not construct any aspect of the project known to be contrary to this code.

   C. Handicapped Accessibility: It is the intent of the Architect of this project (drawings and project manual) to insure that it is constructed in accordance with 2010 ADA Standards for Accessible Design. Where the documents contradict this law and the requirements for handicapped the Contractor shall notify the Architect immediately for instructions. Where the Contractor constructs the project and knows it is in violation of the handicapped accessibility laws and codes he/she shall be made to comply without cost to the Owner.

   D. Qualifications of Manufacturer and Installer: In all work of the project only personnel and firms with a demonstrable skill in the work for which he/she/they bid on and intend to do if awarded the work.

   E. Warranties and Guarantees: A minimum of one (1) year guarantee from all defects and faulty work from all manufacturers and installers shall commence at the date of substantial completion unless a longer period is indicated in the Contract Documents.

2. PRODUCTS: NA

3. EXECUTION:

   A. It is the responsibility of the General Contractor to execute the project using all the codes and standards required by the Contract Documents.

   B. Reference standards are to be used, where applicable in this project. See individual specifications.

011000: CONSTRUCTION SCHEDULE

1. GENERAL

   A. Scope:

      (1) Contractor shall submit a schedule showing all activities with their duration.
      (2) The Contractor shall update and maintain a monthly schedule.
      (3) The Contractor and all Subcontractors, suppliers, and manufacturers shall schedule materials, deliveries and installation to conform with the schedule plans, and provisions to this effect shall be included in all subcontracts.
      (4) The Contractor shall notify the Architect when facts indicate the schedule completion date is unlikely to be achieved. A written summary of why the agreed completion date will not be met and a new date for completion will be required.

   B. Submittal:

      (1) The form of the schedule shall be a bar graph with locations on the bar graph for dates as well as bars.
      (2) All construction activities are to be included in the graph.
      (3) Phasing is to be included in the schedules. See 010100: Summary of Work.

   C. Owner Approval: The Owner will sign one construction schedule as an agreement with the Contractor on the sequence of work and completion.

   D. Cross Reference: 010100: Summary of Work

2. PRODUCTS: None

3. EXECUTION

   A. The following information shall be included on the graph:

      (1) Complete sequence of each construction activity.
      (2) Important product delivery dates.
      (3) Decision dates that will have a material bearing on adherence of mutually agreed upon schedule.

   B. Updating:

      (1) Provide the bar graph with updated information.
      (2) Indicate major changes.
      (3) Indicate, in written narrative, need to change schedule and the corrective action being taken.

   C. Re-distribution: When revision to schedule is approved re-distribute to the Owner's representative(s), Architect and all major subcontractors and suppliers to insure all interested parties are working under the same schedule.

012000: PROJECT CONFERENCES

1. GENERAL

   A. Scope: Requirements for project conferences and procedure for their conduct.

   B. Contractor's Duties:

      (1) Scheduling and notification:

         (a) If a set meeting day and time has not been established, Contractor is to notify invited parties of meeting time and place at least 36 hours prior to meeting.
         (b) Make physical arrangements for and preside over meeting.

      (2) Administration:

         (a) Prepare conference agenda and provide copies of agenda to meeting attendees.
         (b) Record and promptly distribute copies of minutes of significant proceedings and decisions.
         (c) Prepare and distribute copies of construction progress schedules as originally issued or subsequently approved, marked to show current progress.

   C. Pre-Construction Conferences:

      (1) Scheduling: A pre-construction conference shall be held in a location to be announced prior to construction commencement.

      (2) Conference Notification:

         (a) Owner's Representatives
         (b) Architect
         (c) Architect's Consultants (if required)
         (d) Contractor's Team
         (e) Subcontractors (if required)
         (f) Separate Contractors (if applicable)

      (3) Minimum agenda:

         (a) List of Subcontractors
         (b) Insurance
         (c) Construction Progress/Schedule
         (d) Identification of Personnel
         (e) Familiarization of processing of project documentation
         (f) Use of site
         (g) Material and equipment deliveries, storage, protection and priorities
         (h) Safety and first-aid procedures and responsibilities
         (i) Security procedures and methods
         (j) Housekeeping procedures and methods
         (k) Special project requirements and conditions
         (l) Phasing of project's work

   D. Jobsite Progress Conferences:

      (1) Schedule: Unless otherwise requested by the Owner, meeting shall be held a minimum every two (2) weeks.

(2) Attendance:

(a) Owner's Representatives
(b) Architect
(c) Architect's Consultants (if required)
(d) Contractor's Project Manager
(e) Contractor's Project Superintendent
(f) Subcontractors (if required)
(g) Separate Contractors (if applicable)

(3) Minimum Agenda

(a) Review previous meeting action items including outstanding items.
(b) Review progress to date including a site walk-through.
(c) Review schedule and identify anticipated construction concerns that might materially affect the progress of future work.
(d) Review quality control.
(e) Review proposed changes, if any.
(f) Discuss subcontractor issues, if any.
(g) Schedule required pre-installation meetings.
(h) Review submittals, Requests for Information (RFI) and Proposed Change Orders (PCO) to date.
(i) Discuss Owner's items, if any.
(j) Discuss Architect's items, if any.

013000: CONTRACTOR SUBMITTAL REQUIREMENTS

1. GENERAL

   A. Scope: Provisions herein are mandatory requirements for preparing and submitting samples, shop drawings and product data that is required in the various sections of this Project Manual and the General Conditions of the Contract for Construction.

   B. Code and Standards Compliance: IBC, State and Local Codes

   C. Qualifications of installer, fabricator, and/or manufacturer: See applicable section.

   D. Warranties and Guarantees: Submittals as required by 017000: Project Completion Requirements

   E. Cross References: Project manual.

2. PROJECT

   A. Samples:

      (1) Submit size of sample large enough to evaluate color, texture, thickness, etc. Individual section may designate size and, if so, comply.
      (2) If a fixture, fitting, or equipment is required to be submitted the unit will be returned to the General Contractor for distribution to the subcontractor or distributors.

   B. Shop Drawings:

      (1) Drawings shall conform to the following requirements:

         (a) Number drawings consecutively.
         (b) Indicate working and erection dimensions and relationships to adjacent work.
         (c) Show arrangements and sectional views, where applicable.
         (d) Indicate material, gauges, thicknesses, finishes and characteristics.
         (e) Indicate anchoring and fastening details, including information for making connections to adjacent work.

      (2) Form: Number of copies submitted shall be the number required by Contractor plus two which will be retained by Architect. Reproducible documents (sepia or film) may be submitted in lieu of blue line prints or photocopies.

   C. Product Data:

      (1) Include product manufacturer's standard printed material, dated, with product description and installation instructions indicated. Product data may also contain test and performance data, illustrations and special details.
      (2) Form: Submit shop drawings and submittals by email to the Architect. The number of samples and print material submitted shall be the number required by Contractor plus two which will be retained by Architect.
      (3) Data not related to this project shall be deleted from manufacturer's standard data.

3. EXECUTION

   A. Contractor's Review:

      (1) Review submittals and stamp with approval prior to submission to Architect.

(2) Schedule submittals to cause no delay in the work.
(3) By approving submittals, Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria; and that he has checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents.
(4) Where work is indicated "By others", Contractor shall indicate responsibility for providing and coordinating such work; whether by Subcontractors or under separate contracts.
(5) Contractor agrees that submittals processed by Architect are not Change Orders; that purpose of submittals by Contractor is to demonstrate that Contractor understands design concept; that he demonstrates his understanding by indicating equipment and material he intends to furnish and install and by detailing fabrication and installation methods he intends of use.
(6) By submitting samples, shop drawings and product data, the Contractor agrees that he has complied with provisions specified above. Submissions made without Contractor's approval indicated thereon will be returned without being reviewed for compliance with this requirement.
(7) Date each submittal and indicate name of project, Architect, Contractor, Subcontractor, as applicable, description or name of equipment, material or product and identify location at which it is to be used in the work.
(8) Accompany submittal with transmittal letter containing project name, Contractor's name, number of samples or drawings, titles and other pertinent data. Transmittal shall outline deviations, if any, in submittals from requirements of Contract Documents.
(9) No portion of the work requiring submission of a shop drawing, product data or sample shall be commenced until the submittal has been approved by the Architect as specified herein. All such portions of the work shall be executed in accord with approved submittals.

B. Architect's Review:

(1) Shop drawings shall not be reviewed by the Architect unless checked by the supplier and reviewed by the General Contractor.
(2) Architect's review is only for conformance with design concept of project and with information in Contract Documents. Architect's review of a specific item shall not indicate approval of an assembly in which item is a component.
(3) Architect's Review of submittals shall not relieve Contractor of responsibility for deviation from requirements of Contract Documents. Architect's Review shall not relieve Contractor from responsibility for errors or omissions in submittals.
(4) Architect will review each submittal, and return it to Contractor within three weeks of receipt, except where it must be held for coordination, and the Contractor is so advised. Submittals will be stamped and marked as follows:

(a) "Reviewed" indicates the drawings have been reviewed for conformance with design and no exceptions are taken. Proceed with the work.

(b) "Reviewed as Noted" indicates Contractor may proceed with the work as noted.

(c) "Revised and Resubmit" or "Not Approved" indicates drawings are to be revised and resubmitted for review prior to proceeding with the work or that the submittal does not comply with Contract Documents.

C. Resubmission:

(1) Make corrections and changes indicated for unapproved submissions and resubmit in same manner as specified above, until Architect's approval is obtained.
(2) In resubmission transmittal direct specific attention to revision other than corrections requested by Owner on previous submissions, if any.

D. Distribution:

(1) Contractor is responsible for obtaining and distributing copies of submittals to his subcontractors and material suppliers.
(2) Contractor shall maintain a file of reviewed submittals for duration of project, which shall be delivered to Owner as a part of 017000: Contract Completion Requirements.

013300: DELEGATED DESIGN PROCEDURES

1. GENERAL

   A. Scope: Coordinate and assume full responsibility for design, engineering, submittals, fabrication, transportation, and installation of this work.

      (1) Delegated Design efforts include the following

         (a) 055100: Metal Stairs
         (b) 098413: Sound Control
         (c) 116733: Recreational Climbing Wall

      (2) Definitions:

         (a) Delegated Design: Professional design service or certification specially required of the Contractor in the Specifications.
         (b) AHJ: Authorities Having Jurisdiction, defined in AIA Document A201.

      (3) Cross References:

         (a) 055100: Metal Stairs
         (b) 098413: Sount Control
         (c) 116733: Recreational Climbing Wall

      (4) Performance Requirements:

         (a) Comply with Regulations.
         (b) Provide complete, operational systems that perform their intended use.
         (c) Engineer Delegated Design portions for gravity, lateral and seismic loads.

            1. Load criteria is indicated in the specific product Section.
            2. Indicate reactions to structure.
            3. Provide services of a qualified professional engineer licensed in the Project jurisdiction.

         (d) Execute the design intent as indicated in Project Drawings and Specifications.

   B. Codes and Standards Compliance: See 010900: Reference Standards and Local Codes and Ordinances. Contractors and subcontractors will meet all local, state, and federal codes.

   C. Qualifications: General Contractor must have been in business under its present name for the past five years unless variance granted by Owner and/or Architect.

   D. Submittals:

      (1) Preliminary Design: Submit drawings and product data that describe Contractor's design prior to performing engineering calculations and final drawings.

         (a) Architect will evaluate proposed design and comment on conformance with intent of Contract Documents.
         (b) Preliminary review is for aesthetic and general function concerns and will not constitute approval of engineering.

(c) Final Design: Submit drawings, product data and engineering calculations that describe Contractor's final design.
(d) Permit Review: Submit Delegated Design documents to AGJ for review and approval as a Deferred Submittal. Architect will deliver submittal to the AHJ and be the main point of contact with the AHJ.

1. Review by Architect or Architect's consultant prior to submittal to the AHJ is required.
2. Make corrections noted by Architect.
3. Comply with AHJ requirements.
4. Include design criteria, design assumptions, structural calculations, fabrication, and construction details, required clearances, and interface requirements.
5. Product Data, Shop Drawings and Samples: Comply with requirements in Section 013300 for each product of Delegated Design portion of work. Product submittals are in addition to submittals for permit and design data.

E. Quality Assurance:

(1) Design requirements specific to Delegated Design portions are indicated in Drawings and in Sections that specify the component.
(2) Engineer's Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
(3) Pre-Submittal Meeting: Contractor shall meet with Architect, Consultant, and Delegated Designer to discuss the work-portion, submittals, scheduling, and sequencing.

F. Scheduling

(1) Schedule design process and submittals required for Delegated Design portions to fit within Construction Schedule.
(2) Allow adequate time for AHJ review. Contact AHJ for time estimate and coordination of schedule.

014000: QUALITY ASSURANCE

1. GENERAL

A. Scope: This specification includes requirements for the following:

(1) Laboratory services required to perform the specified testing shall be performed by an independent testing Laboratory.
(2) General Contractor shall schedule appointment and cooperate with the Laboratory to facilitate the execution of its required services.
(3) Employment of the Laboratory shall in no way relieve General Contractor's obligations to perform the Work of the Contract.
(4) Inspections and tests cover production of standard products, fabricated systems of work, and installation procedures.
(5) See drawings for mandatory required testing for the project.
(6) Note requirement of General Contractor's responsibility for cost of testing provided herein.

B. Qualifications of Laboratory

(1) Laboratory shall meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
(2) Laboratory shall be authorized to operate in the State in which the Project is located.

C. Reference Standards

(1) ANSI/ASTM D3740 – Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
(2) ANSI/ASTM E329 – Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

D. Laboratory Responsibilities:

(1) Laboratory shall provide qualified personnel at site after due notice and cooperate with Architect and General Contractor in performance of services.
(2) Laboratory shall perform specified inspection, sampling, and testing of products in accordance with specified standards.
(3) Laboratory shall ascertain compliance of materials and mixes with requirements of Contract Documents.
(4) Laboratory shall promptly notify Architect and General Contractor of observed irregularities or non-conformance of Work or products.
(5) Laboratory shall perform additional inspections and tests required by Architect.
(6) Laboratory shall attend Preconstruction conferences, if required.

E. Laboratory Reports:

(1) After each inspection and test, Laboratory shall promptly submit the Laboratory report to the Architect and General Contractor.

(2) The report shall include:

(a) Date issued.
(b) Project Title
(c) Testing Laboratory name, address and telephone number
(d) Name of Laboratory inspector and job number
(e) Date and time of sampling or inspection
(f) Record of temperature and weather conditions
(g) Date of test
(h) Identification of specification section
(i) Location of sample or test in the Project

(j) Type of inspection or test
(k) Results of tests and compliance with Contract Documents
(l) Interpretation of test results

F. Limits on Testing Laboratory Authority:

(1) Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
(2) Laboratory may not approve or accept any portion of the work.
(3) Laboratory may not assume any duties of General Contractor.
(4) Laboratory does not have authority to stop work.

G. General Contractor Responsibilities:

(1) Cooperate with Laboratory personnel, and provide access to work.
(2) Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
(3) Notify Architect and Laboratory 24 hours prior to expected time for operations requiring inspections and testing services.

(a) When tests or inspections cannot be performed after such notice, General Contractor shall notify the Laboratory.
(b) If General Contractor does not notify Laboratory before laboratory personnel are scheduled for this work, General Contractor shall reimburse the Owner for Laboratory personnel and travel expenses.

H. Payment for all Testing:

(1) Initial Services: When initial tests indicate compliance with the Contract Documents the General Contractor shall pay for the tests. When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will also be paid for by the General Contractor.
(2) Retesting: When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency and the costs thereof will be paid for directly by the General Contractor.
(3) General Contractor's Convenience Testing: Inspecting and testing performed exclusively for the General Contractor's convenience shall be the sole responsibility of the General Contractor.

I. Code Compliance Testing: Inspections and tests required by the codes or ordinances, or by a plan approval authority having jurisdiction over the project site, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the General Contractor, unless otherwise provided in the Contract Documents.

J. Testing Prerogative: The Architect and his consultants shall have the prerogative to test any material product, system of products, fabrication, and construction it deems questionable from inspection of work. Such testing, if found to be in compliance with this Project Manual, shall be paid by the Owner. If found not to comply with the standards expressed and implied in this Project Manual the testing shall be paid for by the General Contractor.

014600: INCIDENTAL REPAIR

1. GENERAL

   A. Scope: Includes all materials, labor, equipment and tools necessary to repair, cut, patch, and fit incidental work required to complete the project.

   B. Codes and Standards Compliance: IBC, State and Local Codes

   C. Qualifications of Workmen: Must be competent to perform work required of this specification and have had three (3) years experience.

   D. Submittals: Submit written request in advance of cutting or alteration work which affects the following:

      (1) Structural integrity of any element of the project.
      (2) Integrity of weather-exposed or moisture-resistant element.
      (3) Efficiency, maintenance or safety of operation.
      (4) Visual qualities of exposed elements.
      (5) Work of Owner or separate contractor.

   E. Warranties and Guarantees: 1 year against all defects.

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. All materials shall be new and products of types and quality required by the Contract Documents.

3. EXECUTION

   A. Preparation of Work:

      (1) Inspect existing conditions, including elements subject to damage or movement during cutting and patching work.
      (2) After uncovering, inspect conditions affecting the performance of work.
      (3) Beginning of cutting or patching work means acceptance of existing conditions.
      (4) Provide supports to assure structural integrity of surroundings and provide devices and methods to protect other portions of the Project from damage. See 024120: Selective Building Demolition.
      (5) Provide protection from elements for areas which may be exposed by uncovering the work.
      (6) Erect and maintain waterproof closures for exterior openings. Maintain excavations free of water.
      (7) Erect and maintain dustproof partitions as required to prevent spread of dust, fumes and smoke to other parts of the building. On completion, remove partitions and repair damaged surfaces to match adjacent surfaces.

   B. Workmanship:

      (1) Perform cutting and patching work using methods to avoid damage to other work, and which will prepare surfaces to receive patching and finishing in accordance with the Contract Documents.

(2) Employ original installer to perform cutting and patching for weather-exposed and moisture resistant elements, and sight-exposed surfaces.
(3) Structural Work: Do not cut building framing members or modify the foundation without written approval.

   (a) Modifications to structural system are acceptable only with the Structural Engineer's written approval, submitted through the Architect.
   (b) Submit written request for Structural Engineer's site visit in accordance with submittal requirements of this section.
   (c) See 024120: Selective Building Demolition

(4) Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval.
(5) Restore work with new products in accordance with requirements of Contract Documents.
(6) Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
(7) At penetrations of fire-rated walls, ceilings, or floor construction, completely seal voids with fire-rated material, full thickness of the construction element.
(8) Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish the entire unit.

015000: TEMPORARY CONSTRUCTION SITE CONTROLS

1. GENERAL

   A. Scope: Includes but is not limited to temporary facilities and controls as follows, if required by the Construction Contract:

      (1) Temporary Utilities
      (2) Field Office
      (3) Sanitary Facilities
      (4) Safety Facilities
      (5) Fencing
      (6) Erosion Control

   B. Code Compliance: IBC, IEC, IGC, IMC, IPC, State and Local Ordinances, "On-site Erosion Control" Manual.

   C. Qualifications: Work on temporary facilities and controls must be accomplished by craftsmen that meet the same requirements and licensure needed in other sections of these specifications.

   D. Submittals: A written statement from the Contractor locating the field office, fencing (if required) , sanitary facilities, safety barricades are to be located if an erosion control plan is required (see 3.B.(1)) it must be included and have been reviewed by local government having jurisdiction.

2. PRODUCTS:

   A. Temporary Utilities:

      (1) Permits for utility taps, if any, shall be paid by the Owner and not included in the base bid.
      (2) Products and materials required to install temporary utilities shall be as indicated elsewhere within these specifications.
      (3) Temporary utilities include: water, gas, electricity, sewage, and telephone.

   B. Field Office: The office, if required, shall be kept in a neat appearance during the time it is on the site.

   C. Sanitary Facilities:

      (1) The Contractor shall use a portable toilet facility that is designed to be used on a construction site either owned or rented and shall be maintained and serviced so as not to create a heath and odor problem.
      (2) Minimum servicing per week: 2 times per week

   D. Safety Barricades and Devices:

      (1) The Contractor shall build barricades and devices as required for the safety and security of the project.
      (2) Quality Standard: Comply with requirement of ICC/IBC and DOT.

   E. Fencing: See section 323113: Fences and Gates

   F. Erosion Control Products:

      (1) Quality Standard: In accordance with the Manual for Erosion and Sediment Control (current edition) prepared by the State Soil and Water Conservation Commission and the Erosion and Sedimentation Control Act.

(2) Strictly comply with the requirements in the Manual for Erosion and Sediment Control and requirements of local jurisdiction.
(3) See Erosion Control Drawings.

G. Protection of Exterior Finishes:

(1) Contractor shall protect the portion of the building where the ground intersects vertical face of structure.
(2) This protection may be provided in any form that does not damage the finish and does not allow soiling of the finishes by the weather.

3. EXECUTION:

A. Location: Insure temporary utilities, field office, sanitary facilities, and fencing (if required) are not staged in an area that conflicts with the progress of the project including locations to be graded, paved, or otherwise used during construction.

B. Erosion Plan: The erosion plan must be approved and permitted by government authority having jurisdiction before commencement of sitework.

015600: CONSTRUCTION SAFETY

1. GENERAL

A. Scope: Includes all materials, labor, equipment, tools and aspects of completing the construction documents as written and as modified by change orders during course of progress of project.

B. Codes and Standards Compliance: Comply strictly with IBC Chapter 33: Safeguards during construction as it applies to this project.

C. Qualifications of Workmen: The General Contractor shall be responsible for the safety of all personnel and property on the project or performing duties for the project off site of the project. The General Contractor shall be responsible for all personnel and property including but is not limited to the following:

(1) Owner, Owner's guest, and Owner's hired separate contractors and their staff and workmen.
(2) The General Contractor's guests, staff and workmen.
(3) The subcontractor's guest, staff, and workmen.
(4) The supplier's guest, staff and workmen.
(5) The uninvited public.
(6) Public property (Federal, State, County, City)
(7) Private property.

D. Submittals: If use of public property (e.g., roads, streets, sidewalks, easements) is required to execute project.

017000: CONTRACT COMPLETION REQUIREMENTS

1. GENERAL

   A. Scope: As required by the General Conditions (see conditions relating to the completion in index) and requirements set forth hereinafter.

   B. Code Compliance: IBC, IEC, IMC, IPC, NEC, State and Local Ordinances

   C. Qualifications: Principal of General Contractor must provide cover letter stating to the best of their knowledge the project has been completed in accordance with the Construction Documents and complies with the codes listed above.

   D. Submittals: The following documents are required prior to final acceptance of building.

      (1) Certificate of Substantial Completion
      (2) Release of Liens
      (3) Release of Payments of Debts and Claims
      (4) Consent of Surety to Final Payment
      (5) Certificate of Occupancy
      (6) State Fire Marshal 100% inspection report (if applicable)
      (7) All equipment and material warranties and guarantees
      (8) All equipment maintenance manuals
      (9) Cleaning instructions for flooring, wall protection, solid surfaces, tile and grout
      (10) As-Built drawings and project manual w/addenda (if any)
      (11) HVAC Test & Balance Report
      (12) Attic Stock
      (13) Final Keys or Memo of Deliver to Owner.
      (14) Utility account transfer (if applicable)
      (15) Shop Drawings/Submittals with Architect's stamped review

   E. Definition of Completion: It is the intent of these specifications and contract documents that each and every fixture, piece of equipment, or appliance, and other related article shown on the drawings or specified herein, and whether shown or specified are required for the proper completion of the work, shall be completely installed, connected, wired, and made satisfactorily operable for the use and service for which it was intended. The manufacturer or vendor of any fixture, equipment, or appliance shall see to it that all connections whether mechanical or wired, are properly built-in or attached to the article when it reaches the job site so that it will be operable with and from the connections prepared therefore in the building. Nevertheless, and notwithstanding any omission or failure on the part of the manufacturer or vendor to provide suitable connections, it shall be and it is the responsibility of the Contractor to install and connect such items.

2. PRODUCTS: NA

3. EXECUTION:

   A. General Closeout Information:

      (1) Substantial Completion: When Contractor considers work substantially complete, he shall submit to Architect written notice that work, or designated portion thereof, is substantially complete, along with a list of items to be completed or correct.

         (a) Should Architect determine work is not substantially complete the Contractor will promptly be notified in writing, giving reasons for determination. Contractor must remedy deficiencies and send a second written notice of substantial completion to inspecting Architect. Inspecting Architect will reinspect work.

(b) When Inspecting Architect concurs that work is substantially complete, he will prepare a certificate of substantial completion on AIA form G704, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by Inspecting Architect. Inspecting Architect will submit certificate to Contractor for written acceptance of responsibilities assigned in certificate.

(2) Final Inspection: When Contractor considers work complete, written certification shall be submitted to Architect stating the following:

(a) Contract Documents have been reviewed
(b) Work has been inspected for compliance with Contract Documents and a list of discrepancies have been distributed to all parties and that list of discrepancies has been completed.
(c) Work has been completed in accordance with Contract Documents.
(d) Equipment and systems have been cleaned, tested and started up in presence of Owner's authorized representative and are operational.
(e) Work has been completed and is ready for a final inspection.
(f) If required, the State Fire Marshal has provided their 100% completion review report and approved the project.
(g) Inspecting Architect will make inspection to verify status of completion after receipt of such certification.
(h) When Inspecting Architect finds work is acceptable under Contract Documents, he shall request Contractor to make closeout submittals.

(3) Final Payments: In accordance with General Conditions (see final completion and final payment in index of General Conditions).
(4) Maintenance Manual Content:

(a) Contractors, name of responsible principals, addresses, and telephone numbers.
(b) Each product included, indexed to content of volume shall be listed.
(c) Besides each product listed, provide name, address and telephone number of the following:

Installing Contractor
Maintenance Contractor, as appropriate
Local source of supply for parts and replacement

(d) Each product shall be identified by product name and other identifying symbols as used in Contract Documents.
(e) Written texts, as required to supplement data for particular installations shall be organized in consistent formats under separate headings for different procedures. Logical sequences of instruction for each procedure shall be provided.
(f) Copies of each warranty, bond and service contract issued for project shall be provided. An information sheet for Owner's personnel shall be included, and indicate proper procedures in event of failures and instances which might affect validity of warranties or bonds.

(5) Instruction of Owner's Personnel: As specified elsewhere and prior to final inspection or acceptance, Contractor shall instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems. Operating and maintenance manuals shall constitute basis of instruction. Contents of manual shall be reviewed with personnel in full detail to explain all aspects of operations and maintenance. Hands-on instruction and operating demonstration of all systems shall be provided.

018000: CLEANING

1. GENERAL

A. Scope: Throughout the construction period, maintain the building and site in a standard of cleanliness as described in this section.

B. Code Compliance: IBC, IGC, IMC, IPC, IEC, NEC, State and Local Ordinances

C. Qualifications of Craftsmen: Do not allow anyone without proper training and knowledge, about cleaning new finishes and equipment, to do the work. Damaged work will not be accepted.

D. Warranties and Guarantees: Comply strictly with manufacturer's instructions on cleaning specific equipment and finishes to avoid use of warranty or guarantee.

E. Cross References: In addition to standards described in this section, comply with all requirements for cleaning up as described in various other sections of these Specifications.

F. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Cleaning Materials and Equipment: Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

B. Compatibility: Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or equipment.

3. EXECUTION

A. Progress Cleaning:

(1) Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
(2) Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of the work.
(3) Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

B. Site:

(1) Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
(2) Weekly, and more often if necessary, inspect all arrangements of material stored on the site; restack, tidy, or otherwise service all arrangements to meet the requirements of this specification.
(3) Maintain the site in a neat and orderly condition at all times.

C. Structures:

(1) Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste material. Remove all items to the place designated for their storage.

(2) Weekly, and more often if necessary, sweep all interior spaces clean. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.
(3) As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.
(4) Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while is being performed in the space in which finish materials have been installed. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Architect, may be injurious to the finish floor material.
(5) Protecting Exterior Finishes: Do not allow mud dirt, and/or debris on exterior finishes. Protect adequately to insure compliance of this section.
(6) Following the installation of roofing membrane, clean and remove all debris and loose material.

D. Final Cleaning:

(1) Except as otherwise specifically provided, "clean" (for the purpose of this Article) shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
(2) Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described above.
(3) Site: Unless otherwise specifically directed by the Architect, broom clean all paved areas on the site and all public paved areas directly adjacent to the site. Completely remove all resultant debris.
(4) Structures:

(a) Exterior: Visually inspect all exterior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
(b) Interior: Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains, and dirt from finished surfaces. Use only the specified cleaning materials and equipment.
(c) Glass: Clean all glass inside and outside. Must be cleaned inside and outside at the same time.
(d) Polished Surfaces: To all surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.
(e) Timing: Schedule final cleaning as approved by the Architect to enable the Owner to accept a completely clean project.

019100: PROFESSIONAL CONSULTANTS

1. GENERAL

   A. Scope: Includes all professions relating to the design and engineering on the project.

2. Professionals of Record on Project:

   A. Architect:

      Gregg Sims, Architect
      P.O. Box 219
      Dalton, GA 30722-0219
      Telephone: 706-226-5776
      Fax: 706-226-1111

      Architect: Gregg Sims - gs@greggsims.com
      Assistant: Cathy Snyder - cs@greggsims.com

   B. Mechanical, Electrical, Plumbing, Civil and Structural Engineers:

      March Adams & Associates, Inc.
      310 Dodds Avenue
      Chattanooga, TN 37404

      Jeff Westbrook – Mechanical
      423-664-1470
      jeff.westbrook@marchadams.com

      Gary Ellis – Electrical
      423-698-6675
      gary.ellis@marchadams.com

      Rodney Mansfield – Plumbing
      423-664-1483
      rodney.mansfield@marchadams.com

      Joe Parks - Civil
      423-664-1482
      joe.parks@marchadams.com

      Brian Horne - Structural
      423-664-1493
      brian.horne@marchadams.com

3. EXECUTION

   A. All submittals must come through the office of the Architect.

020630: SUBSURFACE INVESTIGATIONS

1. GENERAL

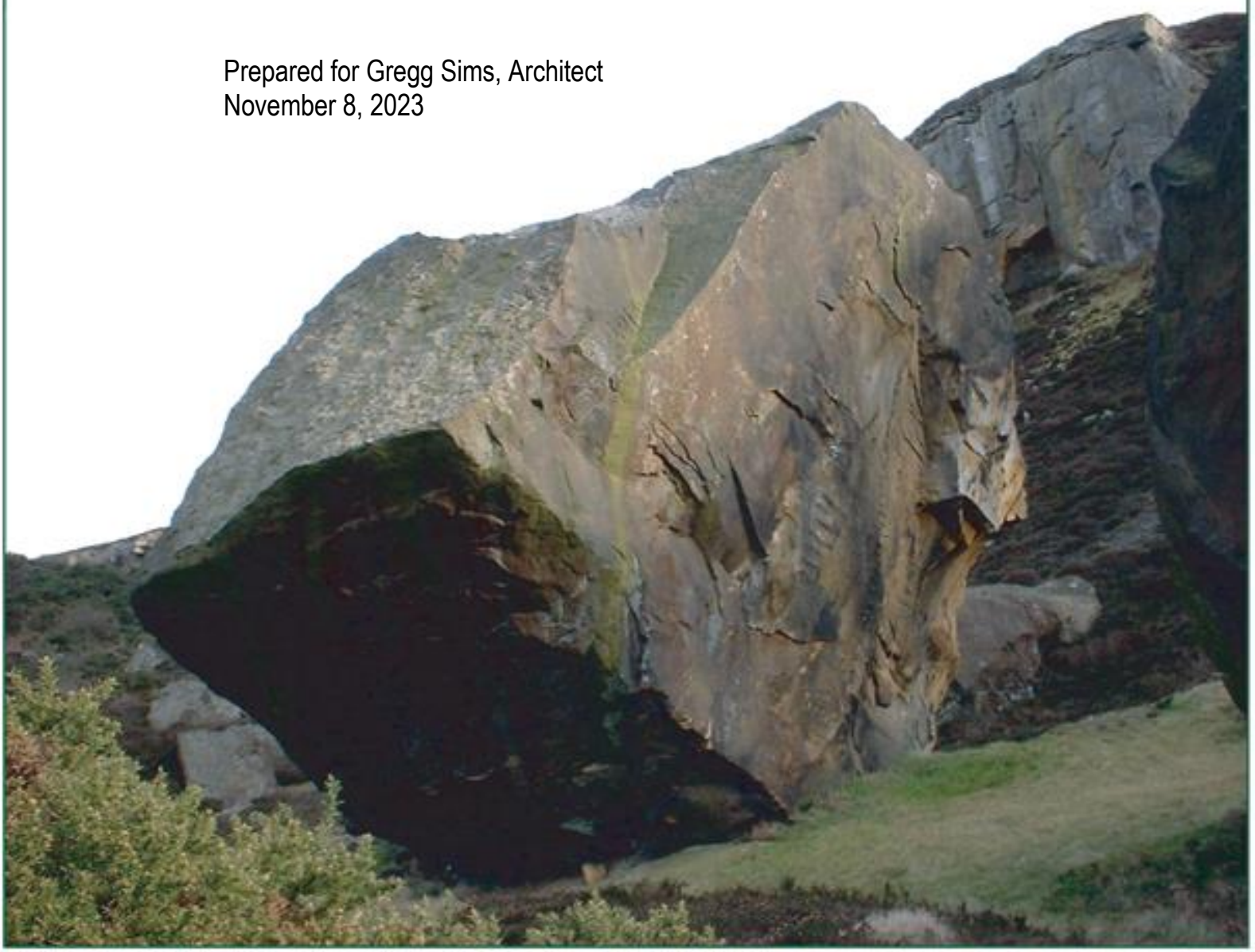
   A. John Davis Recreation Center Addition: Report of Subsurface Evaluation and Geotechnical Engineering Evaluation dated November 8, 2023 prepared by Geo-Hydro Engineers, Inc. for Gregg Sims, Architect of Dalton, Georgia follows this specification.

GEO HYDRO ENGINEERS

Report of Subsurface Evaluation and Geotechnical Engineering Evaluation

John Davis Recreation Center Addition
Dalton, Georgia
Geo-Hydro Project Number 232479.20

Prepared for Gregg Sims, Architect
November 8, 2023



Ms. Cathy Snyder
Gregg Sims, Architect
P.O. Box 219
Dalton, Georgia 30722

November 8, 2023

Report of Subsurface Exploration
and Geotechnical Engineering Evaluation
John Davis Recreation Center Addition
904 Civic Drive - Dalton, Georgia
Geo-Hydro Proposal Number 232479.20

Dear Ms. Snyder:

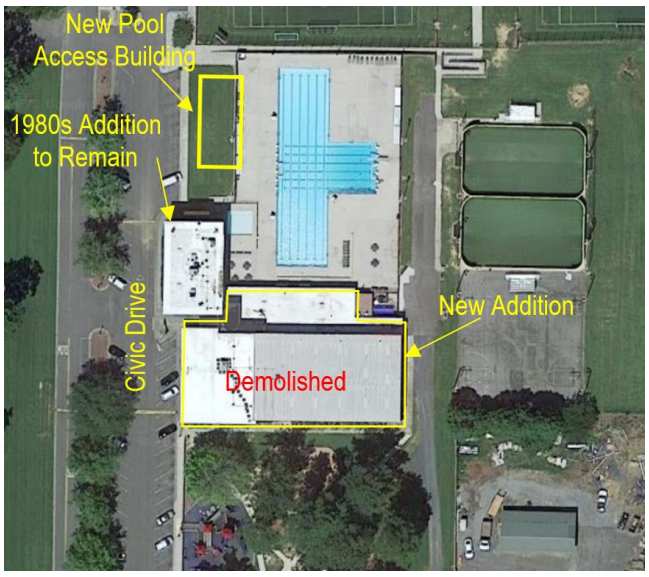
Geo-Hydro Engineers, Inc. has completed the authorized subsurface exploration for the above referenced project. The scope of services for this project was outlined in our proposal number 232479.P0 dated September 21, 2023.

Project Information

The project site is located at the John Davis Recreation Center at 904 Civic Drive in Dalton, Georgia. Figure 1 in the Appendix shows the approximate site location.

The proposed construction includes renovating the 1980s addition and demolishing the remainder of the existing building to create room for the new addition. The new addition will be constructed in the approximate location of the buildings to be demolished and will include a community room, kitchen, gymnasium with seating, storage space, restrooms, and mechanical rooms. The project will also include a new pool access building.

We expect the structural system to include a structural steel frame with masonry walls. At the time of this report, we have not been provided structural loading information for the project. Based on our experience with similar projects, we have assumed that column loads will be no greater than 200 kips will wall loads no greater than 6 kips per lineal foot.



The site is currently occupied by the building pad of the demolished building and the existing 1980s addition. We expect site grading to be minimal and primarily consist of minor grading necessary to direct surface runoff to the site stormwater management system. The annotated aerial photograph to the right shows the approximate building footprints and site conditions prior to demolition.

Exploratory Procedures

The subsurface exploration consisted of 11 soil test borings performed at the approximate requested locations shown on Figure 2 in the Appendix. The test borings were located in the field by Geo-Hydro using a hand-held GPS unit (Garmin GPS Map 64S) with preloaded boring coordinates and by measuring angles and distances from existing site features. In general, the locations of the borings should be considered approximate.

Standard penetration testing, as provided for in ASTM D1586, was performed at select depth intervals in the machine-drilled soil test borings. Soil samples obtained from the drilling operation were examined and classified in general accordance with ASTM D2488 (Visual-Manual Procedure for Description of Soils). Soil classifications include the use of the Unified Soil Classification System described in ASTM D2487 (Classification of Soils for Engineering Purposes). The soil classifications also include our evaluation of the geologic origin of the soils. Evaluations of geologic origin are based on our experience and interpretation and may be subject to some degree of error.

Descriptions of the soils encountered, groundwater conditions, standard penetration resistances, and other pertinent information are provided in the test boring records and hand auger logs included in the Appendix.

Regional Geology

The project site is located in the Appalachian Valley and Ridge Province of Georgia. Based on review of geologic maps, it appears that the site is underlain by a geologic unit known as the Chickamauga Group. This formation includes sedimentary rocks such as sandstone and limestone.

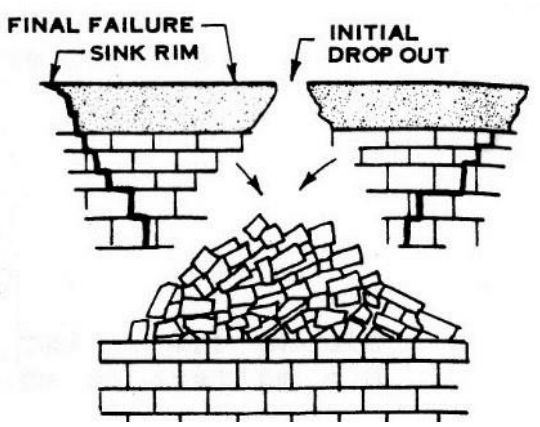
The soils which form from the weathering of the parent rock are termed residual soils. Residual soils derived from limestone or shale are frequently clayey and may be highly plastic. Residual soils typically contain fragments of insoluble rock such as chert.

Solution activity within limestone and dolomite units occurs in the Valley and Ridge Province, particularly along joints, faults, and the bedding planes of the rock. Solution activity in areas where limestone and dolomite units are present directly under the overburden soils often results in the development of an extremely irregular rock surface that frequently has deep slots. The transition from soil to hard rock is generally rather abrupt, with the soils encountered immediately above the rock frequently having a much lower consistency than near the ground surface.

Solution activity can result in the formation of caverns within the limestone or dolomite, and the development of sinkholes and cavities within the overburden soils. Even in areas where deeper limestone or dolomite formations are overlain by shale or sandstones, a rock cavity collapse can occur within the upper rock unit. The figure[1] below illustrates a rock cavity collapse and the subsequent propagation of a void upward through the overburden soils to the surface.

[1] *Correction and Protection in Limestone Terrane*, George F. Sowers, Proceedings of the First Multidisciplinary Conference on Sinkholes, Orlando, Florida, 1984.

Depending upon the stage of development of sinkholes, evidence of ground subsidence may be readily observable at the ground surface, or essentially no indication of impending sinkhole development may be present at the ground surface. The size and frequency of subsurface voids is highly variable and depends on several factors related to geology, climate, and man-induced conditions. The stability of subsurface voids is related not only to the structural characteristics of the subsurface void; but also to proposed site grading, the magnitude of structural loads, significant changes in groundwater levels, drought, and any number of other factors. No obvious signs of sinkhole formation were observed during our work on site.



Overall geologic conditions at the project site have been modified by previous construction activities.

Soil Test Boring Summary

Starting at the ground surface, borings B-1, B-2, B-3, B-9, and B-10 encountered approximately 3 to 4 inches of topsoil. Borings B-4, B-5, B-7, and B-8 encountered approximately 5 inches of concrete. Boring B-6 encountered approximately 4 inches of asphalt underlain by 5 inches of graded aggregate base. Boring B-11 initially encountered approximately 3 inches of gravel. Surface material thicknesses at the site should be expected to vary. For planning purposes, we suggest using a surface material thickness of 8 inches. Detailed measurements necessary for quantity estimation were not performed for this project, and the thickness of surface materials should be expected to vary.

Beneath surface materials, borings B-5 and B-6 encountered fill materials extending to a depth of about 3 feet. The fill materials were classified as silty sand with varying amounts rock fragments. Standard penetration test resistances of 21 blows per foot (B-5) and 6 blows per foot (B-6) were recorded in the fill.

Beneath the fill materials or surface materials, all borings encountered residual soils of typical of the Valley and Ridge Region . The residual soils were classified as clayey silt or silty clay with varying amounts of rock fragments. Standard penetration test resistances recorded in the residual soils ranged from 3 to 33 blows per foot.

Partially weathered rock was encountered in borings B-6, B-8, and B-9 at a depth of about 18 feet. Partially weathered rock is locally defined as residual material having a standard penetration resistance of 100 blows per foot or greater.

Between approximately 6 and 24 hours after drilling , groundwater was encountered in all borings at depths ranging from 14 to 17 feet. The borings were backfilled with soil cuttings after the final groundwater check. It should be noted that groundwater levels will fluctuate depending on yearly and seasonal rainfall variations and other factors, and may rise in the future.

For more detailed descriptions of subsurface soil conditions, please refer to the test boring records included in the Appendix.

Test Boring Summary

Boring	Bottom of Fill (feet)	Top of PWR (feet)	Depth to Auger Refusal (feet)	Boring Termination Depth (feet)	Groundwater Depth* (feet)
B-1	NE	NE	NE	30	15
B-2	NE	NE	NE	30	15
B-3	NE	NE	NE	30	15
B-4	NE	NE	NE	30	14
B-5	3	NE	NE	30	15
B-6	3	18	NE	30	17
B-7	NE	NE	NE	30	15
B-8	NE	18	NE	30	16
B-9	NE	18	NE	30	14
B-10	NE	NE	NE	30	14
B-11	NE	NE	NE	30	15

All Depths in this Summary Table are Approximate
NE: Not Encountered
PWR: Partially Weathered Rock
*Delayed groundwater level measurement recorded between about 6 and 24 hours after drilling

Evaluations and Recommendations

The following evaluations and recommendations are based on the information available on the proposed construction, the data obtained from the test borings, and our experience with soils and subsurface conditions similar to those encountered at this site. Because the test borings represent a statistically small sampling of subsurface conditions, it is possible that conditions may be encountered during construction that are substantially different from those indicated by the test borings. In these instances, adjustments to the design and construction may be necessary.

Geotechnical Considerations

The following geotechnical characteristics of the site should be considered for planning and design:

- Fill materials were encountered in borings B-5 and B-6 extending to a depth of 3 feet. Based on the results of the borings, the fill materials should suitable for reuse as structural fill. However, any fill with high organic content must be segregated prior to reusing the excavated materials. Variations within fill materials should be expected, and poor-quality or loose fill may be encountered intermediate of the areas directly explored. Thorough subgrade and foundation bearing surface evaluations will be required during grading and construction.

- Partially weathered rock was encountered in borings B-6, B-8, and B-9 at a depth of about 18 feet. Excavation of partially weathered rock typically requires large equipment capable of ripping. Due to the leverage required to pre-loosen the material, excavation of partially weathered rock is often impractical in trench excavations. In some cases, impact hammers may be used to remove partially weathered rock for utility alignments. Although based on our understanding of the project and the results of the test boring partially weathered rock does not appear to be a major concern, it is important to note that the depth to rock or partially weathered rock can vary drastically over relatively short distances. It would not be unusual for rock or partially weathered rock to occur at higher elevations between or around some of the soil test borings

- Between approximately 6 and 24 hours after drilling, groundwater was encountered in all borings at depths ranging from 14 to 17 feet. Based on our understanding of the project, we do not expect groundwater to be a major hindrance to design or construction. Regardless of groundwater conditions, the contractor should be prepared to manage surface runoff during rain events and subsurface drainage will be necessary behind all below-grade structures including foundation walls.

- Based on a maximum column foundation load of 200 kips and wall foundation loads not exceeding 6 kips per lineal foot, and contingent upon proper site preparation and thorough evaluation of the foundation excavations, it is our opinion that the proposed gymnasium and pool access buildings can be supported using conventional shallow foundations and concrete slab-on-grade floors. For design purposes, we recommend using an allowable bearing pressure of 3,000 psf.

- Based on the results of the test borings, and following the calculation procedure in the 2018 International Building Code (Chapter 20, ASCE 7-16), the seismic *Site Class* for the site is *D*. The seismic design parameters are as follows: S_S=0.522, S_1=0.123, S_{DS}=0.481, S_{D1}=0.192.

The following sections provide recommendations regarding these issues and other geotechnical aspects of the project.

Existing Fill Materials

Fill materials were encountered in borings B-5 and B-6 extending to a depth of about 3 feet. Based on the results of the borings, the fill materials should be suitable for reuse as structural fill. However, any fill with high organic content must be segregated prior to reusing the excavated materials.

There are several important facts that should be considered regarding existing fill materials and the limitations of subsurface exploration.

- The quality of existing fill materials can be highly variable, and test borings are often not able to detect all of the zones or layers of poor-quality fill materials.

- Layers of poor-quality fill materials that are less than about 2.5 to 5 feet thick may often remain undetected by soil test borings due to the discrete-interval sampling method used in this exploration.

- The interface between existing fill materials and the original ground surface may include a layer of organic material that was not properly stripped during the original grading. Depending on its relationship to the foundation and floor slab bearing surfaces, an organic layer might adversely affect support of footings and floor slabs. If such organic layers are encountered during construction, it may be necessary to "chase out" the organic layer by excavating the layer along with overlying soils.

- Subsurface exploration is simply not capable of disclosing all conditions that may require remediation.

General Site Preparation

Pavements, sidewalks, demolition debris, trees, topsoil, and other deleterious materials should be removed from the proposed construction area. All existing utilities should be excavated and removed unless they are to be incorporated into the new construction. Additionally, site clearing, grubbing, and stripping should be performed only during dry weather conditions. Operation of heavy equipment on the site during wet conditions could result in excessive subgrade degradation. All excavations resulting from rerouting of underground utilities or demolition of below-grade structures should be backfilled in accordance with the *Structural Fill* section of this report.

We recommend, wherever possible, that areas to receive structural fill be proofrolled prior to placement of structural fill. Areas of proposed excavation should be proofrolled after rough finished subgrade is achieved. Proofrolling should be performed with multiple passes in at least two directions using a fully loaded tandem axle dump truck weighing at least 18 tons. Proofrolling must be avoided within 10 feet of

existing buildings and any hardscapes to remain. If low consistency soils are encountered that cannot be adequately densified in place, such soils should be removed and replaced with well compacted fill material placed in accordance with the *Structural Fill* section of this report. Proofrolling should be observed by Geo-Hydro to determine if remedial measures are necessary.

For planning purposes, we suggest considering that approximately 20 percent of the building footprint will require undercutting and replacement extending to a depth of 2½ feet. *The suggested stabilization approach is intended only as a tool to estimate a cost associated with ground stabilization. Ground stabilization may be accomplished by in-place densifications, treatment with geosynthetics (grid or fabric) and crushed stone, or a combination of methods. The need for, extent of, location, and optimal method of stabilization should be determined by Geo-Hydro at the time of construction based on actual site conditions.*

During site preparation, burn pits or trash pits may be encountered. All too frequently such buried material occurs in isolated areas which are not detected by the soil test borings. Any buried debris or trash found during the construction operation should be thoroughly excavated and removed from the site.

Groundwater

Between approximately 6 and 24 hours after drilling, groundwater was encountered in all borings at depths ranging from 14 to 17 feet. Based on our understanding of the project, we do not expect groundwater to be a major hindrance to design or construction. Regardless of groundwater conditions, the contractor should be prepared to manage surface runoff during rain events and subsurface drainage will be necessary behind all below-grade structures including foundation walls.

We recommend that the construction documents include a minimum *performance* specification for dewatering. The specification should require specific results from dewatering rather than dictate a dewatering method. Exhibit “A” as follows provides a minimum guide specification that may be used to develop a dewatering performance specification suitable for this project. In our opinion, Exhibit “A” represents the minimum specification for a project of this scope.

EXHIBIT "A"

Minimum Guide Specification for Dewatering

****

NOTE: The following specifications are for use as a guide for development of actual specifications. The guide is not intended for direct use as a construction specification without modifications to reflect specific project conditions.

****

Control of groundwater shall be accomplished in a manner that will preserve the strength of the foundation soils, will not cause instability of the excavation slopes, and will not result in damage to

> existing structures. Where necessary for these purposes, the water level shall be lowered in advance of excavation, utilizing trenches, sumps, wells, well points or similar methods. The water level, as measured in piezometers, shall be maintained a minimum of 3 feet below the prevailing excavation level. Open pumping from sumps and ditches, if it results in boils, loss of soil fines, softening of the ground or instability of slopes, will not be permitted. Wells and well points shall be installed with suitable screens and filters so that continuous pumping of soil fines does not occur. The discharge shall be arranged to facilitate collection of samples by the Engineer.

Adapted from Construction Dewatering – A Guide to Theory and Practice, John Wiley and Sons.

Excavation Characteristics

Partially weathered rock was encountered in 3 of the 11 borings at a depth of about 18 feet. Excavation of partially weathered rock typically requires large equipment capable of ripping. Due to the leverage required to pre-loosen the material, excavation of partially weathered rock is often impractical in trench excavations. In some cases, impact hammers are necessary to remove partially weathered rock and may be necessary depending on utility layout.

It is important to note that the depth to rock or partially weathered rock may vary drastically over relatively short distances. It would not be unusual for rock pinnacles, boulders, or rock lenses to occur at higher elevations between or around some of the soil test borings.

For construction bidding and field verification purposes it is common to provide a verifiable definition of rock in the project specifications. The following are typical definitions of mass rock and trench rock.

- Mass Rock: Material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at 56,000 pounds (Caterpillar D-8K or equivalent), and occupying an original volume of at least one cubic yard.

- Trench Rock: Material occupying an original volume of at least one-half cubic yard which cannot be excavated with a hydraulic excavator having a minimum flywheel power rating of 123 kW (165 hp); such as a Caterpillar 322 C L, John Deere 230C LC, or a Komatsu PC220LC-7; equipped with a short tip radius bucket no wider than 42 inches.

The foregoing definitions are based on large equipment typically utilized for mass grading. Subsequent excavations for building foundations, retaining walls, and underground utilities are often performed with smaller equipment such as rubber-tired backhoe/loaders or even mini-excavators. Contractors will often request additional payment for mobilizing larger equipment than that which was anticipated during preparation of their construction bid. The amount of additional compensation if any and the minimum equipment size necessary to qualify for any additional compensation should be defined before the start of construction.

Reuse of Excavated Materials

Based on the results of test borings and our observations, residual and fill soils should be suitable for reuse as structural fill. Any excavated fill material containing construction debris, abundant organic content, or other debris in quantities that cannot be readily removed should be considered unsuitable for reuse. Soils containing more than about 5 percent organics as determined by ASTM D2974 will not be suitable for reuse unless they are mixed with "clean" soils to achieve a lower organic content. Geo-Hydro should observe the excavation of existing fill materials to evaluate their suitability for reuse. Soft, unstable fill soils free of deleterious materials may be reusable after routine moisture adjustment.

It is important to establish as part of the construction contract whether soils having elevated moisture content will be considered suitable for reuse. We often find this issue to be a point of contention and a source of delays and change orders. From a technical standpoint, soils with moisture contents wet of optimum as determined by the standard Proctor test (ASTM D698) can be reused if the moisture is properly adjusted to within the workable range. From a practical standpoint, wet soils can be very difficult to dry in small or congested sites and such difficulties should be considered during planning and budgeting. A clear understanding by the general contractor and grading subcontractor regarding the reuse of excavated soils will be important to avoid delays and unexpected cost overruns.

Structural Fill

Materials selected for use as structural fill should be free of organic debris, waste construction debris, and other deleterious materials. The material should not contain rocks having a diameter over 4 inches. It is our opinion that the following soils represented by their USCS group symbols will typically be suitable for use as structural fill and are usually found in abundance in the Valley and Ridge Province: (SM), (ML), and (CL). The following soil types are typically suitable but are not abundant in the Valley and Ridge Province: (SW), (SP), (SC), (SP-SM), and (SP-SC). The following soil types are considered unsuitable: (OL), (OH), and (Pt).

Highly plastic silt or clay, (MH) or (CH) soils, should be used with extreme caution. Such soils will require protection against desiccation or inundation during the construction process. Soils which have a liquid limit greater than 60 and a plasticity index greater than 35 will require blending with less plastic materials to result in lower Atterberg limits.

Laboratory Proctor compaction tests and classification tests should be performed on representative samples obtained from the proposed borrow material to provide data necessary to determine acceptability and for quality control. The moisture content of suitable borrow soils should generally be no more than 3 percentage points below or above optimum at the time of compaction. Tighter moisture limits may be necessary with certain soils.

Suitable fill material should be placed in thin lifts. Lift thickness depends on the type of compaction equipment, but a maximum loose-lift thickness of 8 inches is generally recommended. The soil should be compacted by a self-propelled sheepsfoot roller. Within small excavations such as in utility trenches, around manholes, above foundations, or behind retaining walls, we recommend the use of "wacker packers"

or “Rammax” compactors to achieve the specified compaction. Loose lift thicknesses of 4 to 6 inches are recommended in small area fills.

We recommend that structural fill be compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). The upper 12 inches of floor slab subgrade soils should be compacted to at least 98 percent of the standard Proctor maximum dry density. Additionally, the maximum dry density of structural fill should be no less than 90 pcf. Following Georgia DOT guidelines, the upper 12 inches of pavement subgrade soils should be compacted to at least 100 percent of the standard Proctor maximum dry density. Geo-Hydro should perform density tests during fill placement.

Earth Slopes

Temporary construction slopes should be designed in strict compliance with OSHA regulations. The exploratory boring indicates that most soils at the site are Types B and C as defined in 29 CFR 1926 Subpart P. This dictates that temporary construction slopes in residual soils (Type B) for excavation depths of 20 feet or less above the groundwater level should be no steeper than 1H:1V. Temporary excavation slopes in fill materials (Type C), or in any soil type extending below the groundwater level, must be no steeper than 1.5H:1V. Temporary construction slopes should be closely observed on a daily basis by the contractor’s “competent person” for signs of mass movement: tension cracks near the crest, bulging at the toe of the slope, etc. The responsibility for excavation safety and stability of construction slopes should lie solely with the contractor.

We recommend that extreme caution be observed in trench excavations. Several cases of loss of life due to trench collapses in Georgia point out the lack of attention given to excavation safety on some projects. We recommend that applicable local and federal regulations regarding temporary slopes and shoring and bracing of trench excavations be closely followed.

Formal analysis of slope stability was beyond the scope of work for this project. Based on our experience, permanent cut or fill slopes should be no steeper than 2H:1V to maintain long term stability and to provide ease of maintenance. The crest or toe of cut or fill slopes should be no closer than 10 feet to any foundation. The crest or toe should be no closer than 5 feet to the edge of any pavements. Erosion protection of slopes during construction and during establishment of vegetation should be considered an essential part of construction.

Earth Pressure (Cast-in-Place Walls)

Three earth pressure conditions are generally considered for retaining wall design: "at rest", "active", and "passive" stress conditions. Retaining walls which are rigidly restrained at the top and will be essentially unable to rotate under the action of earth pressure (such as basement or foundation walls) should be designed for "at rest" conditions. Retaining walls which can move outward at the top as much as 0.5 percent of the wall height (such as free-standing walls) should be designed for "active" conditions. For the evaluation of the resistance of soil to lateral loads the "passive" earth pressure must be calculated. It should be noted that full development of passive pressure requires deflections toward the soil mass on the order of 1.0 percent to 4.0 percent of total wall height.

Earth pressure may be evaluated using the following equation:

$$p_h = K (D_w Z + q_s) + W_w(Z-d)$$

where: p_h = horizontal earth pressure at any depth below the ground surface (Z).
W_w = unit weight of water
Z = depth to any point below the ground surface
d = depth to groundwater surface
D_w = wet unit weight of the soil backfill (depending on borrow sources). The wet unit weight of most residual soils may be expected to range from approximately 115 to 125 pcf. Below the groundwater level, D_w must be the buoyant weight.
q_s = uniform surcharge load (add equivalent uniform surcharge to account for construction equipment loads)
K = earth pressure coefficient as follows:

Earth Pressure Condition	Coefficient
At Rest (K_o)	0.53
Active (K_a)	0.36
Passive (K_p)	2.8

The groundwater term, $W_w(Z-d)$, should be used if no drainage system is incorporated behind retaining walls. If a drainage system is included which will not allow the development of any water pressure behind the wall, then the groundwater term may be omitted. The development of excessive water pressure is a common cause of retaining wall failures. Drainage systems should be carefully designed to ensure that long term permanent drainage is accomplished.

The above design recommendations are based on the following assumptions:

- Horizontal backfill
- 95 percent standard Proctor compactive effort on backfill (ASTM D698)
- No safety factor is included

For convenience, equivalent fluid densities are frequently used for the calculation of lateral earth pressures. For "at rest" stress conditions, an equivalent fluid density of 66 pcf may be used. For the "active" state of stress an equivalent fluid density of 45 pcf may be used. These equivalent fluid densities are based on the assumptions that drainage behind the retaining wall will allow *no* development of hydrostatic pressure; that native clayey sands, silty clays, sandy silts, or silty sands will be used as backfill; that the backfill soils will be compacted to 95 percent of standard Proctor maximum dry density; that backfill will be horizontal; and that no surcharge loads will be applied.

For analysis of sliding resistance of the base of a retaining wall, the coefficient of friction may be taken as 0.35 for the soils at the project site. This is an ultimate value, and an adequate factor of safety should be used in design. The force which resists base sliding is calculated by multiplying the normal force on the

base by the coefficient of friction. Full development of the frictional force could require deflection of the base of roughly 0.1 to 0.3 inches.

Foundation Design

After general site preparation and site grading have been completed in accordance with the recommendations of this report, it is our opinion that the proposed gymnasium can be supported using conventional shallow foundations. Provided that column foundation loads do not exceed 200 kips and wall foundation loads are no greater than 6 kips per lineal foot, we recommend using an allowable bearing pressure of 3,000 psf for design purposes. In addition, we recommend a minimum width of 24 inches for column footings and 18 inches for continuous wall footings to prevent general bearing capacity failure. Footings should bear at a minimum depth of 18 inches below the prevailing exterior ground surface elevation to help penetrate soils disturbed during construction and to avoid potential problems due to frost heave.

The recommended allowable bearing pressure is based on an estimated maximum total foundation settlement no greater than approximately 1 inch, with anticipated differential settlement between adjacent columns not exceeding about ½ inch. If the architect or structural engineer determines that the estimated total or differential settlement cannot be accommodated by the proposed structure, please contact us.

Foundation bearing surface evaluations should be performed in all footing excavations prior to placement of reinforcing steel. Geo-Hydro should perform these evaluations to confirm that the design allowable soil bearing pressure is available. Foundation bearing surface evaluations should be performed using a combination of visual observation, hand augering, and portable dynamic cone penetrometer testing (ASTM STP-399).

Because of natural variation, it is possible that some of the soils at the project site may have an allowable bearing pressure less than the recommended design value. Likewise, existing fill materials can be highly variable, and may have an allowable bearing pressure less than the recommended design value. Therefore, foundation bearing surface evaluations will be critical to aid in the identification and remediation of these situations.

Remedial measures should be based on actual field conditions. However, in most cases we expect the use of the stone replacement technique to be the primary remedial measure. Stone replacement involves the removal of soft or loose soils, followed by replacement with well-compacted graded aggregate base (GAB) meeting Georgia DOT specifications for gradation. Stone replacement is generally performed to depths ranging from a few inches to as much as 2 times the footing width, depending on the actual conditions. For budgetary purposes, we suggest considering that as much as 20 percent of the foundation excavations will require over excavation and stone replacement extending to a depth of 3 feet below bearing elevation. The actual quantity of stone replacement will be different and may exceed the provided estimate.

Seismic Design

Based on the results of the test borings, and following the calculation procedure in the 2018 International Building Code (Chapter 20, ASCE 7-16), the seismic *Site Class* for the site is *D*. The seismic design parameters are as follows: S_S=0.522, S_1=0.123, S_{DS}=0.481, S_{D1}=0.192.

Based on the information obtained from the soil test borings, it is our opinion that the potential for liquefaction of the residual soils at the site due to earthquake activity is relatively low.

Floor Slab Subgrade Preparation

The soil subgrade in the area of concrete slab-on-grade support is often disturbed during foundation excavation, plumbing installation, and superstructure construction. We recommend that the floor slab subgrade be evaluated by Geo-Hydro immediately prior to beginning floor slab construction. If low consistency soils are encountered that cannot be adequately densified in place, such soils should be removed and replaced with well-compacted fill material placed in accordance with the *Structural Fill* section of this report or with well-compacted graded aggregate base (GAB).

Assuming that the top 12 inches of floor slab subgrade soils are compacted to at least 98 percent of the standard Proctor maximum dry density, we recommend that a modulus of subgrade reaction of 120 pci be used for design. This value is suitable only for light floor loads (no greater than 150 psf) and transient loads, and should not be used for designing thickened slab sections supporting permanent or semi-permanent loads such as those from equipment and storage racks. For design of floor areas supporting permanent or semi-permanent loads from floor storage, storage racks, etc., we recommend using a modulus of subgrade reaction of 70 pci for design purposes.

Moisture Control for Concrete Slabs

To prevent the capillary rise of groundwater from adversely affecting the concrete slab-on-grade floor, we recommend that slab-on-grade floors be underlain by no less than 5 inches of graded aggregate base (GAB) compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D1557). The stone must be covered by a vapor retarder. We suggest polyethylene sheeting at least 10 mils thick as a minimum vapor retarder.

Flexible Pavement Design

Based on our experience with similar projects, assuming standard pavement design parameters, and contingent upon proper pavement subgrade preparation, we recommend the following pavement sections:

Entrance/Exit Driveways, Main Drive Lanes, and Bus/Truck Traffic Areas

Material	Thickness (inches)
Asphaltic Concrete 9.5mm Superpave Type II	2
Asphaltic Concrete 19mm Superpave	2
Graded Aggregate Base (GAB) (Base Course)	8
Subgrade compacted to at least 100% standard Proctor maximum dry density (ASTM D-698)	12

Automobile Parking and Automobile Traffic Only

Material	Thickness (inches)
Asphaltic Concrete 9.5mm Superpave Type II	2
Graded Aggregate Base (GAB) (Base Course)	6
Subgrade compacted to at least 100% standard Proctor maximum dry density (ASTM D-698)	12

A concrete thickness of 7 inches is recommended for the approach and collection zone in front of any dumpster, in loading and unloading areas, and in designated truck or bus turn-around areas. Please refer to the *Concrete Pavement* section of this report for concrete pavement recommendations.

Similar to floor slab subgrades, pavement subgrades generally deteriorate due to constructions activities between the time of general site preparation and pavement construction. The top 12 inches of pavement subgrade soils should be compacted to at least 100 percent of the standard Proctor maximum dry density (ASTM D698). Scarification and moisture adjustment will likely be required to achieve the recommended subgrade compaction level. Allowances for pavement subgrade preparation should be considered for budgeting and scheduling.

GAB must be compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D1557).

All pavement construction should be performed in general accordance with Georgia DOT specifications. Proper subgrade compaction, adherence to Georgia DOT specifications, and compliance with project plans and specifications, will be critical to the performance of the constructed pavement.

Concrete Pavement

Concrete thicknesses of 5 inches in automobile parking areas and 6 inches in driveways and traffic lanes are recommended. A concrete thickness of 7 inches is recommended for the approach and collection zone in front of any dumpster, in loading and unloading areas, and in designated truck or bus turn-around areas. A 600-psi flexural strength concrete mix (approximately 4,500 psi compressive) with 4 to 6 percent air entrainment should be used. The concrete pavement should be underlain by no less than 5 inches of

compacted graded aggregate base (GAB). GAB should be compacted to at least 100 percent of the modified Proctor maximum dry density (ASTM D1557). The top 12 inches of soil subgrade should be compacted to at least 100 percent of the standard Proctor maximum dry density (ASTM D698).

The concrete pavement may be designed as a "plain concrete pavement" with no reinforcing steel, or reinforcing steel may be used at joints. Construction joints and other design details should be in accordance with guidelines provided by the Portland Cement Association and the American Concrete Institute.

In general, all pavement construction should be in accordance with Georgia DOT specifications. Proper subgrade compaction, adherence to Georgia DOT specifications, and compliance with project plans and specifications will be critical to the performance of the constructed pavement.

Pavement Design Limitations

The pavement sections discussed above are based on our experience with similar projects. After traffic information has been developed, we recommend that you allow us to review the traffic data and revise our recommendations as necessary.

Pavement Materials Testing

To aid in verifying that the pavement system is installed in general accordance with the design considerations, the following materials testing services are recommended:

- Density testing of subgrade materials.
- Proofrolling of pavement subgrade materials immediately prior to placement of graded aggregate base (GAB). This proofrolling should be performed the same day GAB is installed.
- Density testing of GAB and verification of GAB thickness. In-place density should be verified using the sand cone (ASTM D1556) or Nuclear Density Gauge method (ASTM D6938).
- Coring of the pavement to verify thickness and density (asphalt pavement only).
- Preparation and testing of beams and cylinders for flexural and compressive strength testing (Portland cement concrete only). The total number of test specimens required will depend on the number of concrete placement events necessary to construct the pavement.

* * * * * * *

We appreciate the opportunity to serve as your geotechnical consultant for this project. If you have any questions concerning this report or any of our services, please call us.

Sincerely,

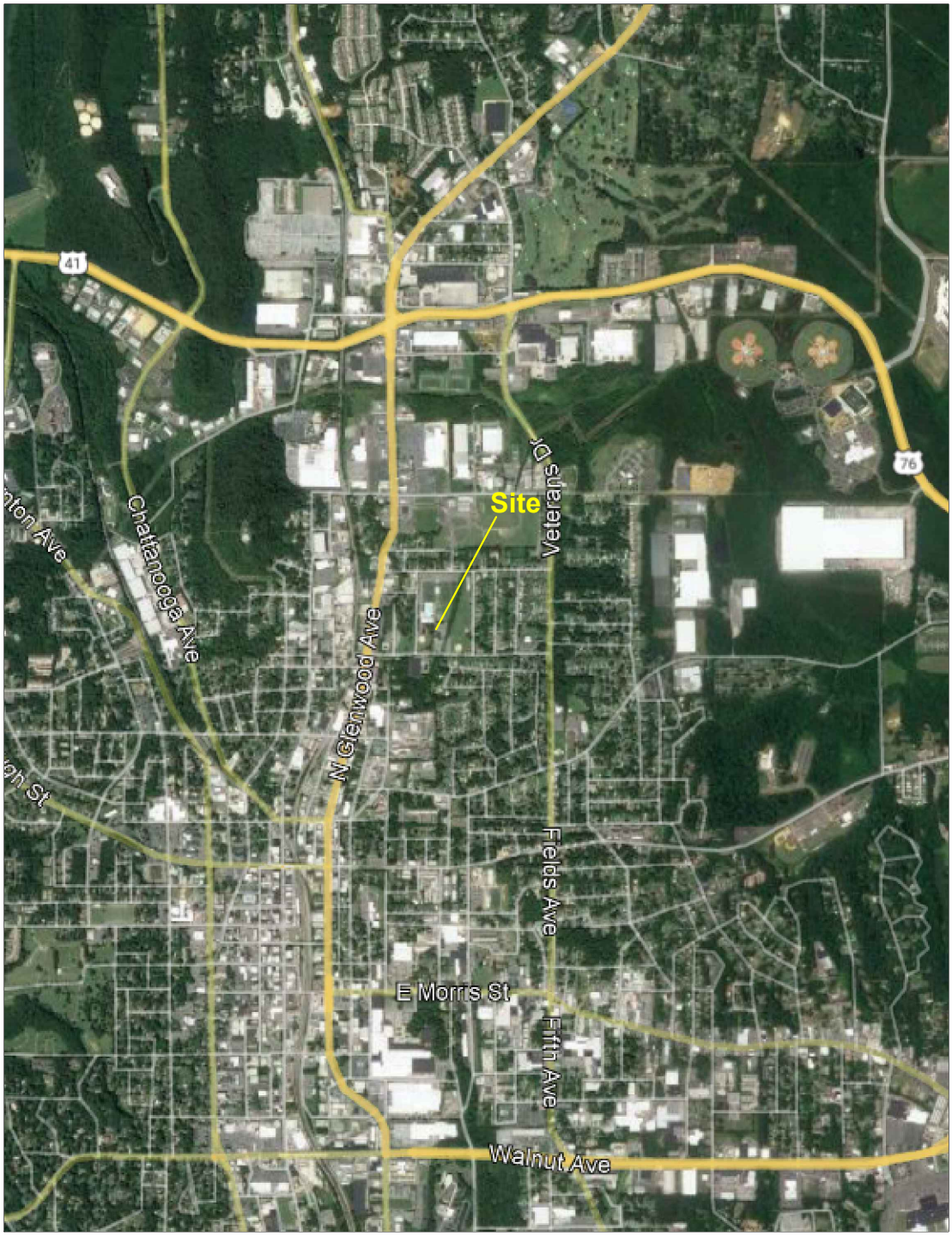
GEO-HYDRO ENGINEERS, INC.

Max Beaham
Staff Engineer
mbeaham@geohydro.com

Luis E. Babler, P.E.
Chief Engineer
luis@geohydro.com

MLB/LEB/232479.20 John Davis Rec Center leb

APPENDIX

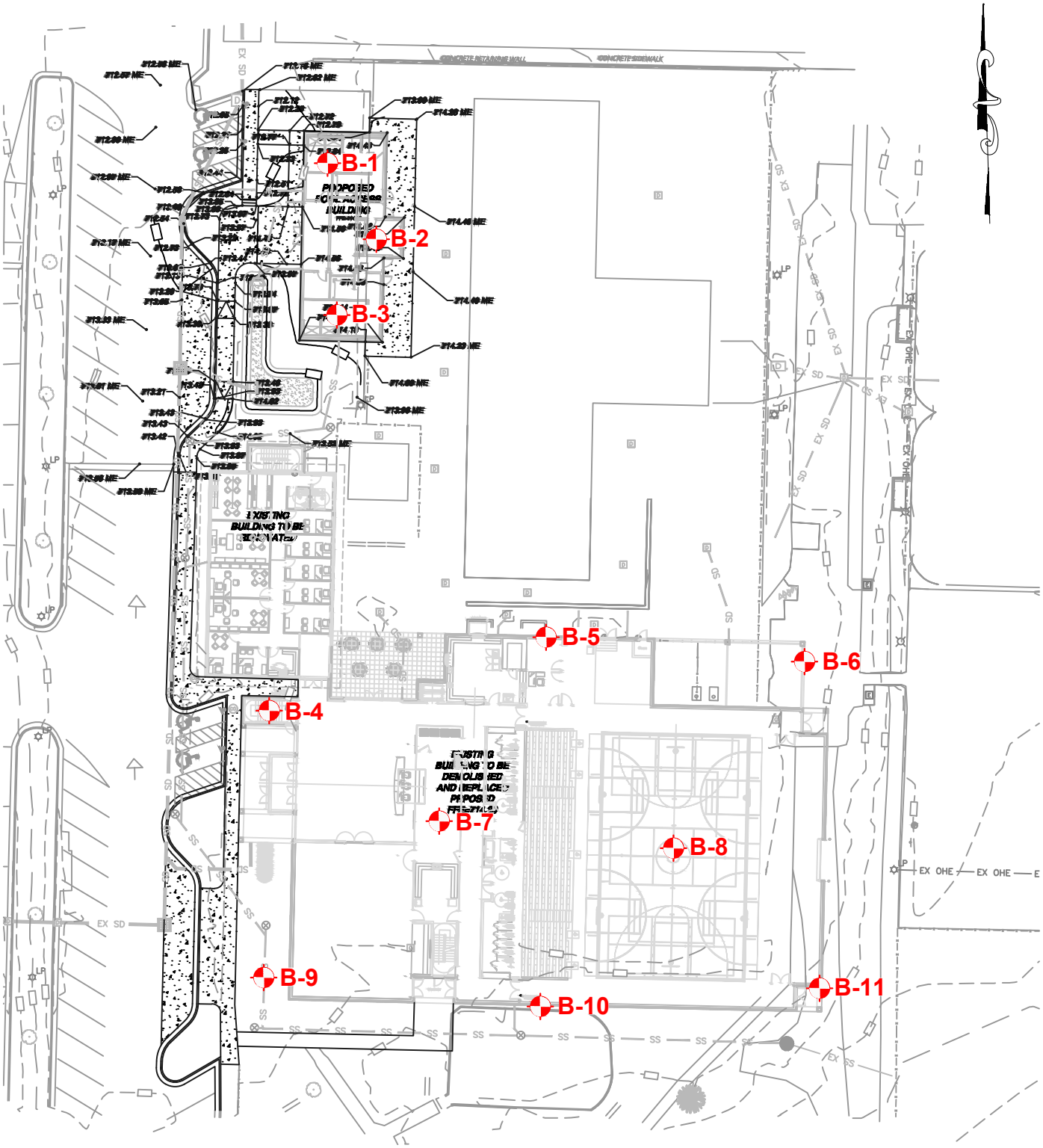


0 0.25 0.5 1 1.5

Approximate Scale, Miles

Figure 1: Site Location Plan

John Davis Recreation Center Addition
904 Civic Drive
Dalton, Georgia
Geo-Hydro Project Number 232479.20



LEGEND: Soil Test Boring

Approximate Scale: 1"= 50'

Figure 2: Boring Location Plan

John Davis Recreation Center Addition
904 Civic Drive
Dalton, Georgia
Geo-Hydro Project Number 232479.20

Symbols and Nomenclature

Symbols

▌	Thin-walled tube (TWT) sample recovered
▯	Thin-walled tube (TWT) sample not recovered
●	Standard penetration resistance (ASTM D1586)
50/2”	Number of blows (50) to drive the split-spoon a number of inches (2)
65%	Percentage of rock core recovered
RQD	Rock quality designation - % of recovered core sample which is 4 or more inches long
GW	Groundwater
	Water level at least 24 hours after drilling
	Water level one hour or less after drilling
ALLUV	Alluvium
TOP	Topsoil
PM	Pavement Materials
CONC	Concrete
FILL	Fill Material
RES	Residual Soil
PWR	Partially Weathered Rock
SPT	Standard Penetration Testing

Penetration Resistance Results	Number of Blows, N	Approximate Relative Density
Sands	0-4	very loose
	5-10	loose
	11-20	firm
	21-30	very firm
	31-50	dense
	Over 50	very dense

	Number of Blows, N	Approximate Consistency
Silts and	0-1	very soft
Clays	2-4	soft
	5-8	firm
	9-15	stiff
	16-30	very stiff
	31-50	hard
	Over 50	very hard

Drilling Procedures

Soil sampling and standard penetration testing performed in accordance with ASTM D 1586. The standard penetration resistance is the number of blows of a 140-pound hammer falling 30 inches to drive a 2-inch O.D., 1.4-inch I.D. split-spoon sampler one foot. Rock coring is performed in accordance with ASTM D 2113. Thin-walled tube sampling is performed in accordance with ASTM D 1587.

GEO HYDRO ENGINEERS

B-1

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **20 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **15 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N	Standard Penetration Test (Blows/Foot)
				Topsoil (Approximately 3 inches)		
				Stiff to very stiff orange, brown, and tan to tan fine to medium sandy clay (CL) (RESIDUUM)	12	
	5				17	
				Stiff orange, brown, and tan clayey silt (ML)	14	
	10				15	
				Stiff brown and tan silty clay (CL)		
	15	▼			12	
				Stiff to very stiff dark brown and tan clayey silt (ML)		
	20	▽			16	
	25				30	
	30			Boring Terminated at 30 feet	15	
	35					

Standard Penetration Test (Blows/Foot): 0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-2

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **25 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **15 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N	Standard Penetration Test (Blows/Foot)
				Topsoil (Approximately 3 inches)		
				Stiff to very stiff black, orange, and tan to brown and tan clayey silt (ML) (RESIDUUM)	16	
	5				15	
					18	
	10				22	
		▼				
	15				11	
	20				15	
				Soft brown fine sandy silt (ML)		
	25	▽			3	
				Very stiff dark brown and tan clayey silt (ML)		
	30			Boring Terminated at 30 feet	22	
	35					

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-3

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **20 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **15 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N	Standard Penetration Test (Blows/Foot)
				Topsoil (Approximately 4 inches)		
				Stiff to very stiff orange, brown, and tan silty clay (CL) (RESIDUUM)	9	
	5				17	
					19	
				Very stiff dark brown and tan clayey silt (ML)		
	10				22	
		▼				
	15				16	
		▽				
	20				23	
	25				30	
	30			Boring Terminated at 30 feet	28	
	35					

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-4

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **20 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **14 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N	Standard Penetration Test (Blows/Foot)
				Concrete (Approximately 5 inches)		
				Stiff brown and tan silty clay (CL) (RESIDUUM)	15	
	5			Firm to stiff orange, brown, and tan to dark brown and tan clayey silt (ML)	12	
					8	
	10			Very stiff to hard dark brown and tan clayey silt (ML)	16	
	15	▼			22	
	20	▽			16	
	25				33	
	30			Boring Terminated at 30 feet	27	
	35					

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-5

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **25 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **15 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
	0			Concrete (Approximately 5 inches)	
				Very stiff orange, brown, and tan silty clay (CL) with rock fragments (FILL)	21
	5			Very stiff gray and tan silty clay (CL) (RESIDUUM)	20
				Very stiff brown and tan silty clay (CL)	22
	10				23
	15	▼			25
	20				17
				Firm tan clayey silt (ML)	
	25	▽			7
				Very stiff brown and tan clayey silt (ML)	
	30			Boring Terminated at 30 feet	19
	35				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-6

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **Not Encountered**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **17 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
				Asphalt (Approximately 4 inches)	
				Gravel Base (Approximately 5 inches)	
				Firm orange, brown, and tan silty clay (CL) (FILL)	6
	5			Stiff to very stiff tan and gray to brown and tan clayey silt (ML) (RESIDUUM)`	10
					12
	10				12
	15	▼			17
				Partially weathered rock sampled as brown and tan clayey silt (ML)	
	20				50/3"
				Stiff brown and tan clayey silt (ML)	
	25				9
				Partially weathered rock sampled as brown and tan clayey silt (ML)	
	30			Boring Terminated at 30 feet	50/4"
	35				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-7

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **30 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **15 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N	Standard Penetration Test (Blows/Foot)
				Topsoil (Approximately 5 inches)		
				Stiff to very stiff gray and tan to brown and tan clayey silt (ML) (RESIDUUM)	22	
	5				21	
					17	
	10				22	
		▼				
	15				16	
	20				10	
	25				28	
		▽				
	30			Boring Terminated at 30 feet	21	
	35					

0 10 20 30 40 50 60 70 80 90 100

Remarks:

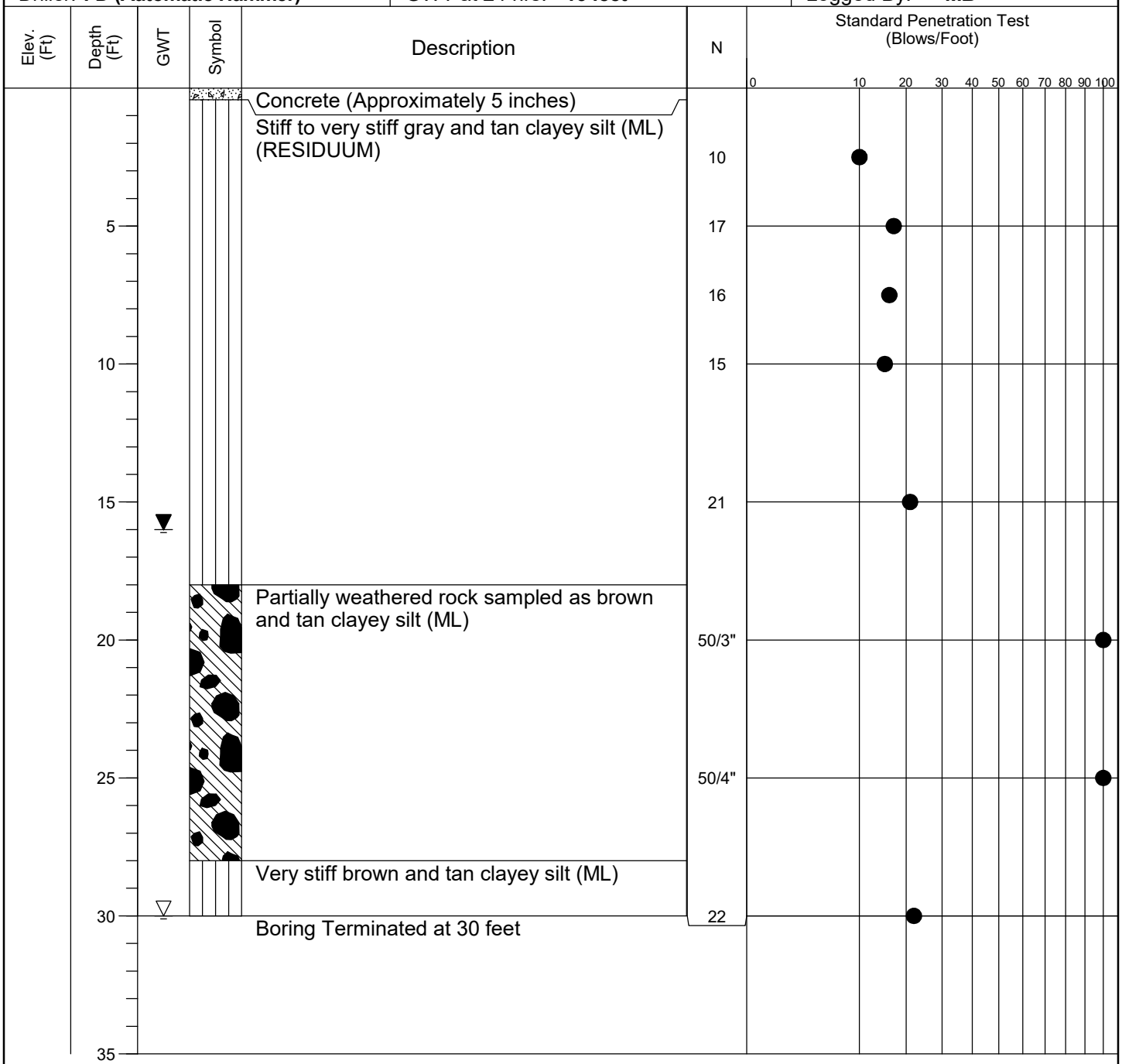
TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-8

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **30 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **16 feet**	Logged By: **MB**



Remarks:

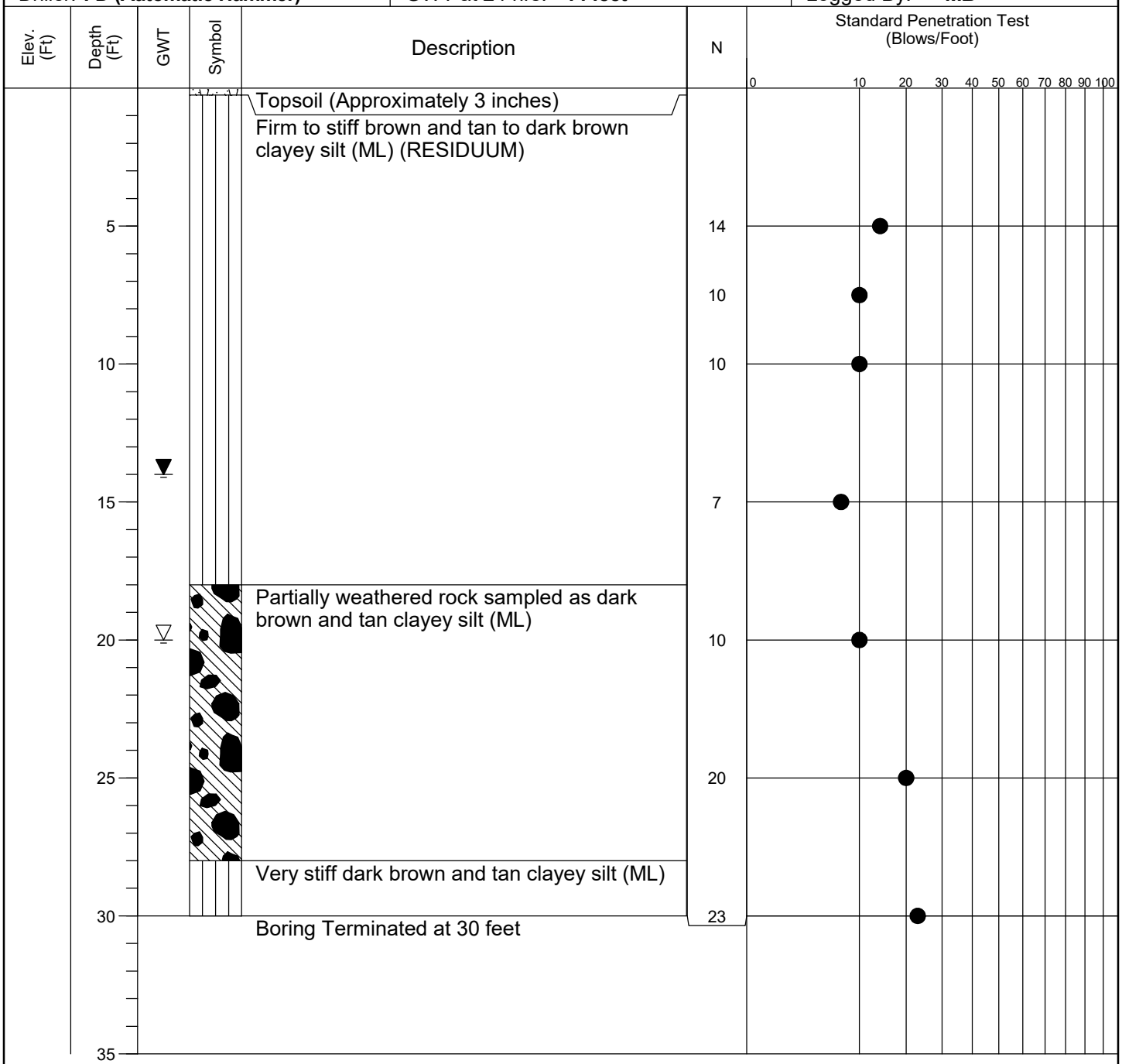
TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-9

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **20 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **14 feet**	Logged By: **MB**



Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-10

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **24 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **14 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
	0			Topsoil (Approximately 3 inches)	
				Stiff to very stiff red, brown, and tan silty clay (CL) (RESIDUUM)	20
	5				11
				Stiff to very stiff tan and gray to brown and tan clayey silt (ML)	21
	10				26
		▼			
	15				17
	20				13
		▽		Soft to firm tan clayey silt (ML)	
	25				4
	30			Boring Terminated at 30 feet	7
	35				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

B-11

Test Boring Record

GEO HYDRO ENGINEERS

Project: **John Davis Recreation Center Addition**		Project No: **232479.20**
Location: **Dalton, Georgia**		Date: **10/18/23**
Method: **HSA- ASTM D1586**	GWT at Drilling: **25 feet**	G.S. Elev:
Driller: **FD (Automatic Hammer)**	GWT at 24 hrs: **15 feet**	Logged By: **MB**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N	Standard Penetration Test (Blows/Foot)
				Gravel (Approximately 3 inches)		
				Very stiff brown and tan clayey silt (ML) (RESIDUUM)	20	
	5			Stiff red, brown, and tan silty clay (CL)	15	
				Stiff to very stiff dark brown and tan clayey silt (ML)	22	
	10				16	
	15	▼			11	
	20				29	
	25	▽			19	
	30			Boring Terminated at 30 feet	26	
	35					

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD LOGS.GPJ GEO HYDRO.GDT 11/8/23

024120: SELECTIVE BUILDING DEMOLITION

1. GENERAL

   A. Scope: Furnish all materials, labor, tools, equipment, and related services necessary for the demolition required and shown on the plans. Demolition includes such work as parts of existing structures, walls, floors, and minor demolition for remodeling protection during demolition and capping of existing utilities. The General Contractor shall be responsible for visiting the site and noting demolition that maybe required of this project.

      (1) Owner Retained Materials: The General Contractor shall walk-through the construction area with the Owner's representative before demolition commencement. General Contractor is to turn-over demolished materials as directed by Owner including entire radiant ceiling system.

   B. Code and Standards Compliance: IBC, IEC, IGC, IPC, IMC and state and local building codes.

   C. Qualification of Craftsmen: Only workmen knowledgeable and competent at demolition work shall be used. It is particularly important to ensure continued service while demolition work is done.

   D. Submittals: Do not cut building framing members or modify the foundation without written approval.

      (1) Modifications to structural system are acceptable only with the Structural Engineer's written approval, submitted through the Architect.
      (2) Submit written request for Structural Engineer's site visit in accordance with submittal requirements of this section.
      (3) Shop Drawings: Required for modifications to building structure. Submit in accordance with Section 01300.

   E. Warranties and Guarantees: The Contractor must repair any damage to any area that is not required to be demolished.

   F. Cross Reference: 018000: Cleaning
      033000: Concrete (cast-in-place)

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS: As required for demolition.

3. EXECUTION

   A. Pre-Construction Precautions:

      (1) Notify Utility Protection Center (UPC) by calling 1-800-282-7411 or log on to www.gaupc.com to obtain a password to enter locate requests through the internet. Have the following information ready before calling:

         (a) Area code and phone number
         (b) First and Last Name
         (c) Type of work to be performed
         (d) Name of party for whom the work is to be performed
         (e) Name of County and City where work is to take place
         (f) State whether the work is to be done in or out of the city

(g) Name of street/address where work is to be performed
(h) Name of nearest cross street to the main address
(i) Indicate specific locating instructions when possible
(j) Indicate if boring and/or blasting will be done

(2) Wait the required amount of time (2 working days) following the day of the call.
(3) Check the positive response information system at 1-888-670-2902.
(4) Maintain markings of the located utilities.
(5) After utilities are marked call the UPC if there are still obvious signs of unmarked utilities before work is started.
(6) The contractor is responsible for the process of notifying UPC and diligently avoiding damaging utilities.
(7) APWA standard color code for utility markings:

White	Proposed Excavation
Pink	Temporary Survey Markings
Red	Electric Power Lines Cables Conduit
Yellow	Gas Oil Steam Petroleum, or Gaseous Material
Orange	Communication, Alarm or Signal Lines
Blue	Potable Water
Purple	Reclaimed Water, Irrigation and Slurry Lines
Green	Sewers and Drain Lines

B. Preparation of Work:

(1) Disconnect, remove, and cap designated utility services within demolition areas. Cover with concrete at floor level where required on lower floor slab.
(2) Mark locations of disconnect utilities. Identify and indicate locations on set of contract documents used for this purpose only.
(3) Perform demolition work to cause as little inconvenience to adjacent occupied building areas as possible.
(4) If required, remove materials and equipment scheduled to be retained by the Owner. Deliver and store where directed.
(5) Except where noted otherwise, immediately remove demolished materials from the site. Do not burn or bury materials on site.
(6) Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered (except asbestos/see below).
(7) Asbestos removal is not a part of this Contract. All asbestos removal work will be done by others. The Contractor will be responsible for bringing suspected asbestos containing material to the attention of the Architect. The following is the procedure relating to asbestos removal.

(a) General Contractor brings suspected asbestos containing material to the attention of the Owner and Architect.
(b) Work in the affected area shall not be resumed except by written agreement of the Owner and Contractor and until:
1. The suspected material is proven not to be asbestos, PCB or other toxic material, or;
2. The suspected material is removed or rendered harmless, as directed hereinafter.
(c) Owner shall have survey made to determine extent and have hazardous material removed using qualified and certified removers. Owner shall have all tests run to certify area is asbestos free.
(d) The Contractor will then keep clear of the asbestos work area until removal is complete.
(e) Owner notifies Architect and Architect notifies General Contractor material has been removed and work can commence again in that area.
(f) The Contractor shall not be required to perform without consent any work relating to asbestos, PCB or other toxic material.

(g) If the Contractor stops work as described above, the Contractor shall make no claims for damages or any type whatsoever arising out of or related to any delay associated with the stoppage of work. If the Contractor's decision to stop work is determined to be well-founded, the Contractor's sole remedy for any delay shall be an extension of the Contract Time for the duration of such stoppage of work. If the Contractor's decision to stop work is determined to be without reasonable basis, the Contractor shall not be entitled to any damages or to be an extension of the Contract Time.

C. Protection of Adjacent Work:

(1) Contractor must exercise every precaution at all times during demolition work to protect existing and adjoining construction, and facilities that are to remain. Any existing or adjoining construction that is not to be demolished or altered, but is damaged during course of demolition must be repaired in a manner to return it to its original state, to complete satisfaction of Owner.
(2) Do not interfere with use of adjacent area. Maintain free and safe passage to and from.
(3) Provide and place bracing or shoring and be responsible for safety and support of structure. Assume liability for such movement, settlement, damage or injury.
(4) Cease operations and notify Owner immediately if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored.
(5) Erect weatherproof closures for exterior openings. Maintain exit requirements.
(6) Erect and maintain dustproof partitions as required to prevent spread of dust, fumes and smoke to other parts of building. On completion, remove partitions and repair damaged surfaces to match adjacent surfaces.
(7) During removal of existing parapets and/or roofing, provide proper protection from falling objects over entrances which area kept open during normal work hours.

D. Workmanship:

(1) Demolish in orderly and careful manner as required to accommodate new work, including that required for connection to existing building. Protect existing foundations and supporting structural members.
(2) Perform demolition in accordance with applicable authorities having jurisdiction.
(3) Repair all demolition performed in excess of that required, at no cost to owner.
(4) Remove demolished materials, tools and equipment from site upon completion of work. Leave site in condition acceptable to Owner.

E. Cleaning: Perform in accordance with 018000: Cleaning.

033000: CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE

A. This section covers formwork, rebars and all other materials, equipment and methods for mixing, placing, testing, finishing, curing, etc. all plain and reinforced, cast-in-place, normal weight concrete.

B. All embedded items required by other trades under the General Construction Contract shall be set under this section.

C. Items not included in the General Construction Contract shall be furnished and placed by the trade requiring these items to be embedded in concrete, but the General Contractor shall cooperate with these trades in order that they are afforded an opportunity to make their installations before concrete is placed.

1.02 RELATED WORK

A. Concrete Curing & Finishing - Section 033051

1.03 REFERENCE STANDARDS FOR QUALITY ASSURANCE

A. All work, testing and inspection shall be in accordance with the applicable sections, and references therein, of the Specifications and Standards of the following:
1. Locally Adopted Building Code
2. American Concrete Institute (ACI)
3. Concrete Reinforcing Steel Institute (CRSI)
4. American Society For Testing Materials (ASTM)
5. PS-1-U.S. Product Standard for Softwood Plywood.

B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

A. Shop drawings for all form work where appropriate and requested.

B. Shop drawings for placing of all reinforcing steel.

C. A trial mix prepared by an independent testing laboratory for each class of concrete and for each size and gradation of aggregate proposed for the project. The preliminary mix design submittals shall contain the applicable information all components of the mix. After mix is established and approved, substitutions shall not be made. (See Paragraph 3.07 - TESTING)

PART 2 - PRODUCTS

2.01 FORMWORK

A. Forms for surfaces which will be exposed to view shall be plywood, steel or lined forms meeting the architectural requirements of the project. Metal or fiberglass forms shall be used for joist and waffle slabs.

B. Form ties shall be designed by the Contractor.

C. Form releasing agent shall be non-staining "Form Oil" as manufactured by Texaco, Sinclair or Nox-Crete Form Coating.

2.02 REINFORCING STEEL

A. Bars shall be deformed billet-steel bars conforming to ASTM A 615. All bars should be grade 60. All bars shall be shop-fabricated and bent cold. Bars shall be free from defects and kinks and from bends not indicated on the Drawings or approved bending diagrams.

B. Mesh reinforcement shall be electrically welded, plain wire fabric conforming to ASTM A 185. Wire shall be cold-drawn mild steel conforming to ASTM A 82.

C. Tie wire shall be of black annealed steel, 16-gage minimum.

D. Metal accessories per CRSI.

2.03 CONCRETE

A. Cement shall be an American brand approved by the engineer, conforming to ASTM C-150, Type 1, unless another type is specified. For exposed surface one brand shall be used throughout.

B. (NOTE: All concrete exposed to freezing and de-icing agents shall have a minimum of 564 pounds (6 bags) of cement per cubic yard with a maximum water/cement ratio of .49 lbs/lb and 5 percent entrained air.)

C. Coarse aggregate shall be crushed stone or gravel having clean, hard durable uncoated particles sized within the limits of ASTM C-33, Table 2, Size No. 57.

D. Fine aggregate shall be clean, hard, durable natural siliceous river sand with uncoated grains free from all organic material or other impurities meeting ASTM C-33. Manufactured sand shall not be used.

E. Mixing water shall be clean, potable, free from oil, acids, salts, alkalies and injurious amounts of vegetable matter.

F. ADMIXTURES:
1. All exterior concrete shall have an air-entraining agent (ASTM C-260) equal to Masterbuilders MBVR to produce a plastic mix with 6% entrained air. It shall be included in the trial design mixes submitted to the Engineer for approval.
2. All interior concrete shall have an air-entraining agent (ASTM C-260) equal to Masterbuilders MBVR to produce a plastic mix with 2% - 3% entrained air. It shall be included in the trial design mixes submitted to the Engineer for approval.
3. Concrete for elevator pit floors and pit walls shall have Eucon Vandex AM-10L integral crystalline admixture. Dosage rate to be determined by a Euclid Chemical representative. It shall be included in the trial design mixes submitted to the Engineer for approval.
4. No other admixture, including flyash, shall be used without the written permission of the Architect/Engineer.

G. Curing materials per Section 033051.

2.04 JOINT FILLER

A. Expansion joint filler shall be preformed resilient, non-extruding, non-bituminous, fiber type conforming to ASTM D-1751 or D-544.

2.05 WATER STOPS

A. At joints in elevator pit construction, use Sika Hydrotite CJ-1030-4M.

2.06 CONTROL JOINTS

A. At saw-cut control joints in floor slabs, use Sika Hydrotite RSS. Contractor to choose product diameter compatible with width of saw-cut.

PART 3 - EXECUTION

3.01 FORMWORK

A. Where applicable forms shall be placed according to approved shop drawings.

B. Erect forms to required dimensions and cross-sections, free of surface defects, tied, shored and braced to movement and leakage of mortar. Any defective formwork and/or defective concrete shall be removed at Contractor's expense.

C. Metal and/or fiberglass pans that are bent, badly rusted, cracked or otherwise damaged shall not be used and shall be removed from the site.

D. Provide forms for footings if soil or other conditions are such that earth trench forms are unsuitable. Omission of forms shall be approved by the Architect/Engineer.

E. Construct forms so they can be removed readily without hammering or prying against the concrete.

F. Provide box-outs, bulkheads with keys, cleanouts, expansion joint strips, and other related items and features.

G. Chamfer all exposed outside corners unless otherwise instructed.

H. Tolerances shall be within the limitations set forth in ACI 347.

3.02 FORM COATING

A. Immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form releasing agent specified, applied in compliance with the manufacturer's instructions. After oiling, any surplus oil on the form surfaces shall be removed.

3.03 REMOVAL OF FORMS

A. No forms shall be removed without the approval of the Architect/Engineer. In general and under normal conditions the Architect/Engineer will approve removal of forms as follows:
   1. Concrete beams, slabs and other members which span between definite supports shall attain 70% of the specified 28-day strength before removal of the forms. Shores for cantilevered beams and slabs shall remain in place for at least an additional 21 days.

2. Pan forms may be removed after three days if pans are designed for early removal. Soffit boards shall not be disturbed and shall not be removed for a minimum of eight days.
3. Under ordinary weather conditions, wall forms, column forms, side of beam forms and other vertical forms for concrete which do not span between definite supports may be removed after two days.
4. Forms for footings may be removed after 24 hours under ordinary weather conditions.
5. When ambient air temperature falls below 45 degrees F during the curing period form removal shall take place based on job-cured test cylinder strength only.
6. After removing forms, horizontal members shall be promptly re-shored at mid-span until the 28-day strength of concrete is attained. No floor shall be loaded in excess of live load for which designed unless adequate shores are placed beneath members supporting the concentration of load.
7. Under no circumstances shall wood be buried in full or left in contact with earth. All wood formwork shall be removed unless noted or specified otherwise.
8. Care shall be taken in the removal of the forms to avoid damage to concrete surfaces. Immediately after the forms are removed, all damaged or imperfect work shall be patched, or, if the work is severely damaged or unacceptable, it shall be rebuilt. Remove all fins from exposed concrete surfaces immediately on removal of forms.
9. Forms to be reused shall be thoroughly cleaned and repaired. Split, frayed, delaminated, or otherwise damaged forms shall not be used.

3.04 REINFORCING STEEL

A. Shop fabricate from approved shop drawings. Bars shall not be heated for bending. Return all horizontal bars 2'-0" (or provide individual corner bars) at all corners and intersections in all concrete walls and footings. All bars marked continuous shall be lapped with a Class "B" tension splice, including at corners. Splices shall be located as shown in accordance with CRSI Standards. Provide diagonal corner bars at corners of all openings in slabs and walls. Use 2-#5 X 4'-0" each corner, each face. If embedment length is not available provide standard hook. General placement and bar coverage shall be in accordance with ACI 318.

B. At job site store at least 12" above ground. Bars shall be free of foreign matter. A thin coating of orange rust resulting from short exposure will not be considered objectionable.

C. Reinforcement which has been exposed for bonding with future work shall be protected from corrosion by heavy wrappings of burlap saturated with a bituminous material.

D. Notify the Engineer at least 24 hours prior to scheduled pouring of concrete for inspection of reinforcing steel. No concrete shall be poured until reinforcement placement is approved. Such approval shall not relieve the Contractor of his responsibility for correctness and compliance with the Contract Documents.

3.05 PRODUCTION OF CONCRETE

A. Concrete shall be produced in an approved central mixing plant in accordance with ASTM C-94.

B. Unless otherwise called for on the drawings, concrete shall develop a compressive strength at 28 days, when tested in accordance with the applicable sections of ASTM, as follows:

1.	Concrete exposed to the weather:	4000 psi Air Entrained
2.	Slabs and footings	3000 psi
3.	Walls/Columns/Beams	4000 psi

3.06 PLACING OF CONCRETE

A. Concrete shall be placed in compliance with the applicable sections of the ACI. Special attention shall be given to the requirements for slump, testing, curing, tolerances and placing during severe weather.

B. Forms shall be free of ice, water, hardened concrete, and debris and items to be embedded shall be in position.

C. Subgrades shall be sprinkled sufficiently to eliminate water loss from concrete. Concrete shall not be placed on frozen ground.

D. Concrete shall be transported by methods to avoid segregation. Do not use vibrators to transport concrete in forms. Concrete shall be placed rapidly and continuously and as close to its final position as possible. If construction joints are required, they shall be placed at a location causing the least effect on the structural integrity of the work.

E. Concrete shall be consolidated by vibration, spading and rodding. Work concrete around reinforcement and embedded items.

F. Provide a drainage system for all retaining walls that are a part of the structure.

G. Coordinate all drawings for proper slope of floor to drains in toilets, showers and similar areas.

3.07 TESTING

A. The verification and control of concrete mixes shall be the work of an independent testing laboratory. The selection of laboratory and cost of testing shall be paid for by the Owner unless other arrangements are made.

B. LABORATORY SERVICES
1. Test aggregates, cement and water for specification compliance. During construction, the Engineer may require field inspection, sampling, and testing of cement, aggregates, etc. testing laboratory in order to determine if the requirements of this specification section are being satisfied.
2. Prepare trial mix for each class of concrete, make and break test cylinders. A minimum of two cylinders shall be tested at 7-days and 28-days.
3. Make slump test and air content test at job site for each sample tested for compressive strength.

C. Test cylinders shall be made and tested as follows:

One (1) set of five (5) cylinders shall be made for each fifty (50) cubic yards or fraction thereof for each class of concrete in each day's pour. Of each set of test cylinders, two (2) shall be broken at seven (7) days, two (2) shall be broken at 28-days, and one (1) held in reserve.

Test cylinders will normally be laboratory-cured. However, the Engineer may require tests on field-cured specimens to check the adequacy of curing operations.

D. Reports on all tests conducted by the laboratory shall be rendered promptly and distributed as follows:

Architect One - (1) copy

Contractor	Two - (2) copies
Structural Engineer	One - (1) copy

Report of control cylinders for job placed concrete shall contain the following:

1. Time of batching
2. Time of sampling
3. Concrete and air temperatures
4. Slump
5. Other information furnished by the General Contractor

E. CONTRACTOR'S FUNCTION

1. Contractor shall advise testing agency in advance of operations to allow for assignment of testing personnel and shall provide reasonable labor and assistance in obtaining, handling and storing test samples at the site.
2. Contractor shall observe procedures of laboratory personnel molding and handling test specimens and if he observes any irregularities of procedures, he shall report them in writing to the Architect within 48-hours.
4. Contractor shall keep a daily log, recording quantities of each class of concrete used, the area location of each quantity of concrete relating to its controlling cylinder and the slump of this concrete, and general weather conditions. The contractor shall furnish this information to the laboratory for inclusion in the test report. The Contractor shall obtain delivery tickets showing the class and strength of concrete, the size of coarse aggregate and the slump order. The Contractor shall identify these tickets relative to the area of placement of the concrete and shall retain them on file. He shall produce the tickets should the Architect/Engineer so request.

3.08 PRECAUTIONS

A. Styrofoam shall not be used as joint filler.

B. Manufactured sand shall not be used for fine aggregate.

C. Severe weather concreting shall be in accordance with ACI-305 and ACI-306.

D. Retempered concrete shall not be used.

E. Defective Work - No materials or concrete which fail to conform to the requirements of this specification section shall be incorporated into the work.

F. Water stops shall be continuous. Do not use lap joints.

G. The placing of dowels after concrete is poured is prohibited. Bars partially embedded in concrete shall not be field-bent.

H. Calcium chloride shall not be used.

3.09 CLEAN-UP

A. After completion of work, remove from the site all excess materials and debris.

033051: CONCRETE CURING AND FINISHES

PART 1 - GENERAL

1.01 SCOPE

A. Provide all materials, equipment, incidentals and labor for patching, finishing, curing and protecting from flowing water and mechanical injury the concrete specified.

1.02 RELATED WORK

A. Cast-In-Place Concrete - Section 033000

1.03 REFERENCED STANDARDS FOR QUALITY ASSURANCE

A. All work shall be in accordance with the applicable sections and references therein, of the Specifications and Standards of the following:
   1. American Concrete Institute (ACI)
   2. American Society For Testing Materials (ASTM)

B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

A. Product data on curing compounds.

PART 2 - PRODUCTS

2.01 WATER CURING

A. Heavy burlap weighing at least 10 ounces per square yard.

B. Clean river sand, ASTM C-33.

C. Sawdust

2.02 MEMBRANE CURING

A. Waterproof sheet material conforming to ASTM C-171, Standard Specification for Sheet Materials For Curing Concrete.

2.03 LIQUID CURING

1.	"Kure-N-Seal" Sonneborn	
2.	"Clear Bond"	Guardian Chemical
3.	"Clear Seal"	(A.C. Horn) Grace Construction
4.	"Eucocure" or Kurez E-100"	Euclid Chemical Co.
5.	"Clear Seal"	Lambert Corporation
6.	"Chem-Seal"	Hillyard Chemical Co.
7.	"Masterseal"	Master Builders

PART 3 - EXECUTION

3.01 PATCHING OF CONCRETE

A. Immediately after removing forms, all surfaces shall be inspected for defective work. Any concrete which is poorly formed, out of alignment or level, or shows a defective service, shall at the election of the Engineer, be removed from the job by the Contractor at the Contractor's expense. The engineer may grant permission to patch or repair defective work; but such permission shall not be considered a waiver of the Engineer's right to require complete removal of the defective work, if in the Engineer's opinion, the patching or repairs do not satisfactorily restore the quality and appearance of the items in question.

B. Where permitted by the Engineer, all honeycombs, voids, stone pockets, tie holes and other defective areas shall be patched as soon as practicable. Patching shall be done in accordance with the following procedure.
   1. Defective areas shall be chipped away to a depth of at least 1" with the edges cut perpendicular to the surface.
   2. The area to be patched and space at least 6" wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar.
   3. A grout of equal parts of Portland Cement and sand, with sufficient water to produce a brushing consistency, shall be well brushed into the surface followed immediately by the patching mortar.
   4. The patch shall be made of the same materials and of approximately the same proportion as used for the concrete except that the coarse aggregate shall be omitted. The mortar shall not be richer than 1 part cement to 3 parts sand. The proportions of white and gray cements shall be determined by making a trial patch. The amount of mixing water used shall be the minimum consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for one hour, during which time it shall be mixed with a trowel to prevent setting.
   5. The mortar shall be thoroughly compacted into place and screened off so as to leave the patch slightly higher than the surrounding surface. The patch shall then be left undisturbed for one to two hours to permit initial shrinkage before being finally finished.
   6. The patched areas shall be finished to match the adjoining surface. On exposed surfaces, where unlined forms have been used, the final finish shall be obtained by striking off the surface with a straight edge spanning the patch and held parallel to the form marks.
   7. Curing of the patched areas shall be in accordance with these specifications.
   8. Contractor's Option:
      In lieu of mixing grout for patching, the Contractor may provide a PVC bonding agent recommended by the manufacturer for the use intended. Approved products and manufacturers:
      a. "Dara Weld C" by W.R. Grace
      b. "Weldcrete" by E.A. Larson
      c. "Vinyl Hesive" by Nox-Crete

3.02 CONCRETE FLOORS
(All floors, tilt-up panels and slabs on grade)

A. The surface of all concrete shall be worked with a wood float or by machine in a manner which will compact the concrete and produce a surface free of depressions or inequalities of any kind. Test for grade (or level) and correct as necessary by removing excess or adding and compacting additional concrete. After the concrete has hardened sufficiently to prevent fine material from working to the top (when the sheen or shiny film of water on the surface has disappeared), the surface shall be finished in accordance with the applicable following paragraphs, but excessive working shall be avoided. Final finishing shall not be started until all surface water has disappeared. The drying of the surface moisture must proceed naturally and must not be hastened by sacking or dusting-on of dry sand and/or cement.

B. At the end of the job, or just prior to application of permanent floor coverings, slabs shall be thoroughly cleaned and left in suitable condition for installation of permanent covering.

C. Tolerances
   1. While still plastic, concrete surfaces shall be testing for surface irregularities with a 10' straightedge and the necessary corrections made. Allowable irregularity is 1/8" in 10', non-accumulating.
   2. Floor slab surfaces shall slope uniformly to floor drains as shown on the drawings.

D. Monolithic finish for Slabs

   All interior floor slabs shall have a steel trowel finish (except for floor slabs to receive ceramic tile). The steel troweling shall produce a smooth finished surface free of pin holes and other imperfections.

E. Depressed slabs shall have a rough screed finish at levels indicated on the drawings.

F. Broom finish shall be used for all interior stairs unless shown otherwise. Slabs and landings shall be troweled to a smooth, even surface and receive a light broom finish.

3.03 FINISHES ON FORMED CONCRETE SURFACES

A. Common finish shall be confined to concrete surfaces which will be covered by other construction and which will not be visible. This finish shall be produced by filling smoothly all tie holes, honeycomb and other depressions, knocking off and evening-up burrs and form marks.

3.04 CURING AND SEALING COMPOUND APPLICATION

A. Curing and sealing compound shall be applied as soon as the concrete has set sufficiently so as not to be marred by the application. Preparation of surfaces, quantities used, application procedures, and installation precautions shall be followed in strict compliance with the manufacturer's stated recommendations and directions as set forth on the package.

B. Final curing shall continue for 7-days minimum.

033100: CONCRETE ACCESSORIES

PART 1 - GENERAL

1.01 SUBMITTALS

Submit manufacturer's product data for all specified materials intended for use.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Filler strips for expansion joints: Non-extruded type cane fiber board impregnated with bituminous material, score ½" for the edge, 3/4" of the way through, for easy removal of top ½" of filler strip material, after concrete pour, or foam plastic with extruded high impact polystyrene removable caps.

B. Vapor retarder: 15-mil thickness polyethylene film.

C. Gravel base: #4 graded aggregate.

D. Joint filler: ASTM D1850.

E. Evaporation Retarder:
   1. Acceptable Products:
      a. Eucobar by Euclid Chemical Company
      b. Confilm by Master Builders
   2. Characteristics:
      a. Compatible with curing agents.
      b. Designed for use on liquid concrete, to prevent shrinkage cracking.
      c. Spray application.
      d. Capable of maintaining moisture content of concrete surface as necessary to cure properly without plastic shrinkage.

F. Concrete sealers:
   1. Acceptable products:
      a. Rez-Seal by Euclid Chemical Company
      b. Equal products by Scofield or Pro-Crete will be acceptable.
   2. Characteristics:
      a. Combination Sealer and Curing Compound
      b. Acrylic Copolymer Composition
      c. Clear color with glossy finish, non-yellowing.

PART 3 - EXECUTION

3.01 ACCESSORIES

Install concrete accessories at locations indicated in accord with manufacturer's recommendations, and as specified herein.

3.02 GRAVEL BASE

Install under concrete slabs, unless noted otherwise, and as indicated on the drawings.

3.03 VAPOR RETARDER

A. Install vapor retarder over compacted, clean subgrade material, free of debris and protrusions.

B. Lay vapor retarder over interior building area to receive concrete slab; lap edges 6". Apply membrane in maximum widths. Lay membrane with seams perpendicular to and lapped in direction of pour. Turn edges of membrane up to within □' of top of slab at intersection with vertical surfaces.

C. Seal openings in vapor retarder around pipes and other protrusions with mastic. Fold at corners for form envelope.

D. Protect vapor retarder from damage until concrete slab is in place. Repair damaged membrane with vapor retarder patch, 6 inches larger on all sides than the damaged area.

3.04 JOINTS

A. Expansion joints:
   1. Install filler strips from bottom of slab to within ½" of finished floor. Fill top ½" full and level with joint filler.
   2. Locate against walls at perimeter of floors and around other protrusions through slabs.

B. Control joints:
   1. Locate control joints in accord with industry standards and as shown on drawings.
   2. Joints shall be formed, sawn, or tooled. Joints subject to traffic (wheel or foot) shall be tooled.
   3. Minimum depth of joint shall be 1/4 the depth of the slab.
   4. Cut control joints as soon as the slab will support the weight of the saw and operator without disturbing the final finish.

3.05 SEALERS

Apply sealer to all concrete floors not receiving an applied finish. Comply with manufacturers recommended application specifications.

035410: UNDERLAYMENT

1. GENERAL
   A. Scope: Includes all materials, tools, labor and equipment necessary for the complete and satisfactory installation of self-leveling floor underlayment.
   B. Codes and Standards Compliance: ADA, ASTM C109, ASTM C136, ASTM C191, ASTM C348, ASTM C1583, ASTM D4060, ASTM E84, ASTM E136, ASTM E1155, IBC, UL, State and Local Codes
   C. Quality Assurance:
      (1) Underlayment installers must have completed training by the underlayment manufacture.
      (2) Underlayment installers must have at least five (5) years experience installing products specified herein.
   D. Submittals:
      (1) Product Data: Manufacturer's standard specifications and descriptive literature, including:
         (a) Product characteristics
         (b) Performance criteria
         (c) Safety Data Sheets
      (2) Manufacturer's written instructions, including:
      (3) Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
      (4) Certificates: Product certificates signed by manufacturer certifying materials complying with specified performance characteristics and criteria and physical requirements.
      (5) Manufacturer's Field Reports: Submit manufacturer's field reports within 3 days of each manufacturer's site visit and inspection.
   E. Warranties and Guarantees: Manufacturer's 10-year warranty from date of substantial completion, covering defects in full product system used.
   F. Cross Reference:
      033000: Concrete (cast-in-place)
      055100: Metal Stairs
      061213: Structural Panel Concrete Subfloor
      093100: Tiling
      096500: Resilient Flooring
      096820: Carpet
      096466: Wood Athletic Flooring
      Structural Drawings
   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.
2. PRODUCTS
   A. Quality and Performance Standards: Schönox HPS North America, Inc. Other manufacturers may be acceptable if they meet or exceed the Quality Standards listed below. All alternates must be submitted to the Architect for approval before the bid date.
   B. Product Characteristics:
      (1) For All Flooring Locations requiring patching/leveling and second level above administration offices (see Architectural and Structural Drawings for specific locations and height requirements):
         (a) Schonox VD Dilutable Acrylic Primer
         (b) Schonox ZM Cement Based Self-Leveling Compound
            1. Compressive Strength: 2,400 psi after 1 day, 5,800 psi after 28 days
            2. Flexural Strength: 1,300 psi after 28 days
            3. Tensile Strength: 400 psi after 3 days

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver materials in accordance with manufacturer's written instructions.
(2) Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact and product name and manufacturer clearly visible and size to suit project.
(3) Store materials protected from exposure to harmful environmental conditions, clean, dry, frost-free and at recommended temperature and humidity levels.
(4) Do not store materials at temperatures lower than 41 degrees F.

B. Examination:

(1) Verification of Conditions: Verify that conditions of substrate previously installed under other sections or contracts are acceptable for underlayment application in accordance with manufacturer’s written recommendations.

(a) Ensure substrate is smooth, sound, clean and free of contaminants which may hinder adhesion.
(b) Visually inspect substrate in presence of consultant.
(c) Inform Consultant of unacceptable conditions immediately upon discovery.
(d) Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from consultant.

C. Preparation:

(1) Mechanically remove friable substrate materials and repair areas to smooth finish using repair compound and methods in accordance with manufacturer's written recommendations.
(2) Moisture Testing: Perform tests so that each test area does not exceed manufacturer’s recommended moisture levels. Perform no fewer than 3 tests in each installation area and with test areas evenly spaced in installation areas.

(a) Anhydrous Calcium Chloride Test (ASTM F1869)
(b) Relative Humidity Test (ASTM F2170)

(3) Mitigate moisture using residual moisture suppressor and methods in accordance with manufacturer's written recommendations. Do not proceed with moisture mitigation without written approval from Architect.

D. Mixing:

(1) Mix and install underlayment components in accordance with manufacturer’s written instructions.
(2) each bag with exactly the amount of water required by the manufacturer.

(a) Mix each bag with exactly the amount of water required by the manufacturer. Do not overwater.
(b) Mix thoroughly as recommend by manufacturer.
(c) Use mixture within time required by manufacturer. Do not use mixture after time expires

E. Application:

(1) Close areas to traffic during underlayment installation and for period after installation recommended in writing by manufacturer.
(2) Coordinate installation of components to provide optimum adhesion to substrate and between coats.

(3) Strictly comply with manufacturer's written instructions.
(4) At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
(5) Apply primer over prepared substrate at manufacturer's recommended spreading rate.
(6) Install underlayment to produce uniform, level surface.
(7) Cure underlayment in accordance with manufacturer's written instructions. Prevent contamination during installation and curing process.
(8) Do not install floor covering over underlayment until after period recommended in writing by underlayment manufacturer.
(9) Remove and replace underlayment areas that evidence lack bond with substrate, including areas that emit a hollow sound when tapped.

F. Protection of Adjacent Work: Ensure no damage is done to work adjacent to area to receive underlayment. Repair or replace adjacent materials damaged by application of underlayment.

G. Cleaning and Protecting Installed Work:

(a) After work has been done remove all debris and loose material.
(b) Protect the installation during construction.

036000: GROUT

1. GENERAL

   A. Scope: Includes all non-shrinking, high strength grout work as follows:

      (1) Patching and minor leveling of floors.
      (2) Grouting
      (3) Anchoring cement

   B. Codes and Standards Compliance: IBC, ASTM C91, C230, C270, C827

   C. Qualifications of Installer: Grout work being done must be performed by qualified personnel that have had experience working with the material prior to this project.

   D. Submittals: Submit manufacturer's literature of the company that is being used.

   E. Warranties and Guarantees: 1 year against separation to adjacent material.

   F. Cross Reference: 033000: Concrete (Cast-in-Place)
      041000: Mortar
      042100: Brick Masonry Units
      042200: Concrete Mansory Units (CMU)
      142123: Machine-Room-Less Electric Traction Passenger Elevators

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality and Performance Standards:

      (1) Patching and Leveling: See 035410: Underlayment

      (2) Grouting between APC and concrete footing:

         (a) Bonsal: Anchor Cement
         (b) U.S. Grout: Five Star Grout
         (c) Minwax Halco Grout

      (3) Anchoring Cement:

         (a) Bonsal: Anchor Cement
         (b) U.S. Grout: Five Star Grout
         (c) Minwax Super Por Rok

   B. Product Characteristics:

      (1) Non-Shrinking

      (2) High Strength:

         (a) Patching: @ 24 Hrs: 2,500 PSI/CS
             @ 28 Days: 5,000 PSI/CS

         (b) APC to Concrete Footing: @ 24 Hrs: 4,000 PSI/CS
             @ 28 Days: 7,000 PSI/CS

(c) Anchoring: @ 24 Hrs: 4,000 PSI/CS
@ 28 Days: 7,000 PSI/CS

(3) Self leveling for patching
(4) Non-rusting/non-ferrous

C. Proportions:

(1) Cement Grout: Proportion materials by volume in accord with ASTM C476-CE for fine or coarse grout as required.
(2) Non-Shrink Grout: Mix prepared non-shrink grout product with water as directed by manufacturer's product data to achieve a minimum compressive strength of 7000 PSI at 28 days.

3. EXECUTION

A. Fabrication: Use only mixing equipment and tools approved by manufacturer. Do not install work below 40 degrees F.

B. Storage and Handling of Materials: Deliver materials in their original, unopened packages, and protect from freezing, direct sun exposure, and exposure to moisture

C. Preparation of Area: Clean area of all extraneous and loose materials before installing grout. All areas to be free of oil, wax, grease, curing compounds, latex compounds, gypsum, asphalt or any other foreign matter.

D. Protection of Adjacent Work: Ensure no damage is done to work adjacent to area to receive grout. Specifically, do not get grout on finish material such as APC, marble tile, gypsum board etc.

E. Manufacturer's Instructions and/or Literature: Prepare and install in strict compliance with manufacturer's written instructions.

F. Workmanship of Installation: Poor workmanship could cause structural damage. Ensure work is thoroughly and properly done.

G. Completion of Work: Inspection by the General Contractor and Architect required for approval.

H. Cleaning and Protecting Installed Work: After work has been done remove all debris and loose material and protect the installation from moisture, weather and other required work.

041000: MORTAR

1. GENERAL

A. Scope: Includes all material, labor, tools, equipment, operations and incidentals required to furnish all mortar to complete exterior masonry work shown on construction documents and specified in Project Manual.

B. Codes and Standards Compliance: ASTM, IBC, State and Local Codes

C. Qualification of Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed in its performance. A firm with a minimum of three (3) years successful experience in the application of materials similar to those specified herein shall be used.

D. Submittals:

(1) Submit manufacturer's product data.
(2) Submit samples for selections

E. Warranties and Guarantees: Provide one (1) year warranty against all defects in material and installation.

F. Cross References: 018000: Cleaning
033000: Concrete (Cast-in-Place)
036000: Grout
041500: Masonry Reinforcing and Accessories
042100: Brick Masonry Units
042200: Concrete Masonry Units (CMU)
090001: Color Scheme
104116: Emergency Key Cabinet

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Blue Circle, Inc.

B. Product Components:

(1) Portland Cement: Meet ASTM C150-CE type 1 natural color domestic manufacturer.
(2) Masonry Cement: Meet ASTM C91-CE, non-staining, 22% maximum air content by volume and proportioned to comply with requirements of ASTM C270-CE for type N mortar.
(3) Hydrated Line: Meet ASTM C207-CE Type S.
(4) Aggregate:

(a) For Mortar: Clean, natural, washed sand meet ASTM C144-CE.
(b) For Cement Grout: Meet ASTM C404-CE, fine aggregate, size No. 1 for fine grout, size No. 8 for course grout when minimum horizontal dimension of grouting space exceeds 4".

(5) Water reducing and Plasticizing Admixture Quality Standard:

(a) Chem-Masters Corp: Hydrolox 400
(b) Master Builders Company: Omicron Mortar Proofing
(c) Sonneborn Building Products: Hydrocide

(6) Water: Clean, potable, free from deleterious amounts of alkalis, acids, and organic materials.

C. Proportions:

(1) Type "N" job mixed or bag mixed mortar: Proportion materials by volume in accord with ASTM C270-CE, as follows:

(a) One part Portland cement and 1/2 to 1-1/4 parts hydrated lime to aggregate proportioned at not less than 2-1/4 nor more than three times the sum of the volumes of cement and lime used, or;
(b) One part masonry cement to aggregate proportioned at not less than 2-1/4 nor more than three times the volume of masonry cement used, and as directed by masonry cement manufacturer's product data to produce Type "N" mortar.
(c) Maximum Air Content: 12%

D. Color: To be determined during construction.

3. EXECUTION

A. Storage and Handling:

(1) Deliver and store manufactured products in original unopened containers.
(2) Store cementitious ingredients in weathertight enclosures and protect against contamination and warehouse set.
(3) Stockpile and handle aggregates to prevent contamination from foreign materials.
(4) Keep water free of harmful materials.

B. Environmental Conditions Criteria:

(1) Lay no masonry when temperature of surrounding air has dropped below 45 degrees F., unless it is rising; and at no time when it has dropped below 40 degrees F., except with written permission from Architect.
(2) When masonry work is authorized at temperatures below 40 degrees F., but above freezing, provide mortar at temperature between 70 degrees and 100 degrees F. Maintain air temperature above 40 degrees F. on both sides of masonry for 72 hours after laying.
(3) Protect masonry construction form direct exposure to wind and sun when erected in ambient air temperatures of 95 degrees F. in the shade with relative humidity less than 50%.

C. Preparation of Product:

(1) Mixing:

(a) Mix mortar and cement grout in power-driven, drum type mixers. Operate mixer minimum of five minutes after addition of all materials.
(b) For job mixed mortars and water reducing and plasticizing admixture in accord with admixture manufacturer's product data.
(c) Addition of other admixtures, including antifreeze ingredients, will not be permitted.
(d) Measure materials for job mixed mortars in a one cubic foot container. Do not measure by shovels.

(e) Discard grout not placed within 1-1/2 hours after water is added to mix, or sooner as indicated by grout manufacturer.

(2) Placing Mortar and Grout:

(a) Place mortar as directed in 042100: Brick Masonry Units and 042200: Concrete Masonry Unit sections.
(b) Re-temper mortar as necessary to keep plastic. Do not use mortar after setting has begun or after 2-1/2 hours of initial mixing.
(c) Place cement grout and non-shrinking grout as specified in other sections.

041500: MASONRY REINFORCING & ACCESSORIES

1. GENERAL

   A. Scope: Includes all material, labor, tools, and equipment to furnish and install all masonry reinforcement and accessories required of project.

   B. Codes and Standards Compliance: ASTM, IBC, BIA Technical Note 288

   C. Qualifications of Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed to perform the work. A firm with a minimum of three (3) years successful experience in the application of materials similar to those specified herein shall be used.

   D. Submittals: Provide manufacturer's product data and installation instructions. If required by the Architect, submit samples of all specified reinforcing, accessories, and required fasteners and anchors.

   E. Warranties and Guaranties: Provide one (1) year warranties against all defects in material and labor.

   F. Cross Reference: 018000: Cleaning
   033000: Concrete (Cast-in-Place)
   041000: Mortar
   042100: Brick Masonry Units
   042200: Concrete Masonry Units (CMU)
   079000: Caulking and Sealants

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard: Hohmann & Barnard, Inc.
   AA Wire Products, Co.
   Dur-O-Wal, Inc.
   Masonry Reinforcing Corporation of America
   Jim Taylor, Inc.

   B. Product Characteristics and Types

      (1) Veneer Anchors: Hohmann & Barnard, Inc. Thermal 2-Seal Wing Nut Anchor

         (a) Type: For anchoring brick veneer to metal stud
         (b) Size: As required for wall thickness
         (c) Finish: Stainless Steel
         (d) Gauge: 9
         (e) Install at 16” x 16” vertical and horizontal spacing

      (2) Veneer Anchors: Hohmann & Barnard, Inc. Thermal Concrete 2-Seal Tie

         (a) Type: For anchoring brick veneer to CMU and fascia at parapet assembly
         (b) Sizes: As required for wall thickness
         (c) Finish: Stainless Steel
         (d) Gauge: 9
         (e) Install at 16” x 16” vertical and horizontal spacing

(3) Truss Box-Mesh: Hohmann & Barnard, Inc.
  (a) Type: Welded boxes project from backup truss-mesh reinforcement
  (b) Sizes: See drawings for details.
  (c) Finish: Hot-Dip Galvanized
  (d) Wire Size: Standard

(4) Extruded Control Joints: Extended natural or synthetic rubber meeting ASTM D2000 (CE) type 2AA 70 durometer hardness. Mason Pro

(5) Weep Holes:
  (a) Spacing: 16" Horizontal
  (b) Placement: At all flashing

(6) Mortar Net:
  (a) Quality Standard: MortarNet
  (b) Size: As required for brick wythe.

(7) Expansion Joints (EJ):
  (a) Premolded Molded Compressible Neoprene:
    1. Quality Standard: Hohmann & Barnard. Inc
    2. Product: NS Closed Cell Neoprene Sponge (ASTM D 1056 GRADE 2A1)
    3. As required for vertical expansion joints shown on drawings.
  (b) See 079000: Caulking and Sealants for expansion joint sealant

(8) Expanding Foam Secondary Sealant: Greyflex (Backerseal) by Mason Pro

(9) Masonry Reglet: Fry Reglet "MA" type and Fry Reglet Springlok flashing
  (a) 1 ½" for brick
  (b) 4" for concrete block

(10) Construction Notes:
  (a) Use extended thermal masonry anchors to connect metal framing to CMU or siding to metal framing @ 12" o.c. vertically and 16" o.c. horizontally. See architectural typical details.
  (b) Exterior concrete or masonry walls shall be anchored for out-of-plane forces at each diaphragm level with steel anchors or straps that are developed into the diaphragm.

3. EXECUTION

A. Fabrication and Assembly: Assemble as directed by manufacturers literature and instructions.
B. Storage and Handling of Material: Product is to arrive on the jobsite in new containers and bought specifically for the project. Protect to insure no deterioration of product.
C. Environmental Conditions: None
D. Preparation of Work: Insure area where masonry reinforcing is to be applied is completed and area is clean and without debris.
E. Protection of Adjacent Work: Insure no damage is done to adjacent work where the products of this specification apply.
F. Manufacturer's Instructions: Comply with directions and limits given and implied in manufacturer's instructions.
G. Workmanship and Installation:
  (1) Comply with BIA Tech Note 28B Revision II (02/87) unless changed by this specification. A copy of this document will be returned with the submittal during construction.
  (2) Brick veneer on metal framing (054000: Cold Formed Metal Framing) wall sheathing with anchors spaced at 1'-4".
  (3) Install seal tape as instructed by manufacturer.
  (4) Do not install ties to the sheathing alone. Insure all ties are attached to the metal studs.
  (5) Install weep holes at 2'-0" just above all flashing.
  (6) Expansion Joints:
    (a) Place expansion joint as shown on drawings.
    (b) Place behind downspouts where applicable.
H. Completion of Work: Architect will review work periodically during construction.
I. Cleaning: See 018000: Cleaning.

042100: BRICK MASONRY UNITS

1. GENERAL

A. Scope: Includes all material, labor, tools, and equipment necessary for a complete installation of brick masonry units.

B. Codes and Standards Compliance: ASTM A82, ASTM A153, ASTM A615, ASTM A775, ASTM A996, ASTM A1008. ASTM C67, ASTM C144, ASTM C150, ASTM C207, ASTM C216, ASTM C270, ASTM C652, ASTM D1056, BIA Technical Note 20, BIA Technical Note 23A, TMS 402, TMS 602, State and Local Codes.

C. Quality Assurance:

(1) Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
(2) Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope specified.
(3) Brick Test: Sample and test shall be in accordance with ASTM C67.
(4) Test Reports:

(a) Testing and reports shall be completed by an independent laboratory.
(b) Test reports for each type of building and facing brick shall be submitted to the Architect for review.
(c) Test reports shall indicate:

1. Compressive strength.
2. 24-hour cold-water absorption.
3. 5-hour boil absorption.
4. Saturation coefficient.
5. Initial rate of absorption.
6. Efflorescence.

(5) Mock-Up: Provide a mock-up of brick specified.

(a) Locate in areas designated by Architect.
(b) Do not begin installation of brickwork until the Architect approves the mock-up(s).
(c) Build as many mock-ups as required to obtain the Architect's acceptance. Remove mock-ups from site when directed by the Architect.
(d) Mock-ups may include adjacent building materials such as cementitious panels and trim. See 074400: Cementitious Panels and Trim.

D. Submittals:

(1) Product Data: Manufacturer's data sheets on each product being used, including:

(a) Preparation instructions and recommendations.
(b) Storage and handling requirements and recommendations.

(2) Selection Samples: For each product specified, two complete sets of brick samples showing range of color and texture to be expected.
(3) Verification Samples: For each finished product specified, two samples representing actual color and texture of the brick specified.
(4) Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Warranties and Guarantees: See certification above. Provide one (1) year warranty against all defects in material and workmanship.

F. Cross-References: 018000: Cleaning
033000: Concrete (Cast-in-Place)
036000: Grout
041000: Mortar
041500: Masonry Reinforcing and Accessories
042200: Concrete Masonry Units
061530: Sheathing
072000: Insulation
072720: Fluid Applied Weather Barrier
074400: Cementitious Panels and Trim
079000: Caulking and Sealants
081100: Hollow Metal Doors and Frames
083300: Overhead Coiling Doors
083380: Special Doors and Frames
084113: Entrances and Storefronts
090001: Color Scheme
104116: Emergency Key Cabinet
104260: Signage
105300: Hanger Supported Aluminum Canopy
112213: Walk-Up Despositories
116733: Recreational Climbing Wall

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Palmetto Brick Company (to match existing brick)

B. Product Characteristics:

(1) Color: Red Wirecut

(2) Size:

(a) Modular: 2 1/4” x 3 5/8” x 7 5/8”

(3) Exposed external corners of brick masonry units shall be square type.

C. Accessory Products: See 041500: Masonry Reinforcing and Accessories

D. Allowable Tolerances:

(1) Maximum Variation from Plumb: 1/4" in 10'-0"; not exceeding 3/8" in 20'-0".
(2) Maximum Variation from Level: 1/4" in 20'-0"; not exceeding 1/2" in 40'-0" or more.
(3) Maximum variation in linear building line from location indicated: 1/2" in 20'-0".
(4) Mortar Joint: Standard tooled joint. 3/8" (+/- 1/32").

E. Wall Anchorage: Exterior masonry walls shall be anchored for out-of-plane forces at each diaphragm level with steel anchors or straps that are developed into the diaphragm.

F. Attic Stock: Provide quantity of brick necessary for a complete installation of brick in-fill at climbing wall location. Owner to provide location for storage.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Store brick off ground to prevent contamination by mud, dust or materials likely to cause staining or other defects and to allow air circulation around stacked units. Wet brick masonry units shall not be installed.
(2) Protect units to be exposed in finish work from staining and physical damage of exposed faces.
(3) Protect reinforcement from elements.

B. Environmental Conditions Criteria:

(1) Lay no masonry when temperature of surrounding air has dropped below 45 degrees F., unless it is rising; and at no time when it has dropped below 40 degrees F., except with written permission from Architect.
(2) When masonry work is authorized at temperatures below 40 degrees F., but above freezing, provide mortar at temperature between 70 degrees and 100 degrees F. Maintain air temperature above 40 degrees F. on both sides of masonry for 72 hours after laying.
(3) Protect masonry construction form direct exposure to wind and sun when erected in ambient air temperatures of 95 degrees F. in the shade with relative humidity less than 50%.

C. Protection of Work:

(1) Keep walls dry during erection by covering at end of each work period with a waterproof membrane. Similarly protect partially completed walls not being worked on. Covering shall overhang at least 2'-0" on each side of wall and shall be anchored on each side of wall.
(2) Do not apply uniform floor or roof loading for at least 12 hrs. after building masonry columns or walls. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.
(3) Protect finished exposed work from stains.
(4) Mortar droppings sticking to unit faces shall be allowed to dry, and then be removed with trowel and surface lightly scrubbed with bristled brush.
(5) Particular care shall be given to keeping masonry units clean in areas not to be painted.

D. Protection of Adjacent Work: Install and inspect mechanical and electrical work prior to enclosing or covering with masonry. Where runs of piping or conduit are required, cut away web of masonry unit without disturbing face or bond.

E. Workmanship and Installation:

(1) Lay only dry masonry units.
(2) Lay masonry plumb, level and true to line with accurate coursing as indicated on the drawings.
(3) Lay units in running bond with head joints centered in alternate courses.
(4) Cutting of masonry shall be done with abrasive power saw. Lay out units to minimize cutting.
(5) Building in of Other Work:

(a) Build in work of other trades indicated to be built in with masonry, including anchors, flashings, wall plugs, expansion joints and accessories, as work progresses. Space and align built-in parts and exercise care not to displace other materials from position. Fill in spaces around built-in items with cement grout.
(b) Fill hollow metal frames in masonry walls with cement grout. Rake back 1/2" joint between hollow metal frame and adjacent masonry to receive sealant.
(c) Unless indicated otherwise, provide minimum 8" of solid end bearing full height of wall from floor to bearing points for lintels, beams and other load supporting members by either solid block or filling cores with cement grout.
(d) Provide lintels and bond beams where indicated using lintel blocks laid with joints matching adjacent work. Reinforcement shall be as indicated and block filled with concrete.
(e) Install loose fill insulation in all perimeter masonry units. See 072000: Insulation.

(6) Mortar Joints:

(a) Bed joints for unreinforced partitions:

1. Lay first course in full bed of mortar.
2. On all other bed joints, apply mortar on face shall only of masonry unit already laid.
3. On masonry unit to be laid, apply a beveled buttering to face shall be ensure full bed joints.

(b) Bed joints for reinforced and fire-rated partitions.

1. Lay all courses in full bed of mortar.
2. Head Joints: Apply mortar to vertical face shells on both the masonry unit already laid and the unit to be laid to ensure full head joint.

(c) Place masonry unit by rolling it to a vertical position and shoving it against adjacent unit, achieving position and alignment with minimum of adjusting.
(d) Adjustment shall be made only while mortar is still soft and plastic by tapping to plumb and bringing to alignment. Remove unit and relay in fresh mortar when unit must be pulled back to align.
(e) Check each unit as laid with mason's level for level and for plumbness with wall below.
(f) Where adjustment must be made after mortar has started to set, remove and replace mortar with fresh mortar.
(g) Keep bed and head joints uniform in width, except for minor variations required to maintain bond and locate returns. Standard thickness for both horizontal and vertical mortar joints shall be 3/8".

(7) Masonry Control Joints:

(a) Make joint 3/8" wide, unless otherwise indicated.
(b) Stop horizontal joint reinforcement 1" from control joint.
(c) Provide Joints:

1. In running walls spaced maximum 40'-0" o.c.
2. At intersecting walls, either of which is more than 10'-0" long.
3. At intersections with concrete walls or columns.
4. At joint between masonry and structural slabs, beams or decks. At fire rated partitions, fill joints with fiberglass batt insulation prior to sealing.
5. At all changes in wall thickness.
6. At all abrupt changes in wall height.

(d) Where control joints occur in running walls, provide sash block with rubber control joint filler.
(e) Leave joint open and clean for caulking in accord with Sealants and Caulking section. Caulk joints exterior and interior.

(8) Joint Treatment:

(a) Flush Joints: Strike joints in masonry to receive finish work of trades other than painting flush.
(b) Tooled Joints: Strike exposed joints in standard masonry units flush and, when partially set, tool using "V" shaped or concave tool.
(c) Joints in Architectural Units: Tool joints to match pattern in face of masonry unit.

(9) Alignment with Existing Masonry: Insure new masonry installed under this contract aligns with existing masonry in all cases. Where condition exists where this is not possible contact Architect immediately.
(10) Arch Construction: NA to this project.
(11) To prevent the appearance of efflorescence on the brick, BIA Technical Note 23A: “Efflorescence Causes and Prevention" shall be strictly followed. It is important that the building is properly flashed, partially built brick walls are properly covered to prevent moisture penetration during construction, and proper weep holes are provided.

F. Cleaning and Pointing:

(1) Keep masonry work free of mortar droppings as work progresses and, at completion of work, rub masonry to remove excess mortar. Clean exposed masonry of stains using water and cleaning compound as required.
(2) Point mortar joints. Remove and replace units with excessive spalls or chips.
(3) Clean masonry units using specified cleaning solution as follows:

(a) At least 21 days prior to application of cleaning solution to masonry, apply solution to half the surface of sample panel. Should discoloration of masonry or mortar joints, staining or efflorescence appear on sample panel, notify Architect and await further instructions.
(b) No wet cleaning shall take place within seven days of placing masonry.
(c) At least two hours prior to application of cleaning solution to masonry work, saturate mortar joints with clean water and flush off loose debris.
(d) Begin cleaning process at highest point of wall, working downward. Work in areas of 20 sq. ft. maximum. Flush walls cleaning progresses to prevent accumulation of scum.
(e) Safety discard solution containing debris and residue.
(f) Do not scrub mortar joints with cleaning solution.
(g) Protect materials adjacent to masonry work subject to corrosion from contact with acid solution.

042200: CONCRETE MASONRY UNITS (CMU)

1. GENERAL
   A. Scope: Includes all material, labor, tools, and equipment necessary for a complete installation of concrete masonry units in accordance with and at locations shown on the construction documents.
   B. Codes and Standards Compliance: ASTM C90-CE, ASTM C129-CE, IBC, UL
   C. Qualifications of Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed in its performance. A firm with a minimum of three (3) years successful experience in the application of materials similar to those specified herein shall be used.
   D. Submittals:
      (1) Certification: Manufacturing company shall certify compliance with the specification requirements, including compressive strength, moisture content, shrinkage, and time rated fire-resistant masonry units (if applicable).
      (2) Samples: 4 samples of specified units. A mock-up of 4'-0" high x 6'-0" long in mortar shall be made at the site once samples are approved. The sample shall indicate bonding, mortar color, and joint tooling, CMU color and texture, reinforcement, and workmanship.
   E. Warranties and Guarantees: Provide one (1) year warranty against all defects in material and workmanship.
   F. Cross-References: 018000: Cleaning
      033000: Concrete (Cast-in-Place)
      036000: Grout
      041000: Mortar
      041500: Masonry Reinforcing and Accessories
      042100: Brick Masonry Units
      055100: Metal Stairs
      055140: Fixed Wall Ladders
      057310: Dry Glazed Glass Railing System
      061530: Sheathing
      072000: Insulation
      072720: Fluid-Applied Weather Barrier
      074400: Cementitious Panels and Trim
      079000: Caulking and Sealants
      081100: Hollow Metal Doors and Frames
      083300: Overhead Coiling Doors
      083380: Special Doors and Frames
      084113: Entrances and Storefronts
      090001: Color Scheme
      092500: Gypsum Board
      095100: Acoustical Ceiling Systems
      096466: Wood Athletic Flooring
      098413: Sound Control
      099100: Painting
      101650: Toilet Partitions
      104260: Signage
      105000: Lockers
      105200: Fire Protection Specialties
      105300: Hanger Supported Aluminum Canopy
      108000: Accessories
      116600: Interior Athletic Equipment
      116643: Indoor Scoreboards
      116733: Recreational Climbing Wall
      122413: Window Roller Shades
      126600: Telescopic Seating
      142123: Machine-Room-Less Electric Traction Passenger Elevator

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Product Characteristics:

(1) Hollow Load-Bearing Units:

(a) Meeting ASTM C90-75 (CE), Grade N, Type II
(b) Dimensions: 7 5/8" x 7 5/8" x 1'-3 5/8"
(c) Jamb blocks to be at all doors, louvers and fan openings.
(d) **Bullnose units at all exposed CMU corner locations**

(2) Bearing and Nonbearing Wall Rating - 2 HR Units (Design No. U906):

(a) For D-2 Classifications:

(1) Blocks laid in full bed of mortar, nominally 3/8” thick, of not less than 2 1/4” and not more than 3 1/2 parts of clean sharp sand to 1 part Portland cement (proportioned by volume) and not more than 50 percent hydrated lime (by cement volume). Vertical joints staggered.
(2) Portland Cement Stucco or Gypsum Plaster: If used, add 1/2" hr. to Classification.

(3) Curing Requirements:

(a) Type Curing: Low pressure steam.
(b) Maximum Drying Shrinkage for Steam Cured Units: 0.02%, as determined by ASTM C426 (CE).
(c) Minimum Days in Yard Storage After Curing: 14 days.

(4) Provide sash block units at masonry-to-masonry control joint and window locations.
(5) Exposed external corners of concrete masonry units shall be round type. Provide corner block units at exposed external corners.
(6) Provide "U" shaped lintel blocks as shown on structural drawings.
(7) Provide "U" shaped bond beam around perimeter.

B. Accessory Products: Cleaning Solution: One-part muriatic acid to ten parts clean water.

C. Allowable Tolerances:

(1) Maximum Variation From Plumb: 1/4" in 10'-0"; not exceeding 3/8" in 20'-0".
(2) Maximum Variation From Level: 1/4" in 20'-0"; not exceeding 1/2" in 40'-0" or more.
(3) Maximum variation in linear building line from location indicated: 1/2" in 20'-0".
(4) Mortar Joint: 3/8" (+/- 1/32")

D. Reinforcing: See 041500: Masonry Reinforcing and Accessories.

E. Wall Anchorage: Exterior masonry walls shall be anchored for out-of-plane forces at each diaphragm level with steel anchors or straps that are developed into the diaphragm.

3. EXECUTION

A. Storage and Handling:

(1) Keep units dry. Allow air circulation around stacked units. Wet concrete masonry units shall not be installed.
(2) Protect units to be exposed in finish work from staining and physical damage of exposed faces.

B. Environmental Conditions Criteria

(1) Environmental Requirements:

(a) Lay no masonry when temperature of surrounding air has dropped below 45 degrees F., unless it is rising; and at no time when it has dropped below 40 degrees F., except with written permission from Architect.
(b) When masonry work is authorized at temperatures below 40 degrees F., but above freezing, provide mortar at temperature between 70 degrees and 100 degrees F. Maintain air temperature above 40 degrees F. on both sides of masonry for 72 hours after laying.
(c) Protect masonry construction form direct exposure to wind and sun when erected in ambient air temperatures of 95 degrees F. in the shade with relative humidity less than 50%.

C. Protection of Work:

(1) Keep walls dry during erection by covering at end of each work period with a waterproof membrane. Similarly protect partially completed walls not being worked on. Covering shall overhang at least 2'-0" on each side of wall and shall be anchored on each side of wall.
(2) Protect finished exposed work from stains.
(3) Mortar droppings sticking to unit faces shall be allowed to dry, and then be removed with trowel and surface lightly scrubbed with bristled brush.
(4) Particular care shall be given to keeping masonry units clean in areas not to be painted.

D. Protection of Adjacent Work:

(1) Install and inspect mechanical and electrical work prior to enclosing or covering with masonry. Where runs of piping or conduit are required, cut away web of masonry unit without disturbing face or bond.
(2) All switches, outlets, and other devices must be centered in the block work. Work done otherwise shall be disapproved.

E. Workmanship and Installation:

(1) Lay only dry masonry units.
(2) Lay masonry plumb, level and true to line with accurate coursing as indicated on the drawings.
(3) Lay units in running bond with head joints centered in alternate courses.
(4) Cutting of masonry shall be done with abrasive power saw. Lay out units to minimize cutting.
(5) Building in of Other Work:

(a) Build in work of other trades indicated to be built in with masonry, including anchors, flashings, wall plugs, expansion joints and accessories, as work progresses. Space and align built-in parts and exercise care not to displace other materials from position. Fill in spaces around built-in items with cement grout.
(b) Fill hollow metal frames in masonry walls with cement grout. Rake back 1/2" joint between hollow metal frame and adjacent masonry to receive sealant.
(c) Unless indicated otherwise, provide minimum 8" of solid end bearing full height of wall from floor to bearing points for lintels, beams and other load supporting members by either solid block or filling cores with cement grout.
(d) Provide lintels and bond beams where indicated using lintel blocks laid with joints matching adjacent work. Reinforcement shall be as indicated and block filled with concrete.
(e) Install loose fill insulation in all perimeter masonry units. See 07200: Insulation.

(6) Mortar Joints:

(a) Bed joints for unreinforced partitions:

1. Lay first course in full bed of mortar.
2. On all other bed joints, apply mortar on face shall only of masonry unit already laid.

3. On masonry unit to be laid, apply a beveled buttering to face shall be ensure full bed joints.

(b) Bed joints for reinforced and fire-rated partitions.

1. Lay all courses in full bed of mortar.
2. Head Joints: Apply mortar to vertical face shells on both the masonry unit already laid and the unit to be laid to ensure full head joint.

(c) Place masonry unit by rolling it to a vertical position and shoving it against adjacent unit, achieving position and alignment with minimum of adjusting.
(d) Adjustment shall be made only while mortar is still soft and plastic by tapping to plumb and bringing to alignment. Remove unit and relay in fresh mortar when unit must be pulled back to align.
(e) Check each unit as laid with mason's level for level and for plumbness with wall below.
(f) Where adjustment must be made after mortar has started to set, remove and replace mortar with fresh mortar.
(g) Keep bed and head joints uniform in width, except for minor variations required to maintain bond and locate returns. Standard thickness for both horizontal and vertical mortar joints shall be 3/8".

(7) Masonry Control Joints:

(a) Make joint 3/8" wide, unless otherwise indicated.
(b) Stop horizontal joint reinforcement 1" from control joint.
(c) Provide Joints:

1. In running walls spaced maximum 26'-0" on exterior and 32'-0" on interior.
2. At intersecting walls, either of which is more than 10'-0" long.
3. At intersections with concrete walls or columns.
4. At joint between masonry and structural slabs, beams or decks. At fire rated partitions, fill joints with fiberglass batt insulation prior to sealing.
5. At all changes in wall thickness.
6. At all abrupt changes in wall height.

(d) Where control joints occur in running walls, provide sash block with rubber control joint filler.
(e) Leave joint open and clean for caulking in accord with Sealants and Caulking section. Caulk joints exterior and interior.

(8) Joint Treatment:

(a) Flush Joints: Strike joints in masonry to receive finish work of trades other than painting flush.
(b) Tooled Joints: Strike exposed joints in standard masonry units flush and, when partially set, tool using "V" shaped or concave tool.
(c) Joints in Architectural Units: Tool joints to match pattern in face of masonry unit.

F. Cleaning and Pointing:

(1) Keep masonry work free of mortar droppings as work progresses and, at completion of work, rub masonry to remove excess mortar. Clean exposed masonry of stains using water and cleaning compound as required.
(2) Point mortar joints. Remove and replace units with excessive spalls or chips.

(3) Clean architectural masonry units using specified cleaning solution as follows:

(a) At least 21 days prior to application of cleaning solution to masonry, apply solution to half the surface of sample panel. Should discoloration of masonry or mortar joints, staining or efflorescence appear on sample panel, notify Architect and await further instructions.
(b) No wet cleaning shall take place within seven days of placing masonry.
(c) At least two hours prior to application of cleaning solution to masonry work, saturate mortar joints with clean water and flush off loose debris.
(d) Begin cleaning process at highest point of wall, working downward. Work in areas of 20 sq. ft. maximum. Flush walls cleaning progresses to prevent accumulation of scum.
(e) Safety discard solution containing debris and residue.
(f) Do not scrub mortar joints with cleaning solution.
(g) Protect materials adjacent to masonry work subject to corrosion from contact with acid solution.

051200: STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SCOPE

A. This section covers all items fabricated from metal shapes, plates, rods and bars except component parts of equipment and items covered by other sections.

B. Fabricated metal items, which are detailed on the drawings but not mentioned specifically herein, shall be fabricated in accordance with the applicable requirements of this section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Steel Joists Framing - Section 052100

B. Steel Decking - Section 053100

1.03 REFERENCED STANDARDS FOR QUALITY ASSURANCE

A. All work shall be in accordance with the applicable sections, and references therein, of the Specifications and Standards of the following:
1. Manual of Steel Construction by American Institute of Steel Construction (AISC).
2. American Society of Testing Materials (ASTM)
3. American Welding Society (AWS)
4. Steel Structures Painting Council (SSPC)
5. Welded Steel Tube Institute (WSTI)

B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

A. Shop drawings in accordance with project procedures showing all dimensions, locations, connection details, notes, accessories, and other materials related to the furnishing, fabricating, testing, painting and erection of the structural steel required by these specifications.

B. Shop drawings shall show complete bolting and welding information, both shop and field, using appropriate symbols.

C. Shop drawings shall be not be made by reproduction of design drawings. Steel erection drawings and detail sheets prepared by steel fabricator shall all be of the same size sheets and approximately the size of the design drawings.

D. Shop drawings shall be reviewed for conformance to specific project requirements by the contractor before being submitted to the Engineer for approval.

1.05 QUALITY ASSURANCE

A. All fabricators shall participate in the AISC Quality Certification Program and shall be designated as an AISC-Certified Plant.

PART 2 - PRODUCTS

2.01 MAIN, SECONDARY MEMBERS & BASE PLATES

A. Rolled Sections - ASTM A-992, Fy=50 ksi.

B. Steel Pipe - ASTM A-501, Fy=36 ksi.

C. Tube Sections - ASTM A-500, Grade "B", Fy=46 ksi or Grade "C", Fy=50 ksi.

2.02 BOLTS

A. Bolted shop and field connections shall be made with high strength components conforming to ASTM A-325 or A-490. Bolts shall have an identifying mark of three (3) radial lines.

B. Non-friction bolt connections may be with bolts conforming to ASTM A-307.

C. All bolts shall be 3/4" diameter unless otherwise shown on drawings.

2.03 WELDING ELECTRODES

A. All welding electrodes shall be E-70 series.

2.04 PAINT – EXPOSED STEEL ONLY

A. Exposed steel is defined as steel exposed to view and/or weather.

B. Unless otherwise noted shop coat paint may be fabricator's standard but shall be compatible with final field painting. Touch-up paint used in the field shall be the same type paint used for the shop coat and shall be delivered to the job in sealed containers clearly marked with manufacturer's name and brand.

C. Finish paint shall be as specified elsewhere in this specification.

D. Lintels shall receive two coats of shop paint before placing.

2.05 GROUT

A. Grout for base plates shall be a ready-to-use, non-metallic, non-corrosive product requiring only addition of water at job site to produce a flowable grouting material having no drying shrinkage at any age. Compressive strength of grout shall be not less than 5000 psi at 28 days.

PART 3 - EXECUTION

3.01 FABRICATION

A. Fabricate from approved shop drawings using members cut from full-length stock. Members may be spliced only where shown.

B. Members shall be free from twist, bends, buckles or open joints.

C. Shop connections may be bolted or welded. Welds, bolt size, number and spacing shall be determined by the AISC Standards. Fabricator shall design and be responsible for all connections. Connections for beams which cannot conform to the typical connection details shall be in accordance with the following:

1. Where beam reactions are not shown on the drawings connection details shall be

detailed for the end reaction resulting from the maximum uniform load which the beam will support (as simple beam) for the span on the drawing.

2. Where beam reactions are shown on the drawings, the connections shall develop the reactions shown.
3. Where connections are subject to eccentricity, such eccentricity shall be taken into account when detailing the connections.

D. Bearing surfaces shall be planed to true beds. Abutting surfaces shall be closely fitted. Tubular sections shall be completely seal-welded at all joints, seams, and splices.

E. Structural steel shall be provided with all holes for attaching wood, masonry, furring, sash angle clips and other parts.

F. Fascia beams and other steel requiring accurate alignment shall be provided with slotted holes and/or washers for aligning the steel accurately. No erection bolts or other fastening parts or joints or rolled stamping names shall show on finished surfaces of exposed steel, exterior or interior.

G. Lintels shall have 8" minimum bearing each side of opening.

H. Shop connections may be welded except as noted. Field connections shall be welded or made with the high strength steel bolts except for girts, stair stringers and handrails which may be field bolted with machine bolts. All welding shall be done by operators qualified by AWS Standards. Certificate shall be furnished when requested. Welding techniques, appearance and quality shall conform to AWS Standards. Continuous jet welding may be employed at all exposed connections requiring a smooth weld in lieu of conventional welds that require grinding.

3.02 SHOP PAINT – EXPOSED STEEL ONLY

A. Exposed steel is defined as steel exposed to view and/or weather.

B. Exposed steel shall be shop cleaned per SSPC-SP3 and primer paint applied immediately thereafter. Except for steel to be field welded, surfaces shall be covered evenly and thoroughly and worked into joints. Paint shall be applied to dry surfaces. Parts inaccessible after assembly shall be given two (2) coats of the specified shop paint.

C. Shop primer shall have a minimum dry film thickness of 1.2 mils.

D. Contact surfaces shall be cleaned before assembly but shall not be painted. Machine finished surfaces shall be protected against corrosion by a suitable coating.

3.03 STORAGE OF MATERIAL

A. Site storage of all structural steel shall be as directed by the job superintendent.

B. All steel shall be stored on blocking so that no metal touches the ground and will be protected against bending under its own weight and water will not collect thereon.

3.04 ERECTION

A. Steel shall be erected level and plumb within AISC tolerances. No final bolting or welding shall be done until structure is properly aligned. The structure shall be secured against all dead load, wind and erection stresses. Temporary bracing shall be used where necessary and shall remain in place as long as required for safety.

B. Bolting shall be done with high strength friction type bolts and hardened washers. Set high strength bolts by the turn-of-the-nut method as specified by the "Research Council On Riveted and Bolted Structural Joints".

C. Holes for turned bolts to be inserted in the field shall be reamed in the field. Erection bolts are not to be used on exposed surfaces. Erection bolts or other surfaces and stiffeners shall not interfere with architectural clearances.

D. No additional holes or cutting of steel work other than shown on the Drawings shall be done without the written permission and approval of the Owner's representative.

E. Light drifting necessary to draw the holes together will be permitted, but drifting to match unfair holes will not be allowed. Twist drills shall be used to enlarge holes as necessary to make connections. Reaming that weakens the members or makes it impossible to fill the holes properly or to adjust accurately after reaming will not be allowed. Enlarging holes by burning is prohibited.

F. Welding - See Paragraph 3.01 H - Protect all adjacent finished surfaces during the progress of welding. Damaged surfaces shall be replaced at cost of the erection contractor.

3.05 FIELD PAINTING (TOUCH-UP)

A. After the structural steel has been erected and before any superimposed construction is placed, apply one field coat of paint to all places where the shop coat of paint has rubbed away; where the shop coat of paint was omitted because of field welding, or where field welding has damaged the shop coat of paint. Apply field paint to the structural steel and bar joists before roof deck is applied.

B. Touch-Up Paint - After erection is completed, all field bolts, field welds, abrasions, etc. shall be cleaned and spot painted. Paint shall be same material used for the shop coat and shall be applied evenly with no runs, etc.

3.06 FIELD QUALITY CONTROL

A. The steel contractor shall secure the services of a testing laboratory as approved and accepted by the local authorities and the owner/engineer to provide qualified inspectors for the following inspections.
   1. All shop and field connections
   2. Qualifications of welders
   3. Daily calibration of impact wrenches used for high strength bolting
   4. Visual inspection of all work after erection

B. Testing agency shall interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations therefrom.

C. Costs of all inspections shall be paid for by the steel contractor. Testing laboratory shall send reports of all inspections directly to the engineer and owner and elsewhere as directed.

D. Bolted connections shall be tested for minimum fastener tension for bolt size and grade specified in conformance with the AISC. Inspection for tightness shall be the arbitration method thus:
   1. Ten percent (10%) of all bolted connections, but not less than two (2) bolts (selected at random) in each connection shall be tested. Test shall be made with an "inspecting wrench" adjusted to "job inspection torque". If no nut or bolt head is turned, the connection shall be accepted. If any nut or bolt head is turned, all bolts

and nuts in the entire connection shall be tested. Contractor shall tighten all bolts in any connection in which a test bolt failed and resubmit the connection for re-inspection. All costs for re-tightening of bolts shall be borne by this Contractor.

E. Welded connections may be inspected visually unless otherwise noted on contract drawings. However if any weld appears inadequate the engineer can require magnetic particle or ultrasonic testing without any additional cost to owner.

3.07 CLEAN-UP

After the completion of this work, remove from the site all excess materials and debris. Leave entire work in a neat and orderly condition ready for inspection.

052100: STEEL JOIST FRAMING

PART 1 - GENERAL

1.01 SCOPE

This section covers all open-web steel joists, joist girders, bridging, joist extensions, etc.

1.02 RELATED WORK

A. Structural Steel Framing - Section 051200

B. Steel Decking - Section 053100

1.03 REFERENCE STANDARDS FOR QUALITY ASSURANCE

A. All work shall be in accordance with the applicable Sections, and references therein, of the Specifications and Standards of the following:
   1. Steel Joist Institute (SJI)
   2. American Institute of Steel Construction (AISC)
   3. American Welding Society (AWS)
   4. American Society for Testing Materials (ASTM)

B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

A. Submit for approval, drawings showing layouts, sizes, bridging, special joists, joist extensions, special girders, moment connections and all required accessories. Do not make shop drawings by reproduction of design drawings.

B. Drawings shall be reviewed for conformance to specific project requirements by the Contractor before submittal to Engineer for approval.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Domestic steel with allowable design stresses determined by the appropriate provisions of the Steel Joist Institution specifications.

B. Joist girders shall be designed as simple span with full gravity loads and for wind load moments where shown on drawings. Top and bottom chords shall be same size throughout their length. Bottom chord shall be extended and attached to support as shown on drawings.

C. Arc-Welding Electrodes, E70 Series (AWS)

D. Bolts and washers, ASTM A-325. All bolts shall be 3/4" dia. minimum.

E. Paint shall be Fabricator's Standard unless otherwise noted.

2.02 ACCEPTABLE MANUFACTURERS

A. Members of the Steel Joist Institute.

PART 3 - EXECUTION

3.01 FABRICATION

A. Fabricate from approved shop drawings in accordance with SJI.

B. Members shall be free from twist, bends, buckles or distortions of any kind.

C. Connections may be bolted or welded. Welders shall be qualified by AWS Standards. Welding shall be in accordance with the SJI Standards.

D. All joists shall be tagged for proper orientation.

3.02 SHOP PAINTING – EXPOSED STEEL ONLY

A. Exposed steel is defined as steel exposed to view and/or weather.

B. After inspection and approval, and before leaving the shop, all joists shall be thoroughly cleaned of all loose mill scale, rust, spatter, slag or flux deposit, and other foreign matter in conformance with Steel Structures Painting Council Specifications

C. All joists and bridging shall be given one .5 mil coat of manufacturers standard paint if no other paint is specified. Paint shall be applied thoroughly and evenly to dry surfaces.

D. Finish paint shall be as specified elsewhere in this Specification.

3.03 DELIVERY AND STORAGE

A. Handle, deliver and store joist as recommended by SJI.

B. Material stored at job site shall be off the ground and protected from the weather.

3.04 ERECTION

A. Erection shall include the setting of all joists and required accessories in accordance with SJI Standard. Setting of bearing plates anchored to masonry shall be set by masonry contractor.

B. Set joists level (or to slopes indicated) to spacing shown with proper bearing on supports. Install accessories indicated or required. Weld joists to structural members, except at expansion joints where bolts and slotted holes shall be used.

C. Bridging shall be in accordance with the SJI specifications. As soon as joists are erected, all bridging shall be completely installed and the joists permanently welded in place before the application of any loads. Cross bridging shall be bolted at intersection.

D. Joists adjacent to walls shall be spaced as shown on drawings. Furnish anchors at top and bottom of joists; masonry contractor shall build these into the masonry wall. As erection progresses, the work shall be securely fastened to take care of all wind and erection loads. No final welding shall be done until each member is properly aligned. No welding shall be done after the roof is on.

E. During erection avoid overloading of other structural members. Errors shall not be

corrected by burning.

3.05 FIELD PAINT – EXPOSED STEEL ONLY

A. Exposed steel is defined as steel exposed to view and/or weather.

B. Before deck is placed all field bolts, welds and abraded places shall be painted with the same paint as used for the shop coat.

3.06 PRECAUTIONS

A. No mechanical, electrical or other equipment shall be suspended from or attached to bridging or joist struts. Suspension of any item from joists or girders shall be within 3" of panel points or with web reinforcement as detailed.

B. Protect all adjacent work during progress of erection and welding. The contractor shall replace any such work that is damaged.

C. Ceiling extension shall not be fastened to walls until all dead loads have been applied.

3.07 CLEAN-UP

A. After completion of this work, remove from the site all excess materials and debris.

053100: STEEL DECKING

PART 1 - GENERAL

1.01 SCOPE

This section covers ribbed steel deck of varying configurations and all accessories used for the support of roofing materials and live loads.

1.02 RELATED WORK

A. Steel Joist Framing - Section 052100.

1.03 REFERENCE STANDARDS FOR QUALITY ASSURANCE

A. All work shall be in accordance with the applicable sections, and references therein, of the Specifications and Standards of the following:
   1. American Institute of Steel Construction (AISC)
   2. Steel Deck Institute (SDI)
   3. American Society of Testing Materials (ASTM)
   4. American Welding Society (AWS)

B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

A. Submit for approval drawings of all decks showing layout, openings, type, accessories, anchorage, etc.

B. Drawings shall be checked and approved by contractor before submittal to engineer.

C. When requested, submit samples of deck for approval.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Deck shall be the gauge and type as called for on the drawings and compatible with rigid insulation board and bonded roof. Deck shall be Factory Mutual approved.

B. Deck shall conform to ASTM A-611, Grade C and the basic SDI Standards.

C. All accessories such as closure panels, sump pans, screws, insulation clips, welding washers, valleys and ridges shall be compatible with deck furnished.

2.02 PAINT

A. Roof deck shall be galvanized and conform to ASTM A-525 G60.

B. After installation, all welds shall be cleaned and spot painted with paint compatible with adjacent surfaces.

2.03 CLOSURE STRIPS

A. Vulcanized, closed-cell synthetic rubber.

2.04 SUMP PANS

A. Fabricate from single piece of 14 gage galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains to be cut in the field.

2.05 ACCEPTABLE MANUFACTURERS

A. Certified members of the Steel Deck Institute.

PART 3 - EXECUTION

3.01 STORAGE

Steel deck shall be stored off the ground with one end elevated to provide drainage and shall be protected from the weather with a non-asphaltic water-proof covering, ventilated to avoid condensation.

3.02 ERECTION

A. Deck sheets shall be placed in accordance with approved layout drawings and all other requirements of the manufacturer, the SDI, Factory Mutual Class 1, and Underwriters Laboratory Type 2 construction. The deck shall be continuous over a minimum of three joist spaces and be fastened to the structural supports by welding at 12" centers unless noted otherwise on the drawings. The first and last ribs of each sheet shall be welded at all supports. End welds and those occurring at laps shall be plug welded through all thicknesses.

B. The deck erector shall provide for all openings and skew cuts shown on the erection drawings. Openings for stacks, conduits, plumbing, vents, etc. not shown on the drawings shall be cut (and reinforced if necessary) by the trades requiring the openings.

C. Ends of lapped sections shall be swaged or otherwise formed so that matching ends will fit tightly. Fit shall be such that roofing bitumen will not drip through. Minimum end lap to be 2".

D. Fastening of side laps may be by screws or welding.

3.03 UPLIFT

Finished roof deck shall be capable of resisting all uplift loading. Unless otherwise indicated on drawings the gross uplift loading shall be 30 psf for eave overhangs and end zones and 20 psf for other roof areas.

3.04 PRECAUTIONS

A. Suspension of mechanical or electrical equipment, etc, from main roof deck is prohibited.

B. Do not puncture roof insulation or membrane.

C. Holes burned in deck during welding shall be filled before insulation is applied.

D. Locate decking bundles to prevent overloading of structural members. Do not use decking for storage or working platforms.

E. Contractor shall verify all locations, plan dimensions, weights, weight distribution, and roof opening size and location for all mechanical units and concentrated loads supported by steel joists. Steel joists shall be modified and strengthened as required to safely support these loads. Provide top chord bracing where deck is omitted under units.

3.05 CLEAN-UP

A. Steel deck, in place, shall be free from oil, grease, dirt, etc. and prepared to receive the next phase of construction.

B. All excess materials and debris shall be removed from the site.

054000: COLD FORMED METAL FRAMING

PART 1 - GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Exterior non-load-bearing curtain-wall framing.
4. Floor joist framing.
5. Roof trusses.
6. Roof rafter framing.
7. Ceiling joist framing.

B. Related Sections include the following:
1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 6 Section "Rough Carpentry" for subflooring, wall sheathing, or roof sheathing using wood-based structural-use panels, particleboard, fibrous-felted board, and foam-plastic sheathing.

1.03 DEFINITIONS

A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated on structural drawings.
1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
c. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/240 of the wall height.
d. Floor Joist Framing: Vertical deflection of 1/360 of the span.
e. Roof Trusses: Vertical deflection of 1/240 of the span.
f. Scissor Roof Trusses: Horizontal deflection of 1-1/4 inches (32 mm) at reactions.
g. Roof Rafter Framing: Horizontal deflection of 1/240 of the horizontally projected span.
h. Ceiling Joist Framing: Vertical deflection of 1/240 of the span.
2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).

3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 1/2 inch (13 mm).

B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Design roof trusses according to AISI's "Design Guide for Cold-Formed Steel Trusses."

1.05 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
   1. Expansion anchors.
   2. Power-actuated anchors.
   3. Mechanical fasteners.
   4. Vertical deflection clips.
   5. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engi-

neering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

D. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

F. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

G. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

H. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" or "Load and Resistance Factor Design Specification for Cold-Formed Steel Structural Members" and the following for calculating structural characteristics of cold-formed metal framing:
   1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

I. Comply with HUD's "Prescriptive Method for Residential Cold-Formed Steel Framing."

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

D. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
   1. Clark Steel Framing Industries.
   2. Consolidated Systems, Inc.
   3. Dale Industries, Inc.
   4. Dietrich Industries, Inc.

5. MarinoWare; Div. of Ware Industries, Inc.
6. Unimast, Inc.

2.02 MATERIALS

A. Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 33 (230), 50 (340), Class 3.
2. Grade: 33 (230) for minimum uncoated steel thickness of 0.0428 inch (1.09 mm) and less; 50 (340), Class 3 for minimum uncoated steel thickness of 0.0538 inch (1.37 mm) and greater.
3. Coating: G60 (Z180).

2.03 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and the properties listed in the structural drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, complying with ASTM C 955, and as follows:
1. Minimum Uncoated-Steel Thickness: 0.0677 inch (1.72mm)
2. Flange Width: 1-1/4 inches (32mm).

2.04 NON-LOAD-BEARING CURTAIN-WALL FRAMING

A. Steel Studs: Manufacturer’s standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C955 and the properties listed in the structural drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:
1. Minimum Uncoated-Steel Thickness: 0.0538 inch (1.37 mm) Matching steel studs.
2. Flange Width: 1-1/4 inches (32 mm). Insert dimension if manufacturer's standard width is insufficient.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows:.
1. Minimum Uncoated-Steel Thickness 0.0538 inch (1.37 mm).
2. Flange Width: 2 inches.

D. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.05 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated with stiffened flanges, complying with ASTM C 955, and the properties listed in the structural drawings.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:
1. Minimum Uncoated-Steel Thickness: Matching steel joists.
2. Flange Width: 1.625 inches (51 mm), minimum.

2.06 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955.

2.07 ROOF-RAFTER FRAMING

A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and the properties listed in the structural drawings.

B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; unpunched; of web depths indicated; complying with ASTM C 955, and the properties listed in the structural drawings.

2.08 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and the properties listed in the structural drawings.

2.09 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi (230 MPa).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. End clips.
5. Foundation clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Joist hangers and end closures.
9. Hole reinforcing plates.
10. Backer plates.

2.10 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load

equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.11 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: [SSPC-Paint 20 or DOD-P-21035] [ASTM A 780].

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

2.12 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
   5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.03 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
1. Anchor Spacing: To match stud spacing.

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where wall-framing continuity is interrupted by floor framing. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced the dimension indicated on Shop Drawings apart. Fasten at each stud intersection.
1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of

punched studs with a minimum of two screws into each flange of the clip angle.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 NON-LOAD-BEARING CURTAIN-WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to infill studs and anchor to primary building structure.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 inches (1370 mm) apart. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches (450 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
a. Install solid blocking at every other stud.
2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.06 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:
1. Joist Spacing: As indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at each end of joists and at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to bottom flange of joists.
2. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.07 TRUSS INSTALLATION

A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section and Section 05 45 00.

B. Truss Spacing: As indicated.

C. Do not alter, cut, or remove framing members or connections of trusses.

D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

E. Erect trusses without damaging framing members or connections.

F. Align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

G. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings.

3.08 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace Work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.09 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

E. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

055100: METAL STAIRS

1. GENERAL

   A. Scope: Includes all material, labor, tools and equipment necessary for delegated designed and installed metal stair systems and railing.

   B. Codes and Standard Compliance: ACI 117, ACI 301, ADA, AISI 121, ANSI 117.1, ASTM A36, ASTM A53, ASTM A123, ASTM A153, ASTM A283, ASTM 307, ASTM A500, ASTM A501, ASTM A570, ASTM A611, ASTM A1011, ASTM C33, ASTM E894, ASTM E935, AWS, ICC, State and Local Codes.

   C. Quality Assurance:

      (1) Manufacturer: A minimum of five (5) years' experience manufacturing similar products.
      (2) Installer: A minimum of 2 years' experience installing similar products.

   D. Submittals:

      (1) Manufacturer's product data including installation instructions.
      (2) Stair Design: Stairs shall be designed and engineered by the manufacturer, incorporating specified criteria by Architect. Manufacturer's engineered design drawings must be designed and stamped by a structural engineer registered in the State of Georgia.
      (3) Shop Drawings: Submit fully detailed shop drawings of metal stairs and railings, showing sizes, details of fabrication and construction, methods of assembly, handrail brackets, locations of hardware, anchors, accessories and installation details.

   E. Warranties and Guarantees: Provide manufacturer's standard warranty.

   F. Cross References: 013300: Delegated Design Procedures
      018000: Cleaning
      033000: Cast-In-Place Concrete
      033100: Concrete Curing and Finishing
      035410: Underlayment
      042200: Concrete Masonry Units
      090001: Color Scheme
      096500: Resilient Flooring
      096510: Rubber Base, Stair Treads and Risers
      099100: Painting

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Product Characteristics:

      (1) Concrete Pan-Filled Stairs: Steel pan-type stair with concrete-filled treads and landings, and with treads, risers and platforms constructed of structural steel sheet. Stair system for Stairs 1, 2 and 3 to have treads and risers covered with rubber and landings covered with resilient flooring.
      (2) Railing System: All stairs shall be provided with a complete stair railing system, including handrails and handrail brackets at walls, fabricated from steel pipe.

B. Stringers and Support Steel:

(1) Structural Shapes: Standard structural sections, as indicated, conforming to ASTM A36/A36M.
(2) Structural Tubing: Welded or seamless steel tubing, conforming to ASTM A500 or ASTM A501(minimum yield point of 33,000 psi), of size and shape indicated.

C. Treads and Risers, Platforms and Landings:

(1) Steel Sheet: Treads, risers, and platforms shall be fabricated from structural steel sheet, of gage or thickness indicated, conforming with ASTM A570/A570M or ASTM A611, with minimum yield point of 33,000 psi, formed as indicated. When gage is not indicated, provide 14 gage steel sheet.

D. Railings and Handrails:

(1) Pipe: Pipe for railings, pipe supports, and handrails shall be seamless steel pipe conforming to ASTM A53, Type S, Grade A, with special instructions to the manufacturer to provide Architectural Handrail Grade, of diameters and sizes indicated.
(2) Handrail Brackets: Provide handrail brackets for handrails at walls, manufactured specifically for the purpose of cast, forged, or wrought steel, of configuration indicated or required to suit conditions, galvanized after fabrication.

E. Anchors, Fasteners, and Accessories: Provide all required anchors, fasteners, miscellaneous components, and accessories as required for a complete and finished stair installation. Bolts, nuts, and washers shall conform with ASTM A307, galvanized in accordance with ASTM A153.

F. Paint: Corrosion- inhibitive protective primer as specified herein. Stair system to be painted per 099100: Painting and 090001: Color Scheme.

G. Grout: Refer to 036000: Grout for requirements.

H. Concrete: Concrete for pan-filled stair treads and landings shall be concrete, weighing not less than 120 pounds per cubic foot, with a minimum compressive strength at 28 days of 4,000 psi.

I. Fabrication:

(1) Metal stairs and railings shall be fabricated by firms or shops experienced and skilled in the construction of metal stairs and architectural railings. There shall be no exposed screws, bolts, and fasteners in the finished work.
(2) For items bearing on concrete, provide steel bearing plates and anchors as indicated or required. Base or bearing plates shall be leveled by means of adjustment nuts. The space below plates shall be packed solid with full bed of non-shrink grout. Templates shall be furnished, together with instructions for setting of anchors, anchor bolts, and bearing plates. The Contractor shall supervise and ensure that anchors and related items are properly set in concrete during the progress of the work.
(3) Weld design shall be as directed by stair system engineer. Welds to be ground down and dressed smooth, so that the shape and profile of the item welded are maintained.
(4) Holes shall be cut, drilled, or punched at right angles to the surface of the metal and shall not be made or enlarged by burning. Holes in base or bearing plates shall be drilled. Holes shall be provided in members as required to permit connecting the work of other trades.
(5) Metal stairs and railings shall be prefabricated and preassembled in the factory or shop as far as practicable.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
(2) Storage: Store materials indoors in a clean, dry area in accordance with manufacturer's instructions.
(3) Handling: Protect materials and finishes from damage during handling and installation.

B. Installation:

(1) Stairs and railings shall be installed by the manufacturer or its authorized representative as indicated and in accordance with the approved Shop Drawings and the manufacturer’s installation instructions. Stairs and railings shall be installed with all accessories furnished by the manufacturer or fabricator as required for complete and finished stair installations.
(2) Installation of stair work shall be true and horizontal or perpendicular as the case may be, level and square, with angels and edges parallel with related lines of the building or structure.
(3) Shop fabricated items subject to damage shall be braced and carefully handled to prevent distortions or other damage.
(4) Field welding, where required, shall conform with requirements specified for shop fabrication.
(5) Bearing plates shall be supported at the proper level by means of adjustment nuts on anchor bolts. Bases and plates shall be set accurately using a high-strength, non-shrink grouting mortar to obtain uniform bearing.

C. Field Painting:

(1) After installation, exposed painted surfaces, field welds, and other abraded or damaged primed surfaces shall be touched up with an additional coat of the same primer for ferrous surfaces as herein before specified for shop painting. Spray-paint all touch-up work.
(2) Finish field painting is specified in Section 099100: Painting.

D. Cleaning and Painting:

(1) All surfaces of metal stairs and railings, including surfaces of pan-filled stairs, shall be cleaned and treated to assure maximum paint adherence, prior to application of the shop prime coat, in accordance with SSPC-SP 1, SSPC-SP 3, SSPC-SP 10, and SSPC-SP 11 as applicable for the exposure and application.
(2) Ferrous metalwork shall be given a shop coat of rust-inhibitive metal primer.
(3) Coordinate with Section 099100: Painting, for compatibility of the prime coat and finish coats of paint.

E. Protection:

(1) Institute protective measures required throughout the remainder of the construction period to ensure that all the materials do not incur any damage or deterioration.
(2) Repair components damaged by subsequent construction activities in accordance with manufacturer’s recommendations; replace damaged components that cannot be repaired to Architect’s acceptance.

055140: FIXED WALL LADDERS

1. GENERAL

F. Scope: Includes all material, labor, tools and equipment necessary to install factory fabricated fixed wall ladders for hatch access.

B. Codes and Standard Compliance: ANSI A14.3, IBC, OSHA, State and Local Codes

C. Quality Assurance:

(3) Manufacturer: A minimum of five (5) years' experience manufacturing similar products.
(4) Installer: A minimum of 2 years' experience installing similar products.

D. Submittals:

(1) Manufacturer's product data including installation instructions.
(2) Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.
(3) Warranty: Submit executed copy of manufacturer's standard warranty.

E. Warranties and Guarantees: Provide manufacturer's standard 5-year warranty.

F. Cross References: 018000: Cleaning
042200: Concrete Masonry Units
054000: Cold Formed Metal Framing
077233: Roof Hatches
092500: Gypsum Board

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

J. Quality Standard: Alaco Ladder Co. Model 560

K. Product Characteristics:

(1) Material: Fabricated from 6061-T6 aluminum alloy for added safety, strength and long-lasting durability, with no painting required.
(2) Side Rails: 1 1/8" round serrated rungs secured with cast aluminum connectors, 4 rivets and 3/8" thick brackets mounted to the walls.
(3) Width: 20 1/4"
(4) Finish: Mill finish
(5) Height: As required for location installation.
(6) Locations: Mezzanine Storage 119D, Mechanical 221B, Furniture and Equipment Storage 220.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

(2) Storage: Store materials indoors in a clean, dry area in accordance with manufacturer's instructions.
(3) Handling: Protect materials and finishes from damage during handling and installation.

B. Installation:

(1) Install fixed ladder in strict compliance with manufacturer’s written instructions.
(2) Installation must comply with applicable local, state and national code jurisdictions.

C. Cleaning: Perform in accordance with 018000: Cleaning.

055800: MISCELLANEOUS METAL

1. GENERAL

A. Shop Drawings: Submit to Architect for approval. Submit samples to Architect for approval, when requested.

B. Reference Standards:

(1) Specification for the design, fabrication and erection of structural steel for buildings of the AISC.
(2) National Association of Archibald Metal Manufacturers.
(3) Standard Qualifications of Procedure of the American Welding Society.

C. Cross References: 018000: Cleaning
090001: Color Scheme
099100: Painting
105300: Hanger Supported Aluminum Canopy

D. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Materials: All materials shall be of domestic manufacturer free from defects impairing strength, durability or appearance and shall be of the best quality obtainable for the purpose intended. Metal shall be formed true to plan detail and shall be installed plumb and in true alignment.

(1) Miscellaneous Aluminum: Alloy 6061-T6
(2) Structural Steel: ASTM A-36
(3) Miscellaneous Steel: ASTM A-36
(4) Bolts: ASTM A-325
(5) Provide all miscellaneous metal anchors, plates, clips, bolts, nuts, etc. of the highest quality and sufficient quantity to complete the intended job. Bolts, anchors, etc. on the exterior or exposed to moisture shall be galvanized or cadmium plated.

3. EXECUTION

A. Fabrication: Fabricate metal items to shape and size indicated with sharp lines, angles and smooth surfaces. Fabrication and erection shall conform to the application portions of the Reference Standards. Straightening or flattening of metal shall be done in a manner that will not injure the material. Avoid sharp kinks or bends. Grind all welds, cuts, etc. to a smooth flush unpitted finish.

B. Painting: Unless otherwise specified, all steel whether structural or miscellaneous, shall have one shop coat of approved rust inhibitive paint. Shop coat marred during erection shall be touched-up by the painting contractor using the same paint as original shop coat.

L. Cleaning: Perform in accordance with 018000: Cleaning.

057310: DRY GLAZED GLASS RAILING SYSTEM

1. GENERAL

A. Scope: Includes all material, labor, tools and equipment necessary to install monolithic tempered glass dry glazed railing assembly.

B. Codes and Standard Compliance: ASTM A666, ASTM B221, ASTM B248, ASTM C1048, ESR-3269 ICC-ES, NAAMM, State and Local Codes

C. Quality Assurance:

(1) Manufacturer: A minimum of five (5) years' experience manufacturing similar products.
(2) Installer: A minimum of 2 years' experience installing similar products.
(5) All components and fittings are to be furnished by the same manufacturer.

D. Submittals:

(1) Manufacturer's product data including installation instructions.
(2) Shop Drawings:

(a) Dimensioned drawings of railing assemblies indicating the following:

1. Elevations; including joint locations, transitions and terminations.
2. Manufacturer's installation and maintenance instructions.

(3) Samples of manufacturer's finishes.

E. Warranties and Guarantees: Provide manufacturer's standard warranty.

F. Cross References: 018000: Cleaning
042200: Concrete Masonry Units
054000: Cold Formed Metal Framing
079000: Caulking and Sealants
088100: Glass and Glazing
090001: Color Scheme
092500: Gypsum Board
096500: Resilient Flooring

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: C.R. Laurence Co., Inc. (CRL) Taper-Loc Dry Glaze Glass Railing System. Other manufacturers may be acceptable if they meet or exceed the quality standard. All alternates must be approved by the Architect before bid date.

B. Product Characteristics:

(1) Material:

(a) Aluminum Components: Conforming to ASTM B221, Alloy 6063-T52
(b) Stainless Steel Components: Conforming to ASTM A666, Type 304
(c) Brass Components: Conforming to ASTM B248, No. 260, Yellow Brass

(2) System Description:

(a) Performance Requirements for Handrail Assembly:

1. Support distributed load of 50 pounds per linear foot, applied horizontally at right angles in any direction to the handrail.
2. Support concentrated horizontal load of 200 pounds, applied in any direction to any point along handrail system.
3. 50 lb. on 1 SF perpendicular to guard at any location.
4. Wind loads 25 psf or as otherwise specified.
5. Distributed loads and concentrated loads not to be applied simultaneously.

(3) Components:

(a) Glazing: Fully tempered ASTM C1048 Kind FT

1. Size: ½" thick
2. Color: Clear
3. Butt joint with clear silicone

(b) Internal Handrail Cap Connection Sleeves: Metal tube, material compatible with handrail cap material.

(c) Dry Glaze System: Dry glaze system designed for CRL B5S standard square profile base shoe.

(d) Shoe Base:

1. Profile: CRL Part B5S, 2 ½" wide by 4 1/5" high rectangular cross-section for ½" monolithic tempered glass.
2. Material: Aluminum 6063-T52
3. Finish: 304 Brushed Stainless Steel
4. Attachment Accessories: Fasteners and sill angles as required by manufacturer for installation shown on drawings.

(e) Metal Cap Railing:

1. Profile: Part CRL GR25BS, 2 ½" diameter
2. Length: As required for installation with as little joints as possible.
3. Finish: 304 Brushed Stainless Steel
4. End Caps to match railing
5. Attachment Accessories: Sleeves, vinyl, inserts, silicone, sealants as required by manufacturer for installation shown on drawings.

C. Fabrication:

(1) Fabricate handrail assembly components to lengths and configurations complying with shop drawings.
(2) Machine joint edges smooth and plane to produce hairline seams when site assembled; supply concealed sleeve connectors for joints.
(3) Isolate dissimilar metals to prevent electrolytic action by applying primer to concealed surfaces of metal components.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver materials properly protected against damage to finished surfaces during transit.
(2) Inspect materials upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
(3) Store materials at building site under cover in dry location.

B. Installation: Install handrails in accordance with manufacturer's recommended installation instructions and approved shop drawings.

C. Cleaning:

(1) Clean glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealants compounds, dirt or other substances.
(2) Remove protective films from metal surfaces.
(3) Clean railing surfaces with clean water and mild detergent. Do not use abrasive chemicals, detergents, or other implements that may mar or gouge the materials.

D. Protection:

(1) Institute protective measures required throughout the remainder of the construction period to ensure that all the materials do not incur any damage or deterioration.
(2) Repair components damaged by subsequent construction activities in accordance with manufacturer's recommendations; replace damaged components that cannot be repaired to Architect's acceptance.

061000: ROUGH CARPENTRY

1. GENERAL

   A. Scope: Includes all materials, labor, tools, and equipment for the complete installation of all wood and plywood required of the project in accordance with the contract documents.

   B. Codes and Standards Compliance: IBC, SBC, ALSC, AOA, AWPA, AWPS, AWPB, SFPA, SPIB, ASTM (D1760, D2555. D2529, D245, D1037, D2016, D2915, D3731), USDC PS 20-70, PS 1-74, WCLIB, WWPA, NLGA.

   C. Qualifications of Carpenter: Only craftsmen skilled in the installation of wood framing and carpentry shall be allowed to work on this project. A firm with a minimum of five (5) years of successful experience shall be employed to "frame" and/or do carpentry work on the project.

   D. Submittals: All wood supplied to the project shall have grade marks for its intended use. Provide preservative wood certification if required by Architect.

   E. Warranties and Guarantees: Provide a one (1) year guarantee for work under this specification. Any lumber and plywood not showing grade and quality marks specified in products below shall be rejected at the expense of the Contractor.

   F. Cross Reference: 061213: Structural Panel Concrete Subfloor
   061530: Sheathing
   064100: Cabinetry
   108000: Accessories
   112213: Walk-Up Depositories
   116733: Recreational Climbing Wall
   122413: Window Roller Shades
   142123: Machine-Room-Less Electric Traction Passenger Elevators

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality and Performance Standard: Georgia Pacific, Koppers

      (1) Lumber: American Softwood Lumber Standard PS 20 C.E. (DOC) SPIB Grading Rules apply; Western Spruce, Fir, Pine acceptable with equivalent grading and quality.
      (2) Plywood: Softwood Plywood: Construction and Industrial PS 1 C.E. (DOC) APA grades and specifications (C20)
      (3) Wood (Decay-Resistant) Treatment: AWPI LP-2, LP-22 (Pressure treated with water-borne preservatives).
      (4) Exterior Sheathing: See 061530: Exterior Sheathing (if required)
      (5) Wood used for blocking in wet areas shall be pre-treated for mold.

   B. Product Characteristics and Types:

      (1) Grading Marks: Each piece of wood or plywood shall bear the grade mark by the board of review, ALSC.
      (2) Grading (wood): Each piece of the following shall conform to the standard in 2.A.(1) above:

         (a) Structural Framing and Blocking: 2" to 4" thick X 2" to 4" wide): No. 2 KD MC15 or as shown on drawings.
         (b) Structural Joists and Planks: 2" to 4" thick X 5" and wider): No. 2 KD MC15
         (c) Concealed Board Lumber: No. 3 KD MC15

(3) Plywood: Each piece of the following plywood shall be supplied to conform to 2.A.(2) above.

(a) Interior exposed plywood (paint finish): Interior type exposed face grade A concealed grade D (A-D INT-APA) (3/4" thick).
(b) Plywood Wall Sheathing: C-D INT APA, exterior glue (3/4" thick)

(4) Wood (Decay-Resistant) Treatment:

(a) Each piece of the following shall be pressure treated to conform to the AWPI standard in 2.A.(3) above and shall bear the quality mark of an independent third-party inspection agency approved by a recognized regulatory authority.

1. Cants, nailers, blocking, striping and similar items in conjunction with roofing, flashing, vapor barriers and waterproofing.
2. Window and floor sills, sleepers, blocking, furring, stripping, and similar items in direct contact with masonry, stonework, CMU, or concrete slabs, beams, or columns.
3. Ground-contact and water-immersed wood (in accordance with standard for ground contact)

(b) For treated lumber and plywood, the following retentions have been established by the American Wood Preservers' Association. They shall be observed on all treated lumber and plywood used on this project:

Retentions (lbs./cu.ft.)	Uses/Exposure
.25	Above Ground
.40	Ground Contact
.60	Wood Foundation (FDN)

1. Treated lumber or plywood either above ground or in contact with the ground, check the treated quality stamp on each piece. It will say "above ground" for uses such as decking or benching which do not touch the soil. It will say "ground contact" for treated lumber or plywood that will touch the soil, or be buried in the ground.

(5) Exterior Sheathing: See 061530: Exterior Sheathing

3. EXECUTION

A. Storage and Handling of Material

(1) Lumber and plywood shall be unloaded in a dry place-not in water or muddy areas.
(2) Untreated lumber and plywood shall not be in direct contact with the ground.
(3) Lumber and plywood stored in an open area should be covered with a material that will give protection from the elements but be porous enough to allow moisture to escape. Polyethylene or similar covers do not allow the passage of moisture.
(4) Framing lumber shall be enclosed and under roof as soon as possible for protection from the elements.
(5) Exterior and interior siding and finish shall be stored in a closed unheated area and shall not be marked on finish side.

B. Environmental Conditions Criteria: Lumber and plywood shall not be stored in areas with extreme changes in temperature.

C. Preparation of Work:

(1) Installation and fabrication of treated lumber where it is cut, bored, or otherwise machined shall be liberally brushed with a solution of copper naphthenate containing a minimum of 2% metallic copper in solution in accordance with the AWPA standard M4.
(2) Weather exposed lumber and plywood shall be kept to a minimum. All warped lumber and plywood shall be replaced before finishes installed.

D. Protection of Adjacent Work: No damage shall be done to existing work from material and installation of work in this section.

E. Manufacturers' Instructions and Trade Associations Instructions: All work shall be in accordance to the published instructions of the manufacturer and trade associations.

F. Workmanship and Installation:

(1) See 060600: Connectors and Supports (if required)
(2) All items shall be rigidly anchored or attached, square, plumb and true, or in other planes and shapes shown on the drawings. Joints shall be tights, even and free of offsets. All surfaces shall be sanded, filled, or otherwise prepared to receive paint or stain, where indicated. All treated lumber cut, drilled, etc. shall be treated on the site in accordance with 3.C.(1). See structural drawing for connectors and supports.
(3) Sizing and Spacing of Members:

(a) Studs: See 054000: Cold Formed Light Gauge Metal Framing
(b) Firestopping Plates: As shown on drawings.
(c) Openings: See 054000: Cold Formed Light Gauge Metal Framing and structural drawing for lintels.
(d) Corners (interior and exterior): 3-2" x 4" unless detailed otherwise.
(e) Wood Blocking: 2 continuous lines (in three equal parts) of 2" x 4" between studs 8'-0" to 10'-0" in height, 3 continuous lines (in four equal parts) of 2" x 4" between studs above 10'-0" to 14'-0" block out and around the following devices:

1. Toilet paper holders.
2. Paper towel dispenser.
3. Cabinetry
4. Grab Bars
5. TV/Monitor Mounting Brackets

G. Wood Siding:

(1) Nail shank should penetrate beyond siding 1 1/2" into wood. Face-nail shiplap with two nails per bearing into "V". Allow 1/8" expansion clearance for lapped siding. Do not nail through undercourse.
(2) Care should be taken not to overdrive nails as splitting or cupping of the siding may result. All end and butt joints must fall over studs or blocking.
(3) Exterior Moisture Control: See 061600: Exterior Sheathing and 072720: Fluid-Applied Weather Barrier (if required)
(4) Finishing: To protect finish from moisture, siding should be pre-treated with a water-repellent preservative, unless mill-treated.

H. Completion of Work: Architect shall observe work in section prior to it being covered up. Notify Architect for this review as required.

I. Cleaning and Protection of Completed Work: Remove all miscellaneous wood and plywood from the project. Do not leave any loose wood or plywood in closed areas such as crawl spaces, attics, and interior wall cavities.

061213: STRUCTURAL PANEL CONCRETE SUBFLOOR

1. GENERAL

   A. Scope: Includes all materials, tools, labor and equipment necessary for the complete and satisfactory installation of structural panel concrete subfloor.

   B. Codes and Standards Compliance: ADA, ANSI S100, ANSI S210, ANSI S214, ANSI S230, ASTM A588, ASTM E84, ASTM E119, ASTM E136, UL, State and Local Codes

   C. Quality Assurance:

      (1) Underlayment installers must have completed training by the underlayment manufacturer.
      (2) Underlayment installers must have at least five (5) years' experience installing products specified herein.

   D. Submittals:

      (1) Product Data: Manufacturer's standard specifications and descriptive literature, including:

         (a) Product characteristics
         (b) Performance criteria
         (c) Safety Data Sheets

      (2) Manufacturer's written installation instructions.
      (3) Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
      (4) Certificates: Product certificates signed by manufacturer certifying materials complying with specified performance characteristics and criteria and physical requirements.
      (5) Manufacturer's Field Reports: Submit manufacturer's field reports within 3 days of each manufacturer's site visit and inspection.

   E. Warranties and Guarantees: Provide Manufacturer's standard warranty.

   F. Cross Reference: 035410: Underlayment
      051200: Structural Steel Framing
      054000: Cold Formed Metal Framing
      061000: Rough Carpentry
      079500: Expansion Control
      096820: Carpet
      Structural Drawings

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard: USG Struco-Crete Brand Structural Panels. Other manufacturers may be acceptable if they meet or exceed the Quality Standards listed below. All alternates must be submitted to the Architect for approval before the bid date.

   B. Performance Requirements:

      (1) Floor Framing (standard systems):

         (a) Floor framing shall be designed with a minimum deflection of L/360, where the Uniform Floor Load is 120 PSF for framing spaced at 24" on center.
         (b) Floor framing shall be designed with a minimum deflection of L/360, where the Uniform Floor Load is 283 PSF for framing spaced at 16" on center.

      (2) Fasteners: Follow the selected fastener layout for screw pattern for the design diaphragm loads by Engineer of Record.

(3) Panel Layout: Follow panel installation provided by the Engineer of Record.
(4) Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.
(5) Non-Combustible Ratings: Where noncombustible assemblies are required, provide materials and application procedures identical to those tested according to ASTM E136.

C. Product Characteristics:

(1) Structural Concrete Panel:

(a) Noncombustible structural subfloor panel manufactured in accordance with AC318.

1. Panel Dimensions:

a. Thickness: ¾”
b. Width: 4’-0”
c. Lengths: 8’-0”, 6’-0” or 6’-8”
d. Long Edges: Tongue and Groove

2. Panel Properties

a. Density: 75 lb./CF tested in accordance with ASTM C1185
b. Weight: 5.0 lb./SF tested in accordance with ASTM D1037 at a thickness of ¾”
c. Noncombustibility: Pass tested in accordance with ASTM E136
d. Surface Burning Characteristics: 0 Flame Spread/0 Smoke Developed tested in accordance with ASTM E84.
e. Mold Resistance: 10 tested in accordance with ASTM D3273, 0 tested in accordance with G21

(2) Structural Panels Fasteners:

(a) In accordance with PER-13067 and PER- 14076, PER- 15092, and ESR- 1792.
(b) Use only fasteners recommended by the Manufacturer.
(c) Install using the recommended spacing and distance from the ends (square cut) and edges (tongue & groove) of the panel.

(3) Coverings and Underlayment: Follow floor covering manufacturers’ installation procedures.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver material to site promptly without undue exposure to weather.
(2) Deliver in manufacturer’s unopened containers, pallets, or panels fully identified with name, brand, type, and grade.
(3) Store above ground in dry, ventilated space.
(4) Protect materials from soiling, exposure, and damage.
(5) If stored outside, material should be covered with waterproof tarps.
(6) Panels must be stored over stable soil or other surface. Soil or surface must be able to carry the load of the stored pallet(s).
(7) Pallets must not be stacked out of alignment by more than +/- ½”.

B. Project Conditions:

(1) When mechanically fastened, do not install structural panels when ambient temperature is below 0 degrees F.
(2) Prior to the application of finished flooring, structural panels must be conditioned at the same temperature as required for the finished flooring for at least 48 hours.
(3) Do not apply finished flooring over structural panels when wet, frozen or with surface frost. If installed panels have snow or ice, do not use salts or defrosting agents. Sand is recommended over slippery surfaces.

C. Examination:

(1) Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
(2) Steel framing to receive the structural panels shall be structurally sound, free from bows, twists, or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of structural panels.

D. General Installation Requirements:

(1) Cold-Formed Steel Framing

(a) The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
(b) The attachment flange or bearing edge for cold-formed steel must be a minimum 1-5/8" wide, 2" preferred, with at least ¾" of the panel bearing on the supporting flange.
(c) The size of the cold-formed steel framing flange required will vary based on the specified mil thickness/gauge and fastener selected.
(d) Cold-formed steel framing thickness and size is always based on diaphragm capacity but must be a minimum 43 mil and spaced no greater than 24" o.c. for up to 450 plf. When significant diaphragm capacity is required, 54 mil may be required.
(e) Joist bearing shall be provided at the foundation that is uniform and level.
(f) Cold-formed steel joists shall be located directly overbearing studs or a header installed at the top of the bearing wall to distribute the load.
(g) Joist framing must be perpendicular to rim joists.
(h) On steel framing, a web stiffener shall be provided at reaction points and/or concentrated loads as specified in the contract documents. End blocking shall be provided where joist ends are not otherwise restrained from rotation.
(i) Additional joists shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
(j) All blocking or bridging must be installed prior to the installation of structural panels.
(k) Framing must be of good quality, free of bows, twists, or other malformations.

(2) Hot-Rolled Steel Framing

(a) The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
(b) Framing shape and size is always based on diaphragm capacity.
(c) Hot-rolled steel framing shall have a 3" or larger bearing surface suitable for fastener insertion and panels must bear a minimum or 1 ¼" on the framing member.
(d) Framing bearing shall be provided at the foundation that is uniform and level.
(e) Joist framing must be perpendicular to support beams.
(f) Additional framing members shall be provided under parallel partitions and around all floor opening that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
(g) All blocking or bridging must be installed prior to the installation of structural panels.
(h) Framing must be of good quality, free of bows, twists, or other malformations.

(3) Structural Panels:

(a) This product may contain respirable crystalline silica. Refer to OSHA Rule 29 CFR 1926. 1153 for specific details about limiting worker exposure to respirable silica.
(b) The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust industrial HEPA vacuum collection device for control of dust and silica. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel. Collected dust shall be disposed of in a safe manner and in compliance with local, state, and federal ordinances.
(c) Structural panels shall be installed with the long edges (tongue & groove) perpendicular to the framing. If primary framing direction changes, removal of the tongue from the first row of panels oriented in the new direction will be necessary for proper fastening. Care should be taken to ensure sufficient framing flange is available for fastening the panels in the new orientation.
(d) Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed. Given that panel width is 48", plan the layout so the first and last panel row width is a minimum of 24" wide. In the case where the row width is less than 24" wide, panels shall be blocked on all edges by framing.
(e) Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist. Place each panel across three or more supports. Less than full length panels at the end of a row may span a single framing opening. Cust panels to length as needed to ensure that the butt end of the panel is centered on the framing member. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
(f) Structural panels shall be fastened following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. Do not fasten all the corners first. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris. Do not gap the panels. Install the second panel and all subsequent panels in a similar manner to complete the row. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows. Less than full length panels at the end of a row may be staggered by a single support.
(g) Penetrations in the panels should be made before installing the panel whenever possible. If penetration is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not damaged. Support the ends and edges of any penetrations with framing if they are greater than 6" in any direction.
(h) Ensure panel is flush with supporting member drive fasteners so the heads are flush with the surface of the board.
(i) Construction Traffic Protection- prior to floor finishing, place minimum 3/8" thick plywood sheathing materials on the floor in high traffic areas over newly installed structural panels. ¼" plywood may be used in lieu of 3/8" material provided it is fastened at all four corners to prevent shifting and curling. Thicker protecting material may be required if heavier loads are expected or work is to be performed that may damage installed structural panels.

(4) Poured Floor Underlayment: See 034510: Underlayment

(5) Floor Finish:

(a) Leftover material shall be removed from the jobsite.
(b) Remover all foreign material from the floor surface and vacuum all dust from the surface.
(c) Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels. If required butt joints and T&G joints shall be filled with an elastomeric patching compound.
(d) Direct application of bonded floor finishes is not allowed.

061530: SHEATHING

1. GENERAL

   A. Scope: Includes wall sheathing, weather resistant barriers and sheathing joint and penetration treatment in accordance with the contract documents.

   B. Codes and Standards Compliance: ASTM C473, ASTM C518, ASTM C1002, ASTM C1177, ASTM C1280, ASTM C1396, ASTM D3273, ASTM D6329, ASTM E72, ASTM E84, ASTM E136, ASTM E96, GA-253, State and Local Codes.

   C. Qualifications Assurance:

      (1) Installer Qualifications: Installer shall have experience with installation of exterior sheathing under similar conditions.
      (2) Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
      (3) Source Limitations: Provide exterior sheathing and accessory materials produced by single manufacturer.
      (4) Mock-Up: Install mock-up using approved exterior sheathing including all related accessories and miscellaneous materials required for the sheathing system.

         a. Mock-up Size: 4' x 4'
         b. Mock-up Substrate: Match wall assembly construction, including window opening.
         c. Mock-up may remain a part of the work, if mock-up is approved.

   D. Submittals: Submit manufacturer's current specifications and installation instructions for each product specified.

   E. Warranties and Guarantees: Provide manufacturer's standard 5-year warranty against manufacturing defects.

   F. Cross Reference: 042100: Brick Masonry Units
      042200: Concrete Masonry Units (CMU)
      061000: Rough Carpentry
      072000: Insulation
      072720: Fluid-Applied Weather Barrier
      074113: Metal Roof, Gutters & Downspouts
      074400: Cementitious Panels and Trim

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality and Performance Standard: Georgia-Pacific Dens-Glass Fiberglass-Mat Faced Gypsum Sheathing

   B. Materials:

      (1) Thickness: 5/8”. See drawings for locations.
      (2) Width: 4 ft.
      (3) Length: 8 ft., 9 ft. and 10 ft.
      (4) Weight: 1.9 lb/sq. ft.
      (5) Edges: Square
      (6) Surfacing: Fiberglass mat on face, back and long edges.

   C. Fasteners: ASTM C1002 corrosion resistant treated screws

3. EXECUTION

A. Delivery, Storage and Handling:

(1) All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements.
(2) Store all gypsum sheathing flat.

B. Installation, General:

(1) Comply with ASTM C1280, GA-253 and manufacturer's written instructions.

(a) Fasten sheathing to cold-formed metal framing with screws.

(2) Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
(3) Horizontal Installation: Install sheathing with V-grooved edges down and tongue and edges up. Interlock tongue with groove to bring long edges in contact with edges of adjacent board without forcing. Abut ends of boards over centers of stud, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

(a) Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8" from edges and ends of boards.

(4) Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

(a) Space fasteners approximately 8" o.c. and set back a minimum of 3/8" from edges and ends of boards.

C. Weather-Resistant Sheathing Barrier Installation: Cover sheathing with weather-resistant barrier per 072720: Fluid-Applied Weather Barrier.

D. Sheathing: Apply elastomeric sealant to joints and fasteners. Seal all penetrations and openings.

E. Flexible Flashing Installation:

(1) Apply flexible flashing where indicated to comply with manufacturer's written instructions. See also 07600: Flashing and Venting.

(a) Prime substrates as recommended by flashing manufacturer.
(b) Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
(c) Lap flashing over weather-resistant building paper at bottom and sides of openings.
(d) Lap weather-resistant building paper over flashing at heads of openings.
(e) After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

F. Protection: When applied to a structure, sheathing must not be left exposed to the elements for more than one month unless all gaps resulting from cuts, corners, joints and machine-end cuts of the sheathing are filled with a elastomeric sealant at the time of erection to protect the sheathing from water intrusion. This treatment will extend exposure time to six months. Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing barrier securely fastened to framing. Apply covering immediately after sheathing is installed.

064100: CABINETRY

1. GENERAL

A. Scope: Includes all material, labor, tools, and equipment necessary to install all cabinetry/countertops, RC Reception 103 canopy laminate, Community Room 2 221 cove lighting well melamine, and PAB interior roof melamine over Life Guard Office 103.

B. Code/Standards Compliance: ADA, IBC, SBC, AWI, ANSI/BHMA A156.9, NEMA LD3

C. Qualifications of Cabinet maker: Only craftsmen skilled in the manufacturer of custom grade cabinets shall be allowed to work on this project. A firm with a minimum of three (3) years of successful experience shall be used to manufacturer the cabinetry required of the contract. Woodwork manufacturers shall be certified by the AWI Quality Certification Program as competent to perform the work specified. Certification shall be evidenced through the application of AWI Quality Certification labels and/or the issuance of an AWI letter of licensing for the project.

D. Submittals:

(1) Shop Drawings:

(a) Submit shop drawings on all items of cabinetry.
(b) Shop drawings shall be of sufficient detail and scale to determine compliance with the intent to the quality grades specified.
(c) Indicate all hardware on drawings.

(2) Brochures:

(a) Submit manufacturer's descriptive literature of specialty items not manufactured by the cabinetmaker, as requested by the Architect.
(b) Supply information on all finish hardware.

(3) Samples:

(a) Submit samples of each wood species which is to receive transparent finish at job site if required or specified.
(b) Submit finished samples of each finish to be applied at factory, if required or specified.
(c) Submit samples of plastic laminate, countertop material and finish hardware, if required or specified.

(4) Field Verification of Dimensions:

(a) All shop drawings submitted for final review shall reflect field verified dimensions.
(b) Cabinetmaker, installer and contractor shall coordinate installation in accordance with provisions of this specification.

(5) Mock-Up:

(a) Provide units with specified countertop; with hardware installed.
(b) Mockup may remain as part of the work.

E. Warranties and Guarantees: Provide a one (1) year guarantee for work under this specification. Any lumber and plywood not showing grade and quality marks specified in products below shall be rejected at the expense of the Contractor. Provide and extend manufacturer's warranty for longer than one year where indicated by manufacturer.

F. Cross References: 018000: Cleaning
061000: Rough Carpentry
066116: Solid Surface Fabrications
066123: Ultracompact Surfacing Countertops
079000: Caulking and Sealants
090001: Color Scheme
093100: Tiling
096510: Rubber Base, Treads and Risers
112213: Walk-Up Depositories
114520: Appliances
Architectural Details

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Materials:

(1) Construction: All cabinets shall be as detailed on drawings. Perform work in accordance with AWI Premium grade quality.
(2) Exposed Surfaces: Plastic Laminate

(a) Includes but is not limited to the backside of cabinet doors, exposed open adjustable shelving (all four edges and top/bottom of shelves), and under countertops. Absolutely no raw cabinet substrates shall be exposed.

(3) Unexposed Surfaces: Melamine

(a) Unexposed sides, bottoms, tops, splash, interior dividers (including interior of cabinets but not backside of cabinet door or exposed shelving) and all other such interior surfaces. Absolutely no raw cabinet substrates shall be exposed.
(b) Blocking, framing, supports shall be of size required, B and better Douglas Fir or White Pine. Any exposed blocking must be covered as noted above.

(4) Countertops:

(a) Solid Polymer Fabrications: See 066116: Solid Surface Fabrications and 090001: Color Scheme
(b) Plastic Laminate: See 090001: Color Scheme

(5) Cabinet and Plastic Laminate Countertop Edge Banding: Charter Industries PVC 3mm

(6) Cabinet Hardware:

(a) Pulls: Doug Mockett DP57 Stainless Steel Wire Pulls: Sizes: 4 5/32” and 10 1/2”. See cabinet elevations for locations.
(b) Hinges: Blum clip top 120°+ #71T5580 self-close with mounting plate #175H9100 or equal
(c) Drawer Slides: Blum Metabox Drawer System
(d) File Drawer Slides: Blum Metabox Drawer System
(e) Adjustable Shelf Supports: 5mm single pin steel shelf rest (BHMA 652). Drill holes in cabinets at 32MM
(f) Doors and Drawers Silencers: Minimum 2 per doors up to 2'-6", 3 per door above 2'-6", 2 per drawer.
(g) Pull-Out Waste Bins: Salice #QPAM with plastic bin. Sized to fit cabinet elevations.
(h) Wire Grommets: 2" Hardware Concepts #6630. Color to coordinate with countertop
(i) Cam Locks: Tubular Cam Lock #UTCL118
(j) Concealed Counter Supports: CSA-0004 Series Wall Mount, Floating Support Bracket system by CenterlineBrackets. See drawings for locations and details.

1. Length: As required for counter depth, Item Number: CSA-0004-XX-OPP. Length options (XX) from 7” - 22”.
2. Flange: 8" with 6 1/4" mounting holes
3. Lag Screws: #12
4. Bracket Top Width: 2 1/2"
5. Bracket Top Thickness: 1/2"
6. Material: Powder Coated Steel
7. Number of brackets shall be provided to span and hold counters detailed.

(k) Note: All connections to be concealed.

(7) Color Selections: See 090001: Color Scheme

3. EXECUTION

A. Fabrication:

(1) Fabricate to AWI premium quality standards
(2) Door and Drawer Fronts: 3/4" thick flush overlay.
(3) Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
(4) Fit shelves, doors, and exposed edges with matching veneer edging. Use one piece for full length only.
(5) Cap exposed plastic laminate finish edges with PVC edge trim of the same color as the exposed laminate.
(6) When necessary to cut and fit on-site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
(7) Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
(8) Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
(9) Provide cut-outs for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

B. Storage and Handling of Materials:

(1) Immediately upon deliver to job site, place materials indoors, protected from weather.
(2) Store materials a minimum of 6" above floor on framework or blocking and cover with protective waterproof covering providing for adequate air circulation and ventilation. Store all materials in dry, conditioned space.

C. Preparation of Area: The General Contractor shall be responsible for coordinating and ensuring the area is properly prepared and ready to receive products in this specification.

D. Protection of Adjacent Work: The Contractor shall insure areas adjacent to the locations where products of this section are not damaged.

E. Workmanship and Installation:

(1) Verify adequacy of backing and support framing.
(2) Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.
(3) Install work in accordance with AWI Premium Quality Standards.
(4) Set and secure materials and components in place, plumb and level.
(5) Scribe work abutting other components, with maximum gaps of 1/32". Do not use additional overlay trim to conceal larger gaps.
(6) Install hardware in accordance with manufacturer's instructions.
(7) Use fixture attachments in concealed locations for wall mounted components.
(8) Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.
(9) Secure cabinet and counter bases to floor using appropriate angles and anchorages.
(10) Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

F. Completion of Work: Adjust moving or operating parts to function smoothly and correctly.

G. Cleaning and Protecting Installed Work: Clean casework, counters, shelves, hardware, fittings, and fixtures.

066116: SOLID SURFACE FABRICATIONS

1. GENERAL

   A. Scope: Includes all material, labor, tools, and equipment necessary to install all of the solid surface and/or quartz applications shown on the plans and details including but not limited to countertops and windowsills.

   B. Code/Standards Compliance: C370, ASTM C531, C1028, E84, E662, ANSI Z124.6, State and Local Codes.

   C. Quality Assurance:

      (1) Fabricator shall have skilled workers who custom fabricated products similar to those required for this project and whose products have a record of successful in-service performance.
      (2) Fabricator/installer shall be certified by the manufacturer(s) of products used as specified herein.

   D. Submittals:

      (1) Manufacturer's Product Data.
      (2) Manufacturer's Care and Maintenance Data.
      (3) Samples: Submit two (2) 3"x3" samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards.
      (4) Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work such as plumbing and electrical.
      (5) Warranty: Provide manufacturer's standard warranty documentation.

   E. Warranties and Guarantees: Provide manufacturer's standard 15-year limited warranty for products specified herein after the date of installation.

   F. Cross References: 018000: Cleaning
      064100: Cabinetry
      079000: Caulking and Sealants
      090001: Color Scheme
      093100: Tiling
      Plumbing Fixtures
      Cabinet Elevations

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard:

      (1) Quartz Countertops: LX Hausys Viatera Quartz Surfaces. Alternates must be submitted to the Architect for approval before bid date.

         (a) Material: Non-porous, homogeneous mixture containing 93% pure quartz with additions of polymers, resins and pigments.
         (b) Thickness: 3cm
         (c) Edge Treatment: See drawings for details.
         (d) Colors: See 090001: Color Scheme
         (e) Locations: See Finish Schedule, Cabinet Elevations and 090001: Color Scheme. Quartz will also be used for window sills in the Recreation Center.

(b) Accessories:

1. Mounting Adhesive: Provide structural grade silicone or epoxy adhesive.
2. Quartz Surface Adhesive: Provide epoxy or polyester adhesive recommended by surface manufacturer for application and conditions of use. Adhesive to match color of surface.
3. Joint Sealant: Clear sealant of type recommended by manufacturer for application and use.
4. Solvent: Denatured alcohol for cleaning quartz surfacing to assure adhesion of adhesives and sealants.
5. Cleaning Agents: Mild soap and water.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver materials to project site until areas are ready for installation.
(2) Store materials indoors prior to installation.
(3) Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

B. Fabrication:

(1) Fabrications to be performed by a certified manufacturer of surface materials.
(2) Fabricate components in shop to greatest extend practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's requirements.
(3) Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Reinforce joints as recommended by surface manufacturer.
(4) Provide holes and cutouts for plumbing and accessories as indicated on the drawings.
(5) Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

C. Preparation of Area: The General Contractor shall be responsible for coordinating and ensuring the area is properly prepared and ready to receive products in this specification.

D. Protection of Adjacent Work: The Contractor shall insure areas adjacent to the locations where products of this section are not damaged.

E. Workmanship and Installation:

(1) Strictly comply with manufacturer's written installation instructions.
(2) Install components plumb and level, in accordance with approved shop drawings and product installation details.
(3) Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
(4) Adhere undermount and/or top mount sinks/bowls to countertops using manufacturer's recommended adhesives, sealants and mounting hardware.
(5) Provide backsplashes and end splashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant.
(6) Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Data of Substantial Completion.
(7) Make plumbing connections to sinks in accordance with plumbing drawings and specifications.
(8) Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired.

F. Cleaning: Remove masking, excessive adhesive and sealants. Clean exposed surfaces as recommended by manufacturer of solid surface counters.

066123: ULTRACOMPACT SURFACING COUNTERTOPS

1. GENERAL

   A. Scope: Includes all material, labor, tools, and equipment necessary to install ultracompact surfacing countertops shown on the plans and details.

   B. Code/Standards Compliance: ANSI A108.5, ANSI A118.4, ANSI A137.1, ASTM C97, ASTM C99, ASTM C170, ASTM C370, ASTM C373, ASTM C482, ASTM C484, ASTM C501, ASTM C648, ASTM C650, ASTM C674, ASTM C880, ASTM C1028, ASTM C1353, State and Local Codes.

   C. Quality Assurance:

      (1) Fabricator shall have skilled workers who custom fabricated products similar to those required for this project and whose products have a record of successful in-service performance.
      (2) Fabricator/installer shall be certified by the manufacturer(s) of products used as specified herein.

   D. Submittals:

      (1) Manufacturer's Product Data.
      (2) Manufacturer's Care and Maintenance Data.
      (3) Samples: Submit two (2) 3"x3" samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards.
      (4) Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work such as plumbing and electrical.
      (5) Warranty: Provide manufacturer's standard warranty documentation.

   E. Warranties and Guarantees: Provide manufacturer's standard 10-year warranty against defects in materials and workmanship.

   F. Cross References: 018000: Cleaning
      064100: Cabinetry
      079000: Caulking and Sealants
      090001: Color Scheme
      093100: Tiling
      Plumbing Fixtures
      Cabinet Elevations

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard: Cosentino USA, Inc. Dekton. Any substitutions must be submitted to the Architect for approval before bid date.

   B. Product Characteristics:

      (1) Composition: Selected raw materials formed into flat slabs utilizing sinterized particle technology.
      (2) Collection: Natural
      (3) Color: Kovik

(4) Surface Finish: Smooth Matte
(5) Thickness: 30mm

C. Adhesive: Type recommended by ultracompact surfacing manufacturer.

D. Fabrication:

(1) Cut ultracompact surfacing panels accurately to required shapes and dimensions.
(2) Fabricate exposed edges as shown on drawing details.
(3) Fabricate with hairline joints.
(4) Cut holes and finishes edges as required for project.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver materials to project site until areas are ready for installation.
(2) Store materials indoors prior to installation.
(3) Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

B. Fabrication:

(1) Fabrications to be performed by a certified manufacturer of surface materials.
(2) Fabricate components in shop to greatest extend practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's requirements.
(3) Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Reinforce joints as recommended by surface manufacturer.
(4) Provide holes and cutouts for plumbing and accessories as indicated on the drawings.
(5) Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

C. Preparation of Area: The General Contractor shall be responsible for coordinating and ensuring the area is properly prepared and ready to receive products in this specification.

D. Protection of Adjacent Work: The Contractor shall insure areas adjacent to the locations where products of this section are not damaged.

E. Workmanship and Installation:

(1) Strictly comply with manufacturer's written installation instructions.
(2) Install components plumb and level, in accordance with approved shop drawings and product installation details.
(3) Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
(4) Adhere undermount and/or top mount sinks/bowls to countertops using manufacturer's recommended adhesives, sealants and mounting hardware.
(5) Provide backsplashes and end splashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant.
(6) Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Data of Substantial Completion.
(7) Make plumbing connections to sinks in accordance with plumbing drawings and specifications.
(8) Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired.

F. Cleaning: Remove masking, excessive adhesive and sealants. Clean exposed surfaces as recommended by manufacturer.

071900: UNDERSLAB VAPOR BARRIER

1. GENERAL

A. Scope: Includes all labor, materials, tools, and equipment necessary for the complete installation of the work specified herein as shown on the drawings.

B. Codes and Standards Compliance: ASTM D1709-09, ASTM E96, ASTM E154, ASTM E1643, ASTM E1745, ASTM F1249-01, State and Local Codes

C. Qualifications Assurance:

(1) Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the vapor retarder.
(2) Obtain vapor retarder materials from a single manufacturer regularly engaged in manufacturing the product.
(3) Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOC's).

D. Submittals:

(1) Independent laboratory test results showing compliance with ASTM & ACI Standards.
(2) Manufacturer's samples, literature.
(3) Manufacturer's installation instructions for placement and seaming.

E. Pre-installation Meeting: Architect, General Contractor, Vapor Retarder Installer and Vapor Retarder Manufacturer to convene one week prior to installation of underslab vapor retarder to discuss installation application.

F. Warranties and Guarantees: Provide manufacturer's standard warranty against any and all defects.

G. Cross References: 018000: Cleaning
033000: Concrete (Cast-in-Place)
096466: Wood Athletic Flooring

H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standard:

(1) Raven Industries VaporBlock 15
(2) Stego Wrap 15
(3) W.R. Meadows Perminator 15

B. Product Characteristics (based on Raven Industries VaporBlock 15):

(1) Vapor retarder must meet all criteria for Class A, per ASTM E1745
(2) Thickness: 15 mil
(3) Weight: 73 lbs/MSF
(4) Classification (ASTM E1745): AB&C

(5) Tensile Strength (ASTM E154, Section 9):

(a) New: 88 lbs/in
(b) After Exposure: 92 lbs/in

(6) Puncture Resistance (ASTM D1709, Method B): >4000g
(7) Maximum Use Temperature: 180°F
(8) Minimum Use Temperature: -70°F
(9) Permeance:

(a) New Material: 0.009
(b) After Conditioning:

1. ASTM E154, Section 8, E96: 0.0104
2. ASTM E154, Section 11, E96: 0.0102
3. ASTM E154, Section 12, E96: 0.0101
4. ASTM E154, Section 13, E96: 0.0091

(10) WVTR: 0.0054 grain/hr-ft^2

C. Accessories:

(1) Seam Tape: 4" wide tape approved by the vapor retarder manufacturer.
(2) Pipe Boots: Pipe boot system approved by the vapor retarder manufacturer.

3. EXECUTION

A. Storage of Materials:

(1) Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
(2) Store materials in a clean, dry area in accordance with manufacturer's instructions.
(3) Protect materials during handling and application to prevent damage or contamination.
(4) Ensure membrane is stamped with manufacturer's name, product name, and membrane thickness at intervals of no more than 85".

B. Environmental Requirements:

(1) Product not intended for uses subject to abuse or permanent exposure to the elements.
(2) Do not apply on frozen ground.

C. Preparation of Area:

(1) Insure all mechanical, electrical and structural work on slab completed before installation of vapor barrier.
(2) Insure gravel bed even and level throughout location of concrete slab. Level and tamp or roll aggregate, sand or tamp earth base.

D. Installation:

(1) Installation shall be in accordance with the manufacturer's instructions and ASTM E1643.

(a) Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
(b) Lap vapor retarder over footings and seal to foundation walls.
(c) Overlap joints 6" and seal with manufacturer's approved 4" wide pressure sensitive tape.

(d) Seal all penetrations (including pipes) with manufacturer's approved pipe boots.
(e) No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.
(f) Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6" and taping all four sides with manufacturer's approved 4" wide pressure sensitive tape.

E. Completion of Work: General Contractor shall inspect the work under this section prior to the concrete slab being poured.

F. Cleaning: See 018000: Cleaning

072000: INSULATION (THERMAL & SOUND ATTENUATION)

1. GENERAL

A. Scope: Includes materials, labor, tools, and equipment necessary to install insulation as specified herein and on shown or implied on the drawings.

B. Code Compliance: ASTM E84, ASTM E96, ASTM E136, ASTM C423, ASTM C518, ASTM C578, ASTM C612, ASTM C726, ASTM C1029, ASTM C1104, ASTM C1014, IBC, UL, State and Local Codes.

C. Quality Assurance: Only Craftsmen who have a demonstrable skill in installing products in this section shall be used. A firm with a minimum of three (3) years' experience in the application of materials similar to those specified herein may be used.

D. Submittals: Submit manufacturer's literature indicating material to be used and samples of each product. Shop drawings required on tapered EPS roof insulation systems. Shop drawings showing all pieces and their relationships to one another and all slopes to drains.

E. Warranties: As indicated on product literature of materials specified. But no less than one year against all defects and faulty workmanship commencing date of substantial completion.

F. Cross Reference: 018000: Cleaning
033000: Cast-In-Place Concrete
042100: Brick Masonry Units
042200: Concrete Masonry Units
054000: Cold Formed Metal Framing
061530: Sheathing
072720: Fluid Applied Weather Barrier
074113: Metal Roof, Gutters & Downspouts
074400: Cementitious Panels and Trim
074616: Aluminum Ceiling, Soffit & Accessories
075300: Thermoplastic Polyolefin Roofing Membrane (TPO)
076000: Flashing and Venting
077113: Metal Coping
077233: Roof Hatches
079000: Caulking and Sealants
079500: Expansion Control
092500: Gypsum Board
095000: Acoustical Metal Ceiling System

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standards:

(1) Sound Attenuation Batt Insulation: Owens-Corning Unfaced 3 1/2"

(a) Locations: All interior gypsum board walls

(2) Rigid Insulation for Exterior Framed Installations: Owens Corning Foamular NGX Unfaced Board Insulation

(a) Thickness: 1 1 /2”
(b) Joint Closure System: Product and installation recommended by Manufacturer.
(c) R Value: R-7.5
(d) Locations: At exterior frames walls.

(3) Rigid Insulation for Exterior CMU Installations: DuPont Thermax Sheathing

(a) Thickness: 1 1/2", square edge, shiplap
(b) Joint Closure System: Product and installation recommended by Manufacturer.
(c) R Value: R-9.8
(d) Locations: All exterior CMU wall construction.

(4) Metal Insulated Roof System: See 074113: Metal Roof, Gutters & Downspouts

(5) Tapered Roof Insulation: See 075300: Thermoplastic Polyolefin Roofing (TPO)

(6) Spray Foam: Icynene Closed-Cell Insulation

(a) All CMU Locations: In all CMU cells except where grouting is required for structure.
(b) RC Locations: In exterior metal columns and above exterior canopies and alcoves with aluminum plank ceilings.
(c) PAB Locations: In interior and exterior metal beams and columns.

(7) Perimeter/Foundation Insulation: Foamular 250

3. EXECUTION

A. Delivery, Storage and Handling of Materials:

(1) Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data.
(2) Store materials above ground, in a dry location, protected from the weather. Damaged packages found unsuitable for use should be rejected and removed from the project.

B. Preparation of Area: Ensure all prerequisite work is finished before commencing insulation work.

C. Installation, General:

(1) Strictly comply with insulation manufacturer's written instructions applicable to products and applications indicated.
(2) Install insulation that is undamaged, dry and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
(3) Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voices with insulation. Remove projections that interfere with placement.
(4) Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

D. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

E. Completion of Work: General Contractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

F. Protection of Work: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

G. Cleaning: See 018000: Cleaning.

072720: FLUID APPLIED WEATHER BARRIER

1. GENERAL

A. Scope: Includes all labor, materials, tools, and equipment necessary for the complete installation of the work specified herein as shown on the drawings.

B. Codes and Standards Compliance: ASTM C1250, ASTM D412, ASTM D2240, ASTM D4541, ASTM E84, ASTM E96, ASTM E283, ASTM E331, ASTM E779, ASTM E783, ASTM E1105, ASTM E1186, ASTM E1677, ASTM E2178, ASTM E2357, ASTM G155, ASTM C1305, AATCC, TAPPI, State and Local Codes

C. Qualifications Assurance:

(1) Qualifications:

(a) Installer shall have experience with installation of commercial fluid-applied weather barrier assemblies under similar conditions.
(b) Installer shall be trained and certified for installation by manufacturer.

(2) Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
(3) Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.
(4) Mock-Up:

(a) Install mock-up using approved weather barrier system including membrane, flashing, joint and detailing compound and related weather barrier accessories according to weather barrier manufacturer's current printed instructions and recommendation.

1. Mock-up Size: 4' x 4'
2. Mock-up Substrate: Match wall assembly construction, including window opening.
3. Mock-up may remain as part of the work, if mock-up is approved.

(b) Contact manufacturer's designated representative prior to weather barrier system installation, to perform required mock-up visual inspection and analysis as required for warranty.

(5) Testing: A Qualitative Water-Leakage Test according to ASTM E1105 shall be performed on the fluid applied weather barrier system at the Contractor's expense. See the Execution portion of this specification.

D. Submittals:

(1) Product Data: Submit manufacturer's current technical literature for each component.
(2) Quality Assurance Submittals:

(a) Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
(b) Manufacturer's Instructions: Provide manufacturer's written instructions.

(3) Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier system installation.
(4) Closeout Submittal: Weather Barrier Warranty. Submit manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

E. Pre-Installation Meeting: Architect, General Contractor, certified installer, and weather barrier manufacturer's designated field representative to convene two weeks prior to installation of weather barrier to discuss installation application.

F. Warranties and Guarantees:

(1) Manufacturer's warranty for weather barrier for a period of ten (10) years from date of purchase.
(2) Pre-Installation meeting and jobsite observations by weather barrier manufacturer for warranty are required.

G. Cross References: 018000: Cleaning
042100: Brick Masonry Units
042200: Concrete Masonry Units (CMU)
061530: Sheathing
072000: Insulation

H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standard: WR Meadows Air Shield Liquid Membrane, Hohmann & Barnard, Inc. Enviro-Barrier VP

B. Accessories:

(1) Joint Treatment: Use product recommended by weather barrier manufacturer to meet warranty requirements.

(a) Joint Tape: Self-adhered fiberglas mesh tape.
(b) Joint Compound: Fluid-applied, vapor permeable, elastomeric flashing material; trowel applied.

(2) Flashing: Use product recommended by weather barrier manufacturer to meet warranty requirements.

(a) Vapor permeable fluid-applied elastomeric flashing.
(b) Flexible flashing with butyl adhesive layer.
(c) Sheet flashing with butyl adhesive layer.

(3) Sealant: Provide weather barrier manufacturer recommended elastomeric; non-vapor permeable sealant; compatible with weather barrier.

(4) Primers for Flexible Flashing and Sheet Flashing: Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

3. EXECUTION

A. Storage of Materials:

(1) Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
(2) Store materials in a clean, dry area in accordance with manufacturer's instructions.
(3) Protect materials during handling and application to prevent damage or contamination.

B. Examination: Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

C. Preparation:

(1) Complete surface preparation, priming, flashing and detailing at openings, cracks, and material transitions prior to beginning installation of fluid-applied weather barrier system.
(2) Surfaces shall be clean and free of frost, oil, grease, mold and efflorescence prior to application of fluid-applied weather barrier system.

D. Installation:

(1) Install fluid-applied weather barrier prior to installation of windows, doors and louvers.
(2) Mask and protect any adjacent finished surfaces from fluid-applied weather barrier material.
(3) Install fluid-applied weather barrier over exterior face of required exterior wall substrates in accordance with weather barrier manufacturer recommendations and instructions.
(4) Install fluid-applied weather barrier by power-rolling method to achieve 25 mils providing a consistent and uniform thickness.
(5) Repair and voids or non-uniform installations or damage by other trades in proper mil thickness prior to installation of final cladding assemblies.

E. Protection and Cleaning:

(1) Protect weather barrier from contact with incompatible materials and sealant not approved per weather barrier manufacturer's recommendations.
(2) Protect installed weather barrier system from damage during construction prior to cladding installation.

(a) If damaged or exposed to UV beyond nine (9) months, clean and prepare surfaces and install additional, full-thickness, fluid-applied weather barrier application in accordance with weather barrier manufacturer's instructions.

(3) Remove masking materials and adjacent protection after weather barrier installation.

074113: METAL ROOF, GUTTERS AND DOWNSPOUTS

1. GENERAL

A. Scope: Includes all materials, labor, tools and equipment necessary to provide and install snap-joint seamed, standing seam metal roof panels, metal trim, accessories, gutters and downspouts.

B. Code and Standards Compliance: AAMA, ASCE, ASTM A653, ASTM A755, ASTM A792, ASTM A980, ASTM C645, ASTM C920, ASTM D226, ASTM D4214, ASTM E1592, ASTM E1980, UL580, State and Local Codes.

C. Quality Assurance:

(1) Manufacturer/Source: Provide metal roof panel assembly, accessories, gutters and downspouts from a single manufacturer.
(2) Approved manufacturer listed in this section with a minimum of five (5) years' experience in manufacturer of similar products in successful use in similar applications.
(3) Installer Qualifications: Experienced installer with a minimum of five (5) years' experience with successfully completed projects of a similar nature and scope.

D. Pre-Installation Meeting: Prior to erection of framing, conduct pre-installation meeting at site with Owner's representative, Architect, manufacturer's technical representative and related trade contractors.

E. Submittals:

(1) Product Data: Provide manufacturer's product and complete installation data for all materials in this specification.
(2) Shop Drawings: Show layouts of metal panels including details of each condition of installation, panel profiles and attachment to building. Provide details showing edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, roof accessories, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.

(a) Indicate points of supporting structure that must coordinate with metal panels system installation.
(b) Include data indicating compliance with performance requirements.
(c) Include structural data indicating compliance with requirements of authorities having jurisdiction.

(3) Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
(4) Samples for Verification: Provide 12" long section of each metal panel profile.
(5) Provide color chip verifying each color selection.
(6) Provide a sample copy of the manufacturer's standard warranty.
(7) Close-Out Submittals:

(a) Maintenance data.
(b) Manufacturer's executed standard warranty.

F. Warranties and Guarantees:

(1) Provide manufacturer's 1-year warranty in which Manufacturer agrees to repair or replace metal panel assemblies that fail in materials and workmanship within one year from date of Substantial Completion.

(2) Special Weathertightness Warranty: Provide manufacturer's special weathertightness warranty in which the manufacturer agrees to repair or replace metal panel assemblies that fail to remain weathertight, including leaks without monetary limitation within 20 years from data of substantial completion.
(3) Special Panel Finish Warranty: Provide manufacturer's special panel finish warranty in which the manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within 25 years from date of Substantial Completion, including color fading, chalking and failure of adhesion, checking or cracking.

G. Cross References: 018000: Cleaning
051200: Structural Steel Framing
053000: Metal Decking
061530: Sheathing
072000: Insulation
074400: Cementitious Panels and Trim
075300: Thermoplastic Polyolefin Roofing Membrane (TPO)
076000: Flashing and Venting
077113: Metal Coping
079000: Caulking and Sealants
090001: Color Scheme

H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: MBCI Metal Roof and Wall Systems

(1) Other manufacturers may be acceptable as an alternate if they meet or exceed the quality standard. Alternates must be submitted to the Architect for approval before bid date.

B. Performance Characteristics:

(1) Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated:

(a) Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings. Certify capacity of metal panels by actual testing of proposed assembly per ASTM E1592
(b) Snow Loads: Pg=10psf
(c) Deflection Limits: Within inward and outward wind-load design pressures in accordance with applicable building code. Note: Due to the use of metal decking, this roof is not a structural element.
(d) Seismic Performance: Comply with ASCE 7, Section 9, "Earthquake Loads"

(2) Wind Uplift Resistance: Comply with UL 580 for wind-uplift class UL-90
(3) Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

C. Material Characteristics:

(1) Thermal Barrier over Deck: 5/8" Glass Mat Roof Board
(2) Johns Mansville SAR Vapor Barrier: 47 mil. Self-adhering fiberglass reinforced tri-laminate woven polyethylene, non-slip, UV protected top surface, self-sealing, SBS rubber and asphalt blend.

(3) Insulation:

(a) Johns Mansville Polyiso Board Insulation

1. Thickness: 4”
2. R Value: 23.6

(b) H-Shield-NB Polyiso Bonded to OSB

1. Thickness: 1.5”
2. R Value: 6.6
3. Fasteners: White screws in length required. Note: Installers must make an effort to install screws in exposed ceiling locations in a uniform pattern.

(4) HydroShield Self Adhering, Self-Sealing Ice and Water Shield High Temperature Underlayment

(5) Metal Roof Panels: Mechanically-seamed, Concealed Fastener, Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with vertical ribs at panel edges, installed by lapping and mechanically interlocking edges of adjacent panels and attaching panels to supports using concealed clips and fasteners in a weathertight installation.

(a) Basis of Design: MBCI Battenlok HS
(b) Nominal Coated Thickness: 24 gauge
(c) Panel Surface: Smooth with striations in pan
(d) Exterior Finish: Fluoropolymer two-coat metallic color system
(e) Color: Silver Metallic, non-direction finish
(f) Panel Width: 16”
(g) Panel Seam Height: 2”
(h) Concealed fastening system

(6) Metal Roof Panel Accessories: Provide complete metal roof panel assembly incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings, in profiles indicated on drawings. Provide required fasteners, closure strips, thermal spacers, splice plates, support plates, and sealants as indicated in manufacturer’s written instructions.

(a) Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.
(b) Panel Clips: Hot-dip galvanized zinc coating, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
(c) Panel Fasteners: Self-tapping screws and other acceptable corrosion-resistant fasteners recommended by roof panel manufacturer. Where exposed fasteners cannot be avoided, supply fasteners with EPDM or neoprene gaskets, with heads matching color of metal panels by means of factory-applied coating.

(d) Joint Sealers: Manufacturer’s standard or recommended liquid and preformed sealers and tapes, and as follows:

1. Factory-Applied Seam Sealant: Manufacturer’s standard hot-melt type.
2. Tape Sealers: Manufacturer’s standard non-curing butyl tape.
3. Concealed Joint Sealant: Non-curing butyl

(e) Steel Sheet Miscellaneous Framing Components: Hot-dip galvanized zinc coated.
(f) Roof Accessories: Approved by metal roof panel manufacturer.

(7) Gutters and Downspouts:

(a) Gutters:

1. Manufactured from same material and color as metal roof panels.
2. Style: Box-Style
3. Size: 7” x 6”, see drawings

(b) Downspouts:

1. Manufactured from same material and color as metal roof panels.
2. Style: Box-style
3. Size: 4” x 6, see drawings

D. Fabrication: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles and structural requirements.

(1) Fabricate metal joints configured to accept factory-applied sealant providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.
(2) Form panels in continuous lengths for full length of detailed runs, except where otherwise indicated on approved shop drawings.
(3) Sheet Metal Flashing and Trim: Fabricated flashing and trim to comply with manufacturer’s written instructions, approved shop drawings, and project drawings. Form from materials matching metal panel substrate and finish.

E. Finishes:

(1) Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer’s written instructions.
(2) Fluoropolymer Two-Coat Metallic System: 0.2-0.3 mil primer with 0.7-0.8 mil 70 percent PVDF metallic fluoropolymer color coat, meeting solar reflectance index requirements.
(3) Interior Finish: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer’s standard light-colored acrylic or polyester backer finish.

3. EXECUTION

A. Delivery, Storage and Handling of Materials: Protect products of metal panel system during shipping, handling and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.

(1) Deliver, unload, store and erect metal panel system, accessory items, gutters and downspouts without misshaping panels or exposing panels to surface damage from weather or construction operations.
(2) Store in accordance with Manufacturer’s written instructions. Provide wood collars for stacking and handling in the field.

B. Examination: Examine metal panel system substrate and supports with installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panel installation.

(1) Inspect metal panel support substrate to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable supports at recommended spacing to match installation requirements of metal panels.
(2) Panel Support Tolerances: Confirm that panel supports are within tolerances acceptable to metal panel system manufacturer but not greater than the following:

(a) 1/4” in 20’-0” in any direction.
(b) 3/8” over any single roof plane.

(3) Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal roof panel system installation.

C. Preparation:

(1) Miscellaneous Supports: Install sub-framing, girts, furring and other miscellaneous panel support members according to manufacturer's written instructions.
(2) Install thermal barrier.
(3) Install vapor barrier. Apply in accordance with underlayment manufacturer's written instructions; apply primer if required. Apply over the entire roof surface.
(4) Install continuous insulation and additional continuous insulation with nail base.
(5) Install ice and water shield barrier over entire surface including wrapping vertically at parapet as shown on drawings.
(6) Flashings: Provide flashings as required to complete metal roof panel system. Install in accordance with 076000: Flashing and Venting.

D. Metal Panel Installation:

(1) Snap-Joint-Seamed, Standing Seam Metal Roof Panels: Install weathertight metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal roof panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses and distortions. Anchor panels and other components securely in place. Provide for thermal and structural movement.
(2) Attach panels to supports using clips, screws, fasteners, and sealants recommended by manufacturer and indicated on approved shop drawings.

(a) Fasten metal panels to supports with concealed clips at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.
(b) Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
(c) Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.
(d) Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

E. Accessory Installation: Install metal panel trim, flashing and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Provide for thermal expansion. Coordinate installation with flashings and other components.

(1) Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips and similar items.
(2) Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
(3) Provide concealed fasteners except where noted on approved shop drawings.
(4) Set units true to line and level as indicated. Install work with laps, joints and seams that will be permanently weather resistant.
(5) Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions. Prepare joints and apply per 079000: Caulking and Sealants.

F. Gutters and Downspouts: Install gutters and downspouts where indicated and where required for proper performance. Connect downspouts to drainage locations as indicated on drawings.

G. Cleaning and Protection:

(1) Remove temporary protective films immediately in accordance with metal roof panel manufacturer's instructions. Clean finished surfaces as recommended by metal roof panel manufacturer.
(2) Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

074400: CEMENTITIOUS PANELS AND TRIM

1. GENERAL

   A. Scope: Includes all labor, materials, tools and equipment necessary for the complete installation of fiber-cement panels and accessories where shown on drawings or as specified herein.

   B. Codes and Standards Compliance: ASTM B136, ASTM B244, ASTM C834, ASTM C920, ASTM C1186, ASTM D1117, ASTM D1730, ASTM E84, ASTM E96, ASTM E119, ASTM E136, ASTM E330, AATCC, TAPPI, IBC, State and Local Codes

   C. Qualifications of Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed to perform the work. A firm with a minimum of three (3) years' experience in the application of materials similar to those specified herein shall be used.

   D. Submittals:

      (1) Product Data: Manufacturer's data sheets on each product to be used, including:

         (a) Installation instructions and recommendations.
         (b) Storage and handling requirements and recommendations
         (c) Manufacturer's best practice guide
         (d) Technical data sheet

      (2) Shop Drawings: Provide detailed drawings of atypical non-standard applications of cladding junctions and penetrations which are outside the scope of the standard details and specifications provided by the manufacturer.
      (3) Samples: Two samples of each primed product specified.

   E. **Mock-Up**: Mock-up of facia including interior and exterior corner details to be constructed for approval by Owner and Architect before commencement of required cementitious panel and trim.

   F. Warranties and Guarantees: Provide manufacturer's limited product warranty with 30-year limited product warranty against defects. Provide an application limited warranty for 2 years.

   G. Cross Reference: 018000: Cleaning
      042100: Brick Masonry Units
      042200: Concrete Masonry Units (CMU)
      061530: Sheathing
      072000: Insulation
      074113: Metal Roof, Gutters & Downspouts
      077113: Metal Coping
      079000: Caulking and Sealants
      090001: Color Scheme
      099100: Painting
      104260: Signage
      105300: Hanger Supported Aluminum Canopy

   H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality and Performance Standard: James Hardie Building Products, Inc. (866-274-3464). All alternates to the Quality Standard must be submitted for approval by the Architect before the bid date.

B. Products:

(1) Non- Vented Soffit:

(a) Finish/Texture: Smooth
(b) Thickness: 1/4”
(c) Size: As required for installation as shown on drawings.
(d) Finish: Primed for paint.

(2) Trim:

(a) Finish: Smooth
(b) Thickness: ¾”
(c) Size: As required for installation as shown on drawings.
(d) Finish: Primed for paint.

(3) Panels:

(a) Finish: Smooth
(b) Thickness: 5/16”
(c) Size: As required for installation as shown on drawings.
(d) Primed for paint.
(e) Note: Panels to be installed against Dens-Glass and metal studs.

(4) Aspyre Siding at Fascia:

(a) Type: Artisian Shiplap Siding
(b) Thickness: 0.625”
(c) Length: 144” boards
(d) Width: 10.25”
(e) Exposure: 9”
(f) Finish: Applied factory applied universal primer. To be painted in the field per 099100: Painting
(g) Installation Note: All joints to be mitered.

(5) Accessories:

(a) Fasteners: Fasteners shall be of high-quality stainless steel to ensure resistance to corrosion. For field painting, fasteners should be treated to accept paint adhesion.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Store products in manufacturer's unopened packaging until ready for installation.
(2) Store siding flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
(3) Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

B. Project Conditions: Maintain environment conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

C. Examination: Do not begin installation until substrates have been properly prepared.

D. Preparation of Area:

(1) Clean surfaces thoroughly prior to installation.

(2) Prepare surfaces using the methods recommended by the manufacturer for achieving the best results for the substrate under the project conditions.
(3) Ensure that drainage plane in intact and all penetrations are sealed.

E. Protection of Adjacent Work:

(1) Insure no debris becomes deposited on finished adjacent work.
(2) All existing work that is damaged shall be repaired.

F. Installation: Install materials in strict compliance with manufacturer's installation instructions.

G. Finish: Finish factory primed siding with a minimum of one coat of high-quality 100 percent acrylic exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

H. Cleaning and Protection:

(1) Maintain prefinished surfaces in clean condition until Date of Substantial Completion. Repair or replace damaged components. Touch-up damages in surfaces are to be indistinguishable in the finished work.
(2) Remove damaged work that cannot be repaired and replaced with new, undamaged components.

075300: THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE (TPO)

1. GENERAL

A. Scope: Furnish and completely install a fully adhered ultra-ply a thermoplastic polyolefin (TPO) roof as detailed in the following specification and drawings.

B. Code Compliance: IBC, ASTM C1177, ASTM C1289, ASTM C1549, ASTM D638, ASTM D1004, ASTM D3273, ASTM D6878, ASTM E84, ASTM E136, FM 1-28, FM 1-29, PS 1, PS 20, SPRI ES-1, State and Local Codes

C. Quality Assurance: Roofing installer shall have the following:

(1) Current Master Contractor status with roof system manufacturer. Provide correspondence from manufacturer approving the applicator.
(2) At least five (5) years' experience in installing specified system.
(3) Capability of providing payment and performance bond to building Owner.
(4) Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.

D. Warranties:

(1) Comply with all warranty procedures by manufacturer, including notifications, scheduling and inspections.
(2) Warranty: Provide manufacturer's 20 year limited warranted covering membrane, roof insulation and membrane accessories.
(3) Warranty to cover damage due to winds up to 72 mph.

E. Cross Reference: 072000: Insulation
074113: Metal Roof, Gutters & Downspouts
076000: Flashing and Venting
077113: Metal Coping
077233: Roof Hatches
090001: Color Scheme
Roof Plan
Mechanical Plans

F. Surface Preparation: The roofing Contractor shall be responsible for providing proper surfaces to receive roofing and flashing. The roofing subcontractor shall notify the Architect in writing of any and all defects in the receiving surfaces, and work shall not proceed until such defects have been corrected. The entire area to be roofed shall be inspected by the roofing subcontractor to determine that it is free of debris, and other gross irregularities. Absolutely no single-ply roofing shall be installed if any substrate is wet. Architect to inspect prior to installation of membrane.

G. Submittals:

(1) Product Data:

(a) Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
(b) Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.

(c) Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearing indicate which option will be used.

(2) Shop Drawings:

(a) The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations and drains.
(b) For tapered insulation, provide project-specific layout and dimensions for each board showing drain locations and penetrations.

(3) Pre-Installation Notice: Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the Manufacturer.
(4) Executed Warranty

I. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCT

A. Quality and Performance Standard: Johns Mansville **0.80 mil** Thermoplastic Polyolefin (TPO) roofing membrane fully adhered system. Other manufacturers may be acceptable if they meet or exceed the quality standard. Alternates must be submitted to the Architect for approval before bid date.

B. Product Characteristics and Types (see drawings for locations and additional details):

(1) Membrane Attachment: Fully adhered
(2) Slope: Provide slope by means of tapered insulation.
(3) Thermal Barrier over Deck: 5/8" Glass Mat Roof Board
(4) Insulation/Cover Board Composite: Isogard HD Composite tapered as required for slope to drains.
(5) Insulation/Cover Board Fastener: As recommended by the roofing manufacturer for membrane specified.
(6) Sealants, Mastics, and Solvents: As supplied or approved by manufacturer. All sealants, mastics and solvents shall be listed on the Manufacturer’s Material Submittal Form. A short description of its use shall also be included.
(7) Flashing: As recommended or supplied by the roofing manufacturer. All flashing material shall match TPO roof.
(8) Overnight Seal: During construction the Contractor shall maintain a watertight seal during any interruption of roof construction at the end of the day and supply the necessary material to accomplish this end.
(9) Other Materials: As supplied or recommended by the Roofing Manufacturer.
(10) Coping: See 077113: Metal Coping
(11) Roof Hatches: See 077233: Roof Hatches

C. Roofing Materials Color: Grey

3. EXECUTION

A. Application: This specification must be in strict compliance with the manufacturer's recommendations. It is the responsibility of the applicator to have this application reviewed by the manufacturer prior to construction, during construction, and at the completion of the project.

B. Material, Delivery, Handling and Storage:

(1) Deliver all materials and/or packages to the jobsite in the manufacturer's original, unopened containers, with legible labels and in sufficient quantity to allow for continuity of work.
(2) Select and operate materials handling equipment in a safe manner, guarding against damage to existing construction or newly applied roofing and conforming to manufacturer's recommendations of handling and storage.
(3) Provide appropriate protection to all materials from weather conditions, i.e., moisture, wind, extreme cold or heat as per manufacturer's recommendations.
(4) Remove all damaged materials from construction site.

C. Environmental Requirements:

(1) Comply with membrane manufacturer recommendations as to allowable weather conditions during installation. Also, take into account the effect of high winds during installation of the roofing system.
(2) Comply with local EPA and OSHA requirements as published by Local, State, and Federal authorities.
(3) Keep all adhesives, sealants, primers and cleaning materials away from all ignition sources.
(4) Consult container labels and Material Safety Data Sheets (MSDS) for specific safety instructions.
(5) All bonding, splicing, and sealing surfaces must be free of dirt, moisture, and any other contaminants.
(6) When the outside temperature is below 40°F, certain combinations of temperature and humidity may cause condensation on the surface of the bonding adhesive. If this condition occurs, do not mate the surfaces. When the ambient air-conditions no longer cause condensation, apply additional Bonding Adhesive and proceed.
(7) If TPO Water Based Bonding Adhesive is used, temperature must be 40°F and rising for the material to perform as designed.
(8) Do not use open flame sources (i.e., propane torches, etc.) to expedite drying of adhesives, sealants, etc. Allow to air dry only.
(9) Do not thin or modify any Firestone material.
(10) Deliver materials to job site in their original containers as labeled by the manufacturer.
(11) Follow Firestone's directions for protection of materials prior to and during installation. Do not use materials that have been damaged to the point that they will not perform as specified.
(12) Care should be used when installing fasteners to avoid possible conduits and other piping in and under the deck.
(13) Fumes from adhesive solvents may be drawn into the building during installation, through rooftop intakes. Refer to Technical Information Sheet "Recommended Guidelines for Application of Roofing Materials to an Occupied Building" in this manual for specific guidelines.
(14) Store roofing material in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable tarpaulins, in a manner to protect it from damage. TPO that has been exposed to the elements for approximately 7 days must be prepared with Splice Wash prior to hot air welding.
(15) TPO is a reflective membrane. Adequate UV eye protection is necessary during installation.
(16) Do not use oil base or bituminous base roof cement.

D. Protection of Work:

(1) The roofing contractor shall work with the roof deck providing a smooth acceptable surface for the proper installation of the roofing membrane, roof insulation and specified components on all new construction projects.
(2) The roofing contractor shall be responsible for the inspection of the deck surface as to suitability for roofing and notify the Architect of any defects that require correction prior to roof application.
(3) For reroofing applications only: Remove existing roof system components as specified by the Architect. If unspecified detrimental components are discovered during installation, they should be brought to the attention of the Architect for corrective action as specified for unanticipated additional work.
(4) Examine surfaces for inadequate anchorage, low areas that will not drain properly, foreign material, ice, wet insulation, and unevenness or any other defect, which would prevent the execution and quality of application of the membrane roofing as specified.
(5) Fill Voids: All surface voids, of the immediate substrate, greater than ¼" wide must be properly filled with an acceptable fill material.
(6) Install Vapor Retarder (if specified on drawings): Install a vapor retarder as specified by the Architect.
(7) The roofing contractor shall be responsible for relocating and adding the drains as shown on the drawings. A subcontractor to the roofing contractor who is a craftsman in this field should do the work.
(8) Remove Moisture: Ponding water, snow, frost and/or ice, present in more than trace amounts, must be removed from the work surface prior to installing the roofing system.
(9) Clean all exposed metal surfaces such as pipes, pipe sleeves, drains, duct work, pitch pockets, etc., by removing loose paint, rust and any asphalt or coal tar pitch of any kind. Remove and discard lead sleeves at soil stack.
(10) DO NOT PROCEED WITH ANY PART OF THE APPLICATION UNTIL ALL DEFECTS AND PREPARATION WORK HAVE BEEN CORRECTED AND COMPLETED.

E. Protection of Adjacent Existing Work: Ensure no damage is done to adjacent work. Any work damaged will require repair to same quality at no expense to Owner.

G. Manufacturer's Instructions and/or Literature: The Roofing Contractor (applicator) shall install the products in this specification in strict compliance with the Manufacturer's recommendations.

H. Workmanship and Installation:

(1) Wood Nailer Location and Installation: Wood nailers must be installed as specified by the Architect or as noted in details. Install wood nailers as follows:

(a) Position Wood Nailer: Total wood nailer height shall match the total thickness of insulation being used and shall be installed with a 1/8" gap between each length and each change of direction.
(b) Secure Wood Nailer: Wood nailers shall be firmly fastened to the deck. Mechanically fasten wood nailers to resist a force of 200 lbs. per lineal foot. Refer to attachment requirements as specified and detailed by the Architect.
(c) Taper Wood Nailer: The wood nailer shall be tapered so that it will always be flush at the point of contact with the insulation.
(d) Chemical Treating of Wood Nailers: Chemical treating for fire resistance or other purposes (other than pressure treating for rot resistance i.e. "Wolmanized" or "Osmose K-33") may affect the performance of the membrane and accessories. Consult Manufacturer's technical services department regarding compatibility.
(e) Work by Others: Make these specifications and details available when nailers are to be installed by others. Work which compromises the integrity of the system may jeopardize the warranty for the project.

(2) Insulation Installation:

(a) Install Insulation: Install only as much insulation as can be covered with roofing membrane and completed before the end of the day's work or before the onset of inclement weather.
(b) Fit Insulation: Neatly fit insulation to all penetrations, and nailers. Insulation shall be loosely fitted, with gaps greater than ¼" being filled with acceptable insulation. Under no circumstances should be membrane be left unsupported over a space greater than ¼". Tapered or feathered insulation should be installed around roof drains so as to provide proper slope for drainage.
(c) Attach Insulation: Insulation must be attached using Firestone fasteners and insulation plates. Refer to the Technical Information Section of this manual for attachment patterns and rates for specific Firestone insulation types and thickness. In a multi-layer insulation assembly, the fastening pattern is determined by the type and thickness of the top layer of insulation.
(d) Stagger Insulation Joints: When installing multiple layers of insulation, all joints between layers should be staggered.

(3) Installation of Roofing Membrane

(a) Quality Control:

1. It will be the responsibility of the roofing contractor to initiate a QC program to govern all aspects of the installation of the new roofing system.
2. The job foreman and/or supervisor will be responsible for the daily execution of the QC program, which will include but is not limited to the inspection and probing of all heat welding incorporated within the roofing system.
3. If inconsistencies in the quality of the welds are found, all work shall cease until corrective actions are taken to insure the continuity of all field and detail welding.

(b) Place Membrane and Allow to Relax: Place membrane panel, over the substrate in its final position. Allow membrane to relax for 30 minutes prior to any seaming or flashing. The system must be installed so that the seams do not impede the flow of water.
(c) Fold the Membrane Back: After making sure the sheet is placed in its final position allowing for a minimum 1-1/2" seam, fold it back evenly onto itself so as to expose the underside. Note: The sheet fold should lay smooth so as to minimize the formation of wrinkles during and after installation.
(d) Remove Dust and Dirt: Sweep the mating surface of the membrane with a stiff broom to remove any dirt that may have accumulated.
(e) Apply the Bonding Adhesive: Apply bonding adhesive at about the same time to both the exposed underside of the sheet and the substrate to which it will be adhered so as to allow approximately the same drying time. Apply bonding adhesive so to provide an even and uniform film thickness. Refer to the Manufacturer's technical information sheets and container labels for specific application instructions. Adhesive may be applied with a roller or by spraying and then rolling.
(f) Stop Bonding Adhesive Short of Splice Area: Care must be taken not to apply bonding adhesive over an area that is to be later heat welded to another sheet or flashing. All bonding adhesives must be completely removed before heat welding.
(g) Apply Bonding Adhesive at Specified Coverage Rate: Refer to container label and technical information sheet for specific application requirements. Adhesive is to be applied at the approximate rate as specified in the Technical Information Sheet for the specific adhesive product.
(h) Test Bonding Adhesive for Readiness: Allow bonding adhesive to flash off until tacky. Touch the bonding adhesive surface in the thickest area with a clean, dry finger to be certain that the adhesive film is dry to the touch and there is no wet adhesive beneath the top adhesive film. If either motion exposes wet or stringy adhesive when the finger is lifted, then it is not ready for mating. Flash off time will vary depending on ambient air conditions. This is especially true for water-based adhesive products.

(i) Bond the Membrane to the Substrate: Starting at the fold, roll the previously coated portion of the sheet into the coated substrate slowly and evenly so as to minimize wrinkles.
(j) Broom the Membrane: To ensure proper contact, compress the bonded half of the sheet to the substrate with a stiff push broom.
(k) Repeat Procedure to Complete the Sheet Installation: Fold the un-adhered half of the membrane sheet back onto itself, and repeat the procedure to complete the bonding to the sheet.

(4) Membrane Welding:

(a) Clean the Lap Splice Area: Using a clean white cotton rag dampened with splice wash, thoroughly clean an area on both sheets at least 6 inches wide if seam area has become contaminated with dirt, debris, moisture, etc. Membrane left exposed for more than 12 hours must be cleaned prior to any welding activity.
(b) Hot Air Weld Lap Splices:

1. Horizontal Field Splices: All field splices on the horizontal surface (including flashing) should be completed using an automatic heat welder wherever possible that has been designed for hot air welding of thermoplastic membranes.
2. Vertical Field Splices: Hand held welders can only be used on vertical welds or where an automatic welder is not practical or cannot be used.
3. Equipment and Test Splice Requirements: The air intake, temperature and speed of the machine must be adjusted to provide proper seam strength. An ample power supply must be provided to all heat welding equipment. A generator, which is dedicated to the heat welding equipment, must be used on all installations. When weather conditions vary, adjustments to the welding machine must be made. It is recommended that this be done using spare material before beginning the finished product. Sheet. In addition, there must be destructive tests performed daily and at the beginning and every time there is an interruption in the welding process (i.e., power failure, welder, shut down, job site conditions change and after lunch). There should be period checks (including at the start of each day) to verify good peel strength.
4. Seam Width Requirements: Seams made with the automatic welder must be a minimum of 1-1/2” wide. Seams made with hand welders must be a minimum of 2” wide. Use silicone hand rollers to assure proper mating of surfaces as hand heat welding proceeds.
5. Seam Inspection: Probe all completed welds using a slotted screwdriver or dull cotter pin puller type tool to verify seam integrity daily. Do not probe welds until they have had time to cool. Any welds found to be insufficiently welded need to be repaired on a daily basis.
6. T-Joint Patches: T-Joint patches must be installed at all intersections of field seams.
7. Cut Edge Sealing: All cut edges with scrim exposed must be sealed with cut edge sealant or general-purpose sealant.
8. Solvent welding is not acceptable.

(5) Membrane Securement (Base Tie-In) Location and Installation:

(a) Provide Membrane Securement: Secure the membrane (base tie-in) at all locations where the membrane ends or goes through an angle change greater than 1” in 12” (i.e., roof edges, curbs, interior walls, etc.).
(b) Install TPO 2 3/8” barbed seam plates:

1. Mechanically fasten 2 3/8” barbed seam plates with fasteners in accordance with the Manufacturer’s details.

2. Refer to the Manufacturer's detail to determine the applicable fastener and the associated penetration requirements for the specific substrate conditions.

(c) Fasten TPO coated metal into wood nailers as shown in the Manufacturer's details:

1. Mechanically fasten TPO coated metal to supporting wood nailer in accordance with the Manufacturer's details.
2. Heat weld membrane to TPO coated metal flashing. Seams made with an automatic welder must be a minimum of 1 ½" wide. Seams made with hand welders must be a minimum of 2" wide.

(6) Flashing Penetrations:

(a) General:

1. Remove all loose existing flashing (i.e., lead, bituminous materials, mastic, etc.).
2. Flash all penetrations passing through the membrane.
3. The flashing seal must be made directly to the penetration.

(b) Pipes, Round Supports, etc.:

1. Flash pipes with TPO pre-molded pipe flashing where their installation is practical.
2. Refer to technical information sheet for maximum and minimum pipe diameters that can be successfully flashed with TPO pre-molded pipe flashing.
3. TPO unsupported flashing is only to be used at inside and outside corners, "T" joints and field wrapped pipe boots and not to be used as a general-purpose flashing.

(c) Roof Drains: These specifications apply for installation of cast iron drains only. For all other drain types contact the Roofing Manufacturer.

1. See drawings for details for roof drain locations.
2. Remove all existing flashing (including lead flashing), roofing materials and cement from the existing drain in preparation for membrane and water block seal.
3. Provide a clean even finish on the mating surfaces between the clamping ring and the drain bowl.
4. Install tapered insulation with suitable bonding surfaces around the drain to provide a smooth transition from the roof surface to the drain. Slope into drain cannot be greater than 1" in 12".
5. Position the membrane, then cut a hole for the roof drain to allow a ½" minimum and ¾" maximum inside the clamping ring.
6. Make round holes in the membrane to align with clamping bolts (a paper punch may be used). Do not cut the membrane back to the bolt holes.
7. Place water block seal on the clamping ring seat flange below the membrane (use a minimum of one half of a 10-oz. tube for a 10" drain).
8. Install the roof drain clamping ring and clamping bolts. Tighten the clamping bolts to achieve constant compression.

(d) Pipe Clusters and Unusual Shaped Penetrations:

1. Fabricate TPO coated metal penetration pockets to allow a minimum clearance of 1" between the penetrations and all sides.
2. Secure penetration pockets and flash per Manufacturer's details.
3. Fill penetration pockets with pourable sealer, so as to shed water. Pourable sealer must be a minimum of 2" deep.

(e) Hot Pipes: Protect the TPO components from direct contact with steam or heat sources when the in-service temperature is in excess of 140°F. In all such cases flash to an intermediate “cool” sleeve.

(f) Scuppers (if required):

1. Secure scupper to the structure.
2. Flash in accordance with the Manufacturer’s details with materials provided or recommended by manufacturer.

(g) Expansion Joints: Where required, install expansion joints in accordance with the Manufacturer’s details.

(7) Flashing – Walls, parapets, mechanical equipment curbs, skylights, etc.

(a) General: Using the largest pieces of continuous TPO membrane practice, flash all walls, parapets, curbs, etc., to the height as specified by the Architect. Where applicable TPO coated metal may be used.

(b) Evaluate Substrate: The following substrates require an overlayment of 5/8” exterior grade or “Wolmanized” plywood mechanically fastened in accordance with the Architect’s requirements:

1. Interior Gypsum Board
2. Stucco
3. Cobblestone
4. Textured Masonry
5. Corrugated Metal Panels
6. Other Uneven Substrates

(c) Existing Flashing: All loose existing flashing must be removed.

(d) Attach Flashing to the Wall Surface First: Apply TPO bonding adhesive at about the same time to both the membrane flashing and the surface to which it is being bonded so as to allow approximately the same drying time. Apply TPO bonding adhesive by rolling the adhesive on to the mating surface evenly, avoiding globs or puddles.

(e) Apply Bonding Adhesive at Specified Coverage Rate: Apply bonding adhesive at the approximate rate as specified in the Manufacturer’s literature for the specific adhesive product. Coverage rate will differ with various substrates and/or climatic conditions.

(f) Test Bonding Adhesive for Readiness: Allow TPO bonding adhesive to flash off until taking. Touch the bonding adhesive surface with a clean, dry finger to be certain that the adhesive does not stick or string. As you are touching the adhesive, pushing straight down to check for stringing, also push forward on the adhesive at an angle to ensure that the adhesive is ready throughout its thickness. If either motion exposes wet or stringy adhesive when the finger is lifted, then it is not ready for mating. Flash off time will vary depending on ambient air conditions. This is especially true for water-based adhesive products.

(g) Roll Membrane Flashing up the Vertical: Roll the flashing into the adhesive evenly and carefully so as to minimize wrinkles.

(h) Broom the Membrane Flashing: To ensure proper contact, compress the flashing to the substrate with a stiff push broom.

(i) Complete Splice to Roof Membrane: Complete the splice between membrane flashing and the main roof sheet by hot air welding. Provide lap splices in accordance with the Manufacturer’s details.

(j) Provide Termination: Provide termination directly to the vertical substrate as shown in the Manufacturer’s details.

(k) Provide Intermediate Attachment: Intermediate attachment is required at 36” on center vertically in accordance with the Manufacturer’s details unless the wall surface is smooth without noticeable high spots or depressions (i.e., plywood, poured or precast concrete, or hollow core block or masonry walls where mortar joints are flush with masonry surface). Additionally, provide termination in accordance with the Manufacturer’s details.

(8) Flashing – Gravel Stops or Roof Edge Metals: Flash all gravel stops or roof edges using as outlined in the Manufacturer's details.
(9) Membrane Repair:

(a) Repair a Puncture in the Membrane: Repair a puncture in the TPO membrane with TPO membrane. The repair must extend a minimum of 2" beyond the boundary of the affected area in all directions. Round all corners of the repair piece (example: a pinhole will require a minimum 4" x 4" patch).
(b) Clean the Membrane: When repairing TPO membrane that has been in service for some time, it is necessary to remove accumulated field dirt. Proper membrane preparation is made by scrubbing the membrane with a scrub brush and warm soapy water, then rinsing with clear water and drying with clean cotton cloths (for membrane with a significant accumulation of dirt, cleaning with acetone and a clean cotton cloth may be required). Firestone SW-100 may then be used.
(c) Install splice.

(10) Temporary Closure (not warranted): Temporary closure to ensure that moisture does not damage any completed section of the new roofing system is the responsibility of the roofing contractor. Completion of flashing, terminations, and temporary closures should be completed as required to provide a watertight condition. Any material contaminated by a temporary closure must be cut out and discarded prior to resumption of installation.
(11) Sheet Metal Work:

(a) For specific installation instructions for the specified system, refer to the Manufacturer's details.
(b) For all other sheet metal work, not supplied by the Manufacturer, refer to fabrication and installation requirements specified by the Architect.

(12) Clean-Up: See 018000: Cleaning.

076000: FLASHING AND VENTING

1. GENERAL

A. Scope: Includes all labor, materials, tools and equipment necessary for the complete installation of the following work as shown on the drawings and specified herein:

(1) Metal flashing at gutters.
(2) Plumbing flashing around piping that penetrates roofing system.
(3) Reglets
(4) Pitch pockets and equipment flashing.
(5) Concealed flexible thru wall flashing.

B. Codes and Standards Compliance: IBC, ASTM, AISI, SMACNA "Architectural Sheet Metal Manual"

C. Qualifications of Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed to perform the work. A firm with a minimum of three (3) years' experience in the application of materials similar to those specified herein shall be used.

D. Submittals: Submit Manufacturer's literature, where applicable, and samples of materials to be used. Submit shop drawings of all sheet metal work, indicating material types, sizes, thicknesses, finishes, fabrication details, anchors, connections and relation to adjacent work.

E. Warranties and Guarantees: Provide two (2) years guarantee against all defects and faulty workmanship commencing with date of substantial completion.

F. Cross References: 018000: Cleaning
072000: Insulation
074113: Metal Roof, Gutters & Downspouts
075300: Thermoplastic Polyolefin Roofing Membrane (TPO)
077113: Metal Coping
077233: Roof Hatches
079000: Caulking and Sealants
095000: Acoustical Metal Ceiling System
099100: Painting
112213: Walk-Up Depositories

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality and Performance Standard:

(1) Flashing Material:

(a) Galvanized Metal: Minimum 22 ga., commercial grade galvanized steel meeting ASTM A526-80, galvanized in accord with ASTM A525-81, coating designation G-90, minimum. Coating to match roofing system color where exposed.
(b) Stainless Steel: Minimum 22 ga., AISI Type 302/304 alloy, 2D finish.
(c) Sheet Lead: Minimum 4.0 lbs./sq. ft., hard type.
(d) Soldering Materials:

1. Solder: Meeting ASTM B32-76, alloy grade 50A, 50% pig lead and 50% block tin.
2. Solder Flux: For galvanized metal, stainless steel and copper; muriatic acid neutralized with zinc. For lead; non-corrosive rosin.

(e) Mastic: As recommended by roofing system manufacturer.

(f) Fasteners: Same material or compatible with sheet metal being fastened.

1. Nails: Flathead, needle point, not less than 12 ga. and of sufficient length to penetrate substrate 1" minimum.
2. Expansion Shields: Lead or bronze sleeves.
3. Screws: Self-tapping type, with round heads.
4. Bolts: Furnished complete with nuts and washers.
5. Rivets: Round head type.
6. Blind Clips and Cleats: Same gauge as sheet metal.
7. Construction Note: Paint the existing fasteners to match roofing system color.

(g) Flashing Reglet System (Concrete): Two-Part Fry SpringLok Type CO

1. Galvanized Steel 24 ga.
2. Minimum counterflashing thickness .025"
3. Finish Standard: Factory applied Kynar 500/Hylar 500 finish to match trim.
4. Accessories: Prefabricated interior and exterior corners and splice plates.

(h) Flashing Reglet System (Masonry): Two-Part Fry SpringLok Type MA

1. Galvanized Steel 24 ga.
2. Sized for brick or concrete block installations
3. Finish Standard: Kynar 500/Hylar 500 finish to match trim
4. Accessories: Prefabricated interior and exterior corners and splice plates.

(i) Pitch Pockets:

1. Mameco International Vulkem 45
2. Pecora NR-201 Urexpan
3. Sonneborn Sonolastic SL 1
4. Characteristics: Pour Grade Self-Leveling one part polyurethane/grey color.

(j) Concealed Flexible Thru-Wall Flashing:

1. Copper fabric by AFCO
2. Fiber-Web 310 thru-wall flashing
3. Type FCC fabric covered copper by Phoenix Building Products
4. Copper fabric flashing by York
5. Type 304SA Self-Adhering Stainless Steel by York
6. Note: All copper sheets in flashing above shall be minimum of 3 oz. Stainless steel flashing to be 2 mil.

(k) Flexible Flashing for Exterior Sheathing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene. Provide primer for flexible flashing as recommended by manufacturer of flexible flashing substrate.

(2) Strip Vents: Cor-A-Vent S-400 in black

B. Product Characteristics: As listed with quality standard.

C. Components: As listed in quality standard.

D. Finish and Color: As specified herein or to be determined during construction.

3. EXECUTION

A. Fabrication:

(1) Fabricate sheet metal work in accord with approved shop drawings and applicable standards. Form sheet metal work with clear, sharp and uniform arises. Hem exposed edges.
(2) Solder stainless steel and copper sheet metal joints with heavy, well-heated coppers. Pre tin joints not less than 1-1/2" wide. Provide 1" minimum soldered joints. After soldering, wash joints and neutralize remaining acid with alkaline solution.
(3) Make joints in aluminum sheets less than 0.040" thickness using flat lock seams, 3/4" in width. Fill seams with exterior sealant. Make joints in thicker sheets using seaming or by Tungsten Arc Welding (TIG) or Gas Metal Arc Welding (MIG) processes, using appropriate filler alloy.
(4) Provide linear sheet metal items in minimum 10'-0" sections except as otherwise noted. Form flashing using single pieces for the full width. Provide shop fabricated, mitered and joined corners, with minimum 2'-0" long legs.

B. Storage and Handling:

(1) Store materials off ground, under cover. Protect from damage and deterioration.
(2) Handle materials to prevent damage to surfaces, edges and ends of sheet metal items. Damaged materials shall be rejected and removed from site.

C. Preparation of Area:

(1) All areas receiving flashing shall be clean, true, and plumb.
(2) All backup nailers, supports, etc. shall be in place prior to starting flashing.

D. Protection of Adjacent Work:

(1) Ensure no mastic or debris becomes deposited on finished adjacent work.
(2) All work that is damaged by flashing installation shall be removed and replaced.

E. Manufacturer's Instructions and/or Literature: In cases of materials specified herein that have Manufacturer's instructions they shall be strictly complied with during construction.

F. Workmanship and Installation:

(1) Sheet Metal Installation:

(a) Install work in accord with approved shop drawings and applicable standards. Sheet metal items shall be true to line, without buckling, creasing, warp or wind in finished surfaces.
(b) Coordinate flashing at roof surfaces with roofing work to provide weathertight condition at roof terminations.
(c) Perform field jointing of lengths as specified for shop fabrication.
(d) Isolate dissimilar materials to prevent electrolysis. Separate using bituminous paint or roofing felt.
(e) Seaming: Form seams in direction of flow. Seams shall be flat lock with cleats soldered. Lap seams occurring in members sloping 45 degrees or more 4" minimum and bed in flashing cement.
(f) Secure sheet metal items using continuous cleats, clips and fasteners as indicated. No exposed face fastening shall be performed.
(g) Fastening:

1. Nails: Confine to one edge only of flashing 1'-0" or less in width. Space nails at 4" o.c. maximum. Provide neoprene washers for nails.

2. Cleats: Continuous, formed to profile of item being secured.
3. Clips: Minimum 2" wide by 3" long formed to profile of item being secured. Space at 2'-0" o.c. maximum except as otherwise indicated.

(h) Form joints in linear sheet metal to allow for 1/2" minimum expansion at 20'-0" o.c. maximum and 8'-0" from corners. Provide 1'-0" wide back-up plate at intersections. Form plates to profile of sheet metal item.

(i) At joints in linear sheet metal items, set sheet metal over back-up plate in two beads of sealant, 1/4" in diameter, minimum. Extend sealant over all metal surfaces. Accurately mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.

(2) Reglet Installation:

(a) Embed reglets as directed by manufacturer, level and true to line. Top of reglet shall be minimum of 7" above high point of cant strip.
(b) Terminate reglet 2" each side of expansion and control joints in substrate to which surface applied reglets are installed. Provide 1'-0" wide cover plate of reglet material, overlapping adjacent reglet lengths 4". Attach cover plates to provide discontinuous joints.
(c) Provide factory fabricated corners at changes in direction.
(d) Following installation of roofing, install counter flashing by snapping into reglet in accord with manufacturer's product data. Overlap adjacent lengths 6" minimum to allow for expansion and contraction.
(e) Pitch Pockets: Form with flat locked joints. Pitch pocket shall be at least 3" larger on each side than penetration, 4" high with flanges extending minimum 4" onto roof surface. Fill pocket to within 1" of top with cement grout, then complete filling with pour grade sealant in accord with manufacturer's product data. Flash onto roof surface with one layer of elastic sheet roofing, extending onto roof surfaces 1'-0", minimum. Finish edges with mastic.

(4) Concealed thru wall flashing installation.

(a) Locations of concealed thru-wall flashing:

1. Between APC coping and top CMU coursing around perimeter.
2. Between APC spandrel and CMU around perimeter.
3. Between APC window sills and CMU below at locations shown on drawings.

(b) Installation:

1. Coping: Flashing for copings shall be laid in a slurry of fresh mortar and topped with a fresh mortar and topped with a fresh full bed of mortar. Flashing shall come within 1/2" of the exterior and interior faces of the wall. Weepholes shall be installed approximately 2' on centers immediately on top of flashing.
2. Spandrels: Spandrel flashing shall start form the outside toe of the shelf angle, go up the face of the beam and then through the wall, turning up on the inside not less than 2". Install weepholes.
3. Head and Sills: Flashing for heads and sills shall start 1/2" form outside face of wall, carrying through the wall and be turned up at the inside not less than 2". Head flashing shall be carried 6" beyond both ends of the steel lintel. Both head and sill flashing shall be turned up at the sides to form a pan. All corners shall be folded - NOT CUT. Install weepholes.

(5) Venting: Strictly comply with manufacturer's installation instructions for venting products.

G. Completion of Work:

(1) Upon completion of work the system shall be tested for water proofing by stopping up the downspouts and allowing system to stand in water for 24 hours. Architect shall be informed of test and Architect and General Contractor shall observe the results at the end of the test.
(2) The General Contractor shall inspect the work under this section prior to any inspections of the Architect.

H. Cleaning and Protecting the Work:

(1) All debris and loose material shall be removed from the area of the work.
(2) No damage to the finish or material shall be acceptable.
(3) General Cleaning: See 018000: Cleaning

077113: METAL COPING

1. GENERAL

   A. Scope: Includes all materials, labor, tools and equipment necessary to provide and install metal coping.

   B. Code and Standards Compliance: FM 4435, SPRI Sheet Membrane & Component Suppliers, ANSI, State and Local Codes

   C. Quality Assurance: High performance coping shall be certified by the manufacturer to meet performance design criteria according to the following test standards:

      (1) ANSI/SPRI ES-1 Test Method RE-3 for Coping: Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems (current edition). The coping system shall be tested simultaneously on horizontal and vertical surfaces and shall exceed horizontal and vertical design wind pressure as calculated in accord with the ANSI/SPRI ES-1 Test RE-3. Use the current edition of *ANSI/SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems*.
      (2) The coping product shall be listed in current *Factory Mutual Research Corporation Approval Guide* approved for Class FM 1-90. (Consult current *FM Approval Guide* or contact the factory for wall size, cleat spacing and gauge requirements).

   D. Submittals:

      (1) Product Data: Provide manufacturer's product and complete installation data for all materials in this specification.
      (2) Shop Drawings: Show profiles, joining method, accessory location, anchorage and flashing details, adjacent construction interface, and dimensions.
      (3) Samples: Available upon request; sized to represent material adequately.
      (4) Installation Guide: The product manufacturer shall provide a written installation guide.

   E. Warranties and Guarantees:

      (1) Provide a manufacturer's full system warranty for roof edge systems, when installed per manufacturer's instructions.
      (2) Provide a 35-year warranty for painted finish covering color fade, chalk and film integrity.

   F. Cross References: 018000: Cleaning
      072000: Insulation
      074113: Metal Roof, Gutters & Downspouts
      074400: Cementitious Panels and Trim
      075300: Thermoplastic Polyolefin Roofing Membrane (TPO)
      076000: Flashing and Venting
      079000: Caulking and Sealants
      090001: Color Scheme

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard: Pac-Clad Gold Coping. Alternates must be submitted to the Architect for approval before bid date.

      (1) Metal coping with galvanized steel anchor/support cleats for capping any parapet wall. The system shall be watertight, maintenance free, and not require exposed fasteners. Joints shall be butt-type with concealed splice plates.

(2) Performance Characteristics:

(a) Coping sections shall expand and contract freely while locked in place on anchor cleats.
(b) Coping sections shall lock to anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats.
(c) All splice plates include factory applied dual non-curing sealant strips capable of providing a watertight seal.

(3) Metal Cap: .040 Clear Anodized Aluminum
(4) Coping Cap: Lengths of 12'-0", widths to 24" manufactured to job requirements. True radii may be built to template.
(5) Coping Vertical Face and Back Leg: 2 1/4" to 12 1/2" manufactured to job requirements.
(6) Concealed Splice Plates: 8" wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips.
(7) Anchor/Support Cleat: 20-gauge pre-punched galvanized cleat with stainless steel spring mechanically locked to cleat normally 12" wide at 4'-0" on center. Mechanically fastened as indicated and detailed.
(8) Fasteners: #10 x 1 1/2" stainless steel fasteners with provided drivers. No exposed fasteners shall be permitted. Fasteners shall be electrolytically compatible.
(9) Finishes: Shall be standard Fluropon Illumipon coated from manufacturer's color list.
(10) Color: Anodic Clear

B. Accessories:

(1) Corners, end caps, pier caps, etc. shall be fabricated by the coping manufacturer.
(2) Welded or quick-lock assembly shall be used to maintain watertight integrity.

3. EXECUTION

A. Delivery, Storage and Handling of Materials:

(1) All material shall arrive in the manufacturer’s original sealed, labeled containers.
(2) Store materials in a dry, protected, well-vented area. The contractor shall report damaged material immediately to the delivering carrier and note such damage on the carrier’s freight bill of lading.
(3) Remove protective plastic surface film immediately after installation [if applicable].

B. Job Conditions:

(1) Verify that other trades with related work are complete before mounting coping covers.
(2) Mounting surfaces shall be straight and secure; substrates shall be of proper width.
(3) Refer to the construction documents, shop drawings and manufacturer’s installation instructions.
(4) Coordinate installation with roof membrane manufacturer’s installation instructions before starting.
(5) Observe all appropriate OSHA safety guidelines for this work.

C. Inspection: Verify that coping installation will not disrupt other trades. Verify that substrate is dry, clean and free of foreign matter. Report and correct defects prior to any installation.

D. Installation:

(1) Submit product design drawings for review and approval to Architect or Owner before fabrication.

(2) Installing contractor shall check as-built conditions and verify the manufacturer's coping details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the manufacturer's installation guide when setting copings.
(3) Installer shall use provided fasteners consistent with the manufacturer's instructions suitable for the substrate to which it is being installed.

E. Clean-Up: Upon completion of this section of work, remove all protective wraps and debris.

F. Protection:

(1) Protect installed products until completion of project.
(2) Touch-up, repair or replace damaged products before substantial completion.

077233: ROOF HATCHES

1. GENERAL

A. Scope: Includes all material, labor, tools, and equipment necessary to install factory fabricated roof hatches for ladder access.

B. Codes and Standards Compliance: IBC, UL, State and Local Codes

C. Quality Assurance:

(1) Manufacturer: A minimum of five (5) years' experience manufacturing similar products.
(2) Installer: A minimum of 2 years' experience installing similar products.
(3) Manufacturer's Quality System: Registered to ISO 9001 Quality Standards including in-house engineering for product design activities.

D. Submittals:

(1) Manufacturer's product data including installation instructions.
(2) Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.
(3) Warranty: Submit executed copy of manufacturer's standard warranty.

E. Warranties and Guarantees: Provide manufacturer's standard warranty. Material shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

F. Cross References: 018000: Cleaning
051200: Structural Steel Framing
052100: Steel Joist Framing
053100: Steel Decking
055140: Fixed Wall Ladders
072000: Insulation
075300: Thermoplastic Polyolefin Roofing Membrane (TPO)
076000: Flashing and Venting
079000: Caulking and Sealants

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: BILCO Company. Other manufacturers may be acceptable if they meet or exceed the Quality Standard. Alternates must be submitted to the Architect for approval before bid date.

B. Product Characteristics:

(1) Model No.: Type S-50TB Single Leaf Roof Hatch
(2) Opening Size: 3'-0" x 2'-6"
(3) Overall Size: 3'-5" x 3'-11"
(4) Thermally broken curb with integral capflashing, 11 gage aluminum
(5) Thermally broken cover, 11 gage aluminum
(6) 3" curb insulation

(7) 3” cove insulation
(8) EPDM gasket all around cover
(9) Stainless steel #316 pintle hinge
(10) Bilclip flashing system
(11) Slam latch with inside and outside handles with padlock hasps
(12) Lock strike and padlock hasp
(13) Lifting mechanism with reinforced composite tubes and compression springs
(14) Automatic hold open arm with red vinyl crip and cover release
(15) Arm guide bracket
(16) Locations: Mezzanine Storage 119D, Mechanical 211B, Furniture and Equipment Storage 220

C. Accessories:

(1) Ladder Up Safety Post LU-1

(a) Tubular post shall lock automatically when fully extended
(b) Safety post shall have controlled upward and downward movement
(c) Release lever shall disengage the post to allow it to be returned to its lowered position
(d) Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14” on center and clamp brackets to accommodate ladder rungs up to 1 3/4" in diameter.
(e) Material of Construction: Steel
(f) Balance Spring: Stainless Steel
(g) Hardware: Stainless Steel type 316
(h) Finish: Yellow powder coat
(i) Locations: Mezzanine Storage 119D, Mechanical 211B, Furniture and Equipment Storage 220

(2) Bil-Guard 2.0 Hatch Rail System RL2-STB

(a) 1 ¼” schedule 40 pipe in 6061 T6 aluminum alloy rails
(b) Self-closing gate
(c) Aluminum post supports
(d) Corner brackets
(e) Stainless steel spring hinges
(f) Cast aluminum gate with latch with stainless steel pin
(g) Finish: Yellow powder coat
(h) Location: Furniture and Equipment Storage 220

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
(2) Storage: Store materials indoors in a clean, dry area in accordance with manufacturer's instructions.
(3) Handling: Protect materials and finishes from damage during handling and installation.

B. Installation:

(1) Install roof hatches and accessories in accordance with manufacturer's instructions at locations indicated on the drawings.
(2) Install hatches and accessories plumb, level, square, rigid, without warp or rack.
(3) Provide proper support for frames.
(4) Anchor frames securely in place.
(5) Use manufacturer's supplied hardware.
(6) Replace defective or damaged hatches or other components as directed by Architect.

C. Adjusting:

(1) Adjust hatch doors, latches and accessories for smooth operation without binding.
(2) Inspect and adjust locks to operate properly.
(3) Touch-up marred finishes with manufacturer's supplied paint.

D. Cleaning:

(1) Clean surfaces in accordance with manufacturer's instructions.
(2) Do not use abrasive cleaners.

E. Protection: Protect hatches and accessories from damage during construction.

079000: CAULKING AND SEALANTS

1. GENERAL
   A. Scope: Furnish all materials, labor, tools, and equipment to caulk and seal all interior and exterior joints and openings required by the contract documents and to produce a positive weathertight barrier against passage of air and moisture.
   B. Code and Standards Compliance: ASTM C509, ASTM C920, ASTM D1056, EPA, SWRI 2 SWRI 7, State and Local Codes
   C. Qualifications
      (1) Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.
      (2) Installers: Use only personnel with three (3) years' experience who have been specifically trained in caulking and sealing procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this section.
   D. Submittals: Provide samples of color choices if not color is selected in this specification. If a color is noted or after a color is selected from the color chart install five (5) linear foot of caulking in a location on the building selected by Architect.
   E. Warranties and Guarantees: Provide 3-year warranty.
   F. Cross References: 041500: Masonry Reinforcing and Accessories
      042100: Brick Masonry Units
      042200: Concrete Masonry Units (CMU)
      057310: Dry Glazed Glass Railing System
      064100: Cabinetry
      066116: Solid Surface Fabrications
      066116: Ultracompact Surfacing Countertops
      072000: Insulation
      074113: Metal Roof, Gutters & Downspouts
      074400: Cementitious Panels and Trim
      076000: Flashing and Venting
      077113: Metal Coping
      077233: Roof Hatches
      079500: Expansion Control
      081100: Hollow Metal Doors and Frames
      083300: Overhead Coiling Doors
      083380: Special Doors and Frames
      084113: Entrances and Storefronts
      088100: Glass and Glazing
      090001: Color Scheme
      092500: Gypsum Board
      093100: Tiling
      095000: Acoustical Metal Ceiling System
      096500: Resilient Flooring
      099100: Painting
      102600: Wall Protection
      104116: Emergency Key Cabinet
      112213: Walk-Up Depositories
      116733: Recreational Climbing Wall
   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standards:

(1) Self Leveling Paving Joint Sealant (Urethane)

(a) Manufacturers and Products

1. Bostik Chem-Calk 950
2. Pecora Nr-201
3. Sonneborn Sonocastic SL Paving Joint Sealant

(b) Federal Specification No. FS TT-S-00230C
(c) Alternates will be reviewed for approval.
(d) Color: Grey

(2) Interior Caulking (Acrylic Latex)

(a) Characteristics:

1. Non-Staining
2. Non-Bleeding
3. Paintable

(b) Manufacturers and Products

1. Bustik (Chem Calk 600)
2. DAP, Inc. (Acrylic Latex Caulk with Silicone)
3. Pecora (AC-20)
4. Sonneborn (Sonolac)
5. Tremco (Acrylic Latex 834)

(c) Applications

1. Perimeters of Door and Window Frames
2. Bathroom
3. Shower/Tub
4. Splashboard
5. Around Plumbing Fixtures/Fittings
6. Baseboards
7. Sinks

(d) Color: White
(e) ASTM Standard: ASTM C834/76

(3) Elastomeric Exterior Sealant (Silicone)

(a) Characteristics:

1. Single Component
2. Use non-acid type with porous material.
   Use acid type with non-porous material.
3. Manufacturers

a. Dow Chemical
b. General Electric (GE)
c. Pecora
d. Tremco

(4) Application with GE Quality Standard:

(a) Perimeter of all exterior doors, window frames , louvers, and grilles.
(b) Joints at Architectural Precast Concrete wall panels (GE-Silpruf)
(c) Joints at dissimilar materials (GE-Silpruf)
(d) Exterior bitt-joint glazing of glass (GE-Ultraglaze 4000)
(e) Metal Roof Flashing (GE-Silpruf)
(f) Under exterior thresholds (GE-Silpruf)
(g) Building Expansion Joints (GE-Silpruf)
(h) Structural Glazing (GE-Ultraglaze 4000)

(5) Penetration (firestop) Sealant (at mechanical, electrical penetrations and as directed on contract documents)

(a) Characteristics

1. Self-Bonding
2. 2 HR Rated
3. Single Component

(b) Manufacturers and Products:

1. 3M
2. General Electric RTV 7403 Penetration Sealant
3. Frammaur FM or FE

(c) Color: As provided by manufacturer

(6) Moldable Fire Putty: 3M

(a) Components:

1. Fire Barrier Moldable Putty + Pads
2. Fire Barrier Moldable Putty + Sticks

(7) Fire Barrier Sealant: 3M

(a) Components:

1. FD 150
2. Watertight Sealant 1000 NS

(8) Firestop Identification Labels: 3M
(9) Backer Rod: Hohmann & Barnard

(a) Characteristics:

1. Density: 1.5 PCF
2. Delfection: 4 PSI @ 25%
3. Water Absorption: 0.02% by vol.
4. Temperature Range: -90° F to 200°F

(10) Joint Sealing Tape: McMaster-Carr 4” Polyethylene Plastic Sealing Tape
(11) Exterior Wall Joint Seal: Seismic Colorseal by Sika Emseal

(a) Characteristics:

1. Silicone coated, ultraviolet resistant, watertight, primary wall seal with factory-applied adhesive on one side.
2. Form: Precompressed to less than nominal material size for installation into designed joint size equal to material nominal size.
3. Color: To be selected during construction.

B. Joint Cleaner: Non-staining type recommended by sealant and caulking manufacturers.

C. Joint Primer (When indicated by manufacturer for a specific joint): Non-staining type recommended by sealant and caulking manufacturer for intended use.

D. PAB Lockers/Surrounding Substrate Backup Fill: Square Neoprene Rubber ½" x ½" square

E. Backup Materials: Type below recommended by sealant and caulking manufacturers

(1) Closed cell type

(a) Ethaform SF (Dow Chemicals)
(b) Backer Rod (Hohmann & Barnard)
(c) SonoFoam (Sonneborn-Contech)
(d) Neo-Cord (Williams)
(e) Expand-O-Cord
(f) Neoprene Sponge NS (Hohmann & Barnard)

(2) Open Cell Type:

(a) Denver Foam (Backer Rod Manufacturing and Supply Co.)
(b) Foam-Pail (Taylor Products Division)

F. Color: Unless specified above colors for each sealant installation will be selected by the Architect from standard colors normally available from the specified manufacturers. Should such standard color not be available from the approved manufacturer except at additional charge, provide all such colors at no additional cost to the Owner.

3. EXECUTION

A. Examination of areas to be sealed or caulked: Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Preparation:

(1) Concrete and Ceramic Tile Surfaces:

(a) All surfaces in contact with sealant shall be dry, sound, and well brushed and wiped free from dust immediately before installation.
(b) Use solvent to remove oil, grease, and moisture, wiping the surfaces with clean rags.
(c) Where surfaces have been treated, remove the surface treatment by use of sandblasting or wire brushing.
(d) Remove all laitance and mortar from the joint cavity.
(e) Where backstop is required, insert the approved backup materials in the joint cavity to the depth required.

(2) Steel Surfaces

(a) Steel surfaces in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish, the metal shall be scraped or wire brushed to remove mill scale.
(b) Use solvent to remove oil and grease, wiping the surfaces with clean rags.
(c) Remove protective coatings on steel by sandblasting or by a solvent that leaves no residue.

(3) Aluminum Surfaces:

(a) Aluminum surfaces in contact with sealant shall be cleaned of temporary protective coatings , dirt, oil, and grease.
(b) When masking tape is used for a protective cover, remove the tape just prior to applying the sealant.
(c) use only such solvents to remove protective coatings as are recommended for that purpose by the manufacturer of the aluminum work, and which are nonstaining.

C. Installation of Backup Material: Use only the backup material recommended by the manufacturer of the sealant and approved by the Architect for the particular installation, compressing the backup material 25% to 50% to secure a positive and secure fit. When using backup of tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock.

D. Priming: Use only the primer recommended by the manufacturer of the sealant and approved by the Architect for the particular installation. Apply the primer in strict accordance with the manufacturer's recommendations as approved by the Architect.

E. Bond-Breaker Installation: Install an approved bond-breaker were recommended by the manufacturer of the sealant and where directed by the Architect, adhering strictly to the installation recommendations as approved by the Architect.

F. Installation of Sealants:

(1) General: Prior to the Start of installation in each joint, verify the joint type according to the details in the drawings, and verify that the required proportion of width of joint to depth of joint has been correct.
(2) Equipment: Apply sealant under pressure with hand or power-actuated gun or other appropriate means. Guns shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as designed.
(3) Typing: All sealant and caulking compounds of any one type shall be the product of one manufacturer (i.e., All polyurethane, butyl, polysulfide, or silicone sealants must each be product of one manufacturer).
(4) Concealed Caulking: Caulking for minor areas that are to be totally concealed such as under thresholds, etc. shall be silicone sealant.
(5) Exterior Sealing: Sealant compounds for all exterior locations, other than specified in the following two paragraphs, shall be one-part silicone sealants. Backing rods shall be closed cell foam flexible rod or cord stock of proper diameter to compress snuggly in joint. Sealant compounds at exterior and interior locations where glass is butt glazed shall be one-part silicone sealants especially recommended by manufacturer as suitable for this type of installation.
(6) Horizontal Installations: Sealants for horizontal installation over expansion joints in exterior Portland cement concrete paving must be self-leveling, two-part polyurethane sealants especially designed for this purpose.
(7) Vertical Installations: Deposit sealants in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the join bond surfaces equally on opposite sides. Fill sealant rabbet to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove so that joint will not trap moisture and dirt.
(8) Fire Barrier Sealants: Strictly comply with fire barrier sealant manufacturer's written installation instructions.
(9) Fire Stop Identification Labels: Strictly comply with fire stop label installation. Place labels 6'-0" high on wall every 4'-0" O.C.
(8) Spillage: Do not allow sealants to overflow or spill onto adjoining surfaces or to migrate into the voids of adjoining surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces by either the primer/sealer or the sealant. Remove excess and spillage of compounds promptly as the work progresses. Clean the adjoining surfaces to eliminate evidence of spillage, without damage to the adjoining surfaces or finishes.

(9) Masking: Thoroughly and completely mask all joints where the appearance of sealant on adjacent surfaces would be objectionable.
(10) Tooling: Tool all joints to the profile shown on the details in the drawings.
(11) Cleaning Up: Remove masking tape immediately after joints have been tooled. Clean adjacent surfaces free from sealant as the installation progresses. Use solvent or cleaning agent as recommended by the sealant manufacturer.

079500: EXPANSION CONTROL

1. GENERAL

A. Scope: Includes materials, labor, tools, and equipment necessary to install architectural joint systems.

B. Code Compliance: ADA, ANSI A137, ASTM A666, ASTM B36, ASTM B455, ASTM B209, ASTM B221, ASTM D2000, ASTM E1399, ASTM E1612, ASTM E1966, AA-M10, AAMA 611, UL No.263, UL2079, ULCS115,

C. Quality Assurance:

(1) Installer Qualifications: Approved by manufacturer.
(2) Source Limitations: Obtain all architectural joint systems through one source from a single manufacturer.
(3) Loading Characteristics: Standard loading refers to covers that are capable of withstanding up to 500 lb. point loads. Heavy duty refers to covers that are capable of withstanding up to 2000 lb. point loads.
(4) Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 and/or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction. Fire ratings are to be not less than the rating of adjacent construction.

D. Submittals:

(1) Shop Drawings: Include line diagrams showing plans, elevations, sections, details, splices, block out requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
(2) Product Data: Submit copies of manufacturer's latest published literature for material specified herein for approval, and obtain approval before materials are fabricated and delivered to the site. Data to clearly indicated movement capability of cover assemblies and suitability of material used in exterior seal for UV exposure.
(3) Samples: Manufacturer's color charts showing the standard range of colors and finishes available for each exposed metal and elastomeric seal material.
(4) Certificates: Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

E. Warranties: Manufacturer to provide a five (5) year warranty for all joint covers.

F. Cross Reference: 018000: Cleaning
033000: Cast-In-Place Concrete
061213: Structural Panel Concrete Subfloor
072000: Insulation
079000: Caulking and Sealants
092500: Gypsum Board
095100: Acoustical Ceiling System
096500: Resilient Flooring
096510: Rubber Base, Treads and Risers
096820: Carpet

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: InPro Architectural Products. Other manufacturers may be acceptable if they meet or exceed the quality standard set herein. All alternates must be approved by the Architect before bid date.

(1) Interior Floor Joint System: 101-A09-025
(2) Surface Mount Floor/Wall Condition: 105-A02-025
(3) Surface Mount Floor/Floor Condition: 106-A01-025
(4) Seismic Wall to Ceiling Condition: 116-A18-025
(5) Glide Plate Wall/Corner and Wall/Ceiling Condition: 300-A09-025
(6) 2 Hour Fire Barrier Floor to Floor Application: 925-050 System
(7) 2 Hour Fire Barrier Wall to Wall Application: 925-050 System

B. Materials:

(1) Aluminum: ASTM B221, Alloy 6005A-T61, 6063-T5, 6061-T5, 6105-T5 for extrusions; ASTM B209, Alloy 6061-T6, 3003-H14, 5005-H34 for sheet and plate

(a) Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
(b) Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
(c) Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
(d) Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.
(e) High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.

(2) Stainless Steel: ASTM A 666, Type 304 for plates, sheet, and strips.

(a) Finish: No.4, directional satin.

1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

(3) Brass: ASTM B 36/B 36M, UNS Alloy C26000 for half hard sheet and coil.
(4) Bronze: ASTM B 455, Alloy C38500 for extrusions; Alloy C28000 Muntz Metal for plates. E. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.
(5) Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.
(6) Compression Seals: ASTM D2000; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.

(7) Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.
(8) Moisture Barrier: 7-ply laminate reinforced Polyethylene.
(9) Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

C. Locations: See drawings for details.

3. EXECUTION

A. Delivery and Storage:

(1) Manufacturer to provide protective film on all exposed cover plates components.
(2) Deliver joint system to jobsite in new, clean, unopened cartons or rates of sufficient size and strength to protect materials during transit.
(3) Inspect materials upon arrival. Store components in original containers in a clean, dry location. Ensure temperature or moisture sensitive components are stored in a tempered location.
(4) Contractor to provide temporary protective covers on all installed finished surfaces. Protection is required to guard against both surface abrasions as well as overloading of horizontal deck components by construction traffic.

B. Examination: Examine surfaces and blackouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Preparation:

(1) Prepare substrates according to architectural joint system manufacturer's written instructions.
(2) Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.
(3) Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suite type of construction indicated and to provide for secure attachment of joint systems.
(4) Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

D. Installation:

(1) Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.
(2) Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.

(a) Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
(b) Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
(c) Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
(d) Locate in continuous contact with adjacent surfaces.
(e) Standard-Duty Systems: Shim to level where required. Support underside of frames continuously to prevent vertical deflection when in service.
(f) Heavy-Duty Systems: Repair or grout block out as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
(g) Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

(3) Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

(a) Provide in continuous lengths for straight sections.
(b) Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
(c) Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

(4) Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer before installing compression seals.
(5) Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
(6) Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.

(a) Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

(7) Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings where indicated.

E. Protection:

(1) Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
(2) Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

F. Cleaning and Protection of Work: See 018000: Cleaning.

081100: HOLLOW METAL DOORS AND FRAMES

1. GENERAL

A. Scope: Includes all material, labor, tools, and equipment necessary for the complete installation of hollow metal doors and framing shown on the drawings and indicated in the finish schedule.

B. Codes and Standards Compliance: ADA, IBC, ANSI, ASTM, AHMA, UL, SDI (Door)

C. Qualifications of Installer: Only craftsmen who have demonstrated a skill in work required in this section shall be employed on the work. A firm with a minimum of three (3) years experience shall be employed to do work required of this section.

D. Submittals:

(1) Shop Drawings: Indicate door and frame elevations and sections, materials, gages, finishes, fabrication and erection details. Use SDI-111d and SDI 106 as guides in developing the necessary door schedule.
(2) Sample: Submit 1'-0" x 1'-0" corner section of welded frame section and anchors to be used if required by Architect.
(3) Certification of Label Construction: For components exceeding Underwriters' Laboratories Inc. (UL) tested size limitations, furnish UL inspection certificate stating that component construction conforms to UL rating requirements.

E. Warranties and Guarantees: Provide one (1) year free of defects and faulty construction.

F. Cross References: 018000: Cleaning
042100: Brick Masonry Units
042200: Concrete Masonry Units (CMU)
054000: Cold Formed Metal Framing
079000: Caulking and Sealants
081416: Wood Doors
087100: Finish Hardware
088100: Glass and Glazing
090001: Color Scheme
092500: Gypsum Board
099100: Painting

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality and Performance Standard:

(1) Frames: Curries, Republic Steel, Inc., Ceco Door Products
(2) Insulated Solid Metal Doors: Curries, Republic Steel, Ceco Door Products

B. Product Characteristics: Frames

(1) Frame Width: As required per drawings.
(2) Frame Depth: Profile 2" frames
(3) Headers: 4”, See drawings and Door Schedules

(3) Frame Construction:

(a) Frames: Welded steel construction, with joints fully welded, dressed and ground smooth, free of defects, warp and buckle, with integral stops for doors. Provide welded frames with temporary spreaders during shipping and erection. Cope or miter corner joints in true alignment; weld continuously on inside of frame. Face welding and notching of stops at head and jamb intersection not acceptable.
(b) Gauge/Finish:

1. Exterior Frames: 16-gauge hot dipped galvanized steel coated inhibitive primer.
2. Interior Frames: 16-gauge steel, bonderized and coated chromate rust-inhibitive primer, baked on.
3. Provide 14-gauge frames for door openings 4 feet or wider.

(c) Transom Bars, Mullions, Sidelite and Borrowed Lite Frames: Shop fabricate from same material as door frames, joint welded and ground smooth. Fabricate in largest size sections allowed by shipping and installation restrictions. Field joints shall occur only as indicated on approved shop drawings.
(d) Conceal fasteners required on all frames.
(e) Form double return flanges on all frames where frames wrap around wall openings from flanges to fit wall thicknesses.

(4) Mill Finish: One coat of Manufacturer's standard rust inhibitive primer after chemical treatment of galvanized surfaces for paint adhesion, performance to comply with ANSI A224-11C.E.

(5) Preparation for Hardware:

(a) Reinforcement: Mortise, drill, and reinforce components for hardware installation in accord with SDI-100-83.
(b) Punch single leaf frames to receive three (3) silencers; adhesive applied silencers not acceptable.
(c) Factory prepared hardware locations shall be in accord with "Recommended Locations for Builders' Hardware for Standard Steel Door and Frames", as adopted by the Steel Door Institute.

(6) Frame Anchors:

(a) Wall Anchors for Frame Attachment to Masonry Construction: Adjustable, flat, corrugated or perforated, T-shaped anchors with leg not less than 2" wide by 10" long. Provide one anchor per jamb for each 2'-0" of height or fraction thereof. Anchors for fire-rated frames shall be labeled type.
(b) Wall Anchors for Frame Attachment to Drywall Partitions: Manufacturer's standard adjustable type for attachment to studs. Provide one anchor per jamb for each 2'-0" of height or fraction thereof. No exposed screw heads in frames.
(c) Floor Anchors: Clip type to receive two fasteners per jamb, welded to bottom of jamb and mullions.
(d) In-Place Masonry or Concrete: 3/8" countersunk, flat head, stove bolts in expansion shields, spaced 6" maximum from top and bottom of frame and at 2'-0" o.c. maximum between.

(7) Thermal Break Frames: Provide thermal break frame for exterior doors.

C. Product Characteristics:

(1) Door Width: As required by door schedule on drawings.

(2) Door Height: As required by door schedule on drawings.
(3) Door Depth: 1 3/4"
(4) Door Construction:

(a) Flatness of steel shall meet the stretcher level standards.
(b) Door shall be full flush construction and conform to Commercial Standard CS242-62, Product Standard PS4-66 and Steel Door Institute Standard SDI-100.
(c) Door shall be fabricated from 18 gauge cold-rolled steel in accordance with ASTM A366. Refer to Technical Data Sheets No. 107 and 108.
(d) Lock edge shall be non-beveled and is continuous lap seam welded and planished. Reinforcements for mortise or cylindrical locks shall be of a box type configuration and in accordance with ANSI A115 Standards.
(e) Hinge edge is non-beveled and reinforced with a continuous 16 gage channel projection welded at maximum 5" on centers. Additional reinforcing plates are provided at the hinge locations to give a total of 3/16" thickness.
(f) Proper reinforcements (min/SDI 107) shall be provided for other hardware. Reinforcements, drilling and tapping for mortised applied hardware shall be done at the factory. Surface applied hardware reinforcements shall be installed at the factory. Drilling and tapping shall be done in the field by others. Reinforcement for surface applied closer shall be 12 gage steel.
(g) Doors shall be reinforced by laminating panels to an expanded polystyrene core completely filling the inside of the door.
(h) A "U" factor at least .23.
(i) Door shall have a flush top and inverted bottom 16 gage channel projection welded at maximum 2 1/2" on centers.
(j) All doors shall be thoroughly cleaned, phosphatized and finished as standard with one coat of baked-on rust inhibiting gray prime paint, capable of passing a 120-hour salt spray test in accordance with Federal Standard 141 or ASTM Specification B117 and a 250-hour humidity test in accordance with ASTM Specification D1735.

(5) Grade: Grade II heavy duty level B.

D. Finish/Color: Deliver chemically treated to ensure maximum paint adhesive factory applied prime coat (air dried or baked-on). And prime coat shall meet ANSI-A224.1. See 090001: Color Scheme and 099100: Painting.

E. Fire Labeled Doors and Frames: See door schedule in drawings.

F. Tolerances: Standard: SDI-117 Manufacturing tolerances, standard steel doors and frames.

3. EXECUTION

A. Fabrication: Standards: SDI 100-83 and ASTM A366 C.E.

B. Storage and Handling of Material:

(1) Deliver hollow metal work packaged for protection.
(2) Inspect work upon delivery for damage. Reject damaged items.
(3) Store materials under cover, on raised platforms, in vertical position. Protect from moisture and remove from wet containers if wetting occurs.

C. Preparation of Area: Ensure area is ready to receive work; starting work in section is evidence that the installer is satisfied with the surrounding work.

D. Protection of Adjacent Work: Ensure no damage is done to adjacent work in the course of doing the work required of this section.

E. Manufacturer's Instruction: Comply strictly to Manufacturer's written instruction on the installation of the work required of this section.

F. Workmanship and Installation:

(1) Frame Installation:

(a) Install hollow metal frames in accord with SDI-100-83, SDI-105, and SDI-110, and approved shop drawings and product data.
(b) Welded Frames:

1. Grout frames: See 041000: Mortar
2. Set welded frames plumb, rigid, and in true alignment in position called for in contract documents prior to beginning partition work. Brace frames until permanent anchors are set.
3. Set anchors for frames as work progresses. Install anchors at hinge and strike levels. Grout frames in masonry walls as specified in Concrete Unit Masonry section.
4. Remove temporary braces and spreaders after wall construction is complete.
5. Install welded frames in drywall partition in accord with approved shop drawings. Secure using adjustable jamb anchors and floor anchors.
6. Install welded frames in prepared openings in concrete walls using countersunk bolts and expansion shields.
7. Weld field splices in borrowed lite frames and grind smooth.

(c) Fire-rated Frames: Install in accord with requirement of NFPA #80.

(2) Door Tolerances to Frame:

(a) Head Frame to Door: 1/8"
(b) Jamb Frame to Door: 1/8"
(c) Door to Door (pair): 1/8"
(d) Face of Door-to-Door Stop: 1/16"

(3) Door Installation:

(a) Install doors plumb and in true alignment in prepared opening and fasten.
(b) Install in accordance to DHI "The Installation of Commercial Steel Doors and Steel Frames"
(c) Surface Applied Hardware: Field drilling and/or tapping shall be done with care. Miss located hardware which exposes unused holes etc. may be disapproved.

(4) Painting: See 099100: Painting

G. Cleaning: See 018000: Cleaning

081416: WOOD DOORS

1. GENERAL

A. Scope: Furnish all materials, labor, tools, and equipment to provide and install all wood doors required by the door schedule and described herein.

B. Code and Standards Compliance: ADA, ANSI A208.1, ASTM E152, AWI, NFPA 80, NFPA 252, UL 10B, UL 10C, WDMA, ,

C. Quality Assurance:

(1) Installer Qualifications: Use only personnel with three (3) years-experience who have been specifically trained in hanging doors and who are completely familiar with the details shown on the Drawings and the installation requirements called for in this section.
(2) Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

D. Submittals:

(1) Shop Drawings: Clearly indicate the following on the shop drawings.

(a) Door elevations
(b) Door schedule
(c) Hardware locations
(d) Reinforcement of top, bottom and side stiles
(e) Type of core
(f) Thickness and type of wood veneers
(g) Internal blocking for hardware attachment
(h) Cutouts for glazing and louvers
(i) Type of glass and stops
(j) Type of finish for all door edges
(k) Door swings
(l) Dimensions and detail of openings for glass or grilles, if applicable

(2) Samples:

(a) Submit 1'-0" by 1'-0" door corner samples indicating facing and cross banding, edge bands and core construction for each door type specified, if requested by the Architect.
(b) Submit samples of each face veneer, approximately 1'-0" by 1'-6" in size, representative of proposed species, cut, color and graining, finished as specified in Finish Carpentry and Millwork section.

(3) Certification of label construction.

E. Warranties and Guarantees: Provide manufacturer's life of original installation warranty providing for replacement of any door exhibiting:

(1) Delamination
(2) Warp or twist of ¼” or more in any 3’-6” x 7’-0” section of door.
(3) Telegraphing of any part of core assembly through face to cause surface variation of 1/100 inch or more in a 3-inch span.
(4) Defects which may impar or affect performance of door for its intended purpose.
(5) Replacement to include installation of door and hardware and finishing of door.

F. Cross References: 081100: Hollow Metal Doors and Frames
087100: Finish Hardware
088100: Glass and Glazing
090001: Color Scheme
099100: Painting (for staining)

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Wood Doors:

(1) Quality Standard: Oshkosh Architectural Flush Wood GPFSC 5-Ply FSC Certified. Other manufacturers may be acceptable if they meet or exceed the quality standard. Alternates must be submitted to the Architect for approval before bid date.
(2) Product Characteristics and Types:

(a) All bonded construction
(b) Meets WDMA I.S.1-A grade
(c) Face veneer meeting WDMA "A" grade, minimum 1/50" thick
(d) Stile face to match face veneer
(e) Face veneer species: Plain Sliced Select White Maple, pair match double doors
(f) Veneer Finish: Unfinished. To be finished on-site to match laminate cabinets.
(g) Side Edges: Premium veneer to match face veneers. To be finished onsite to match cabinets.
(h) Top and Bottom Edges: Hardwood sealed against moisture at factory before delivery.
(i) Type 1 adhesive - face to core, adhesive to contain no formaldehyde
(j) Core: FSC certified particleboard core with no added urea formaldehyde
(k) Fire Rate Mineral as required for specified rated doors
(l) Size: 1-3/4" thick, sizes as scheduled on drawings.
(m) View Panels: US Fire Door VSIG Slimline I.G. Vision Lite Frames
(n) Glass: See 088100: Glass and Glazing, 087100: Finish Schedule and Drawings
(o) See 090001: Color Scheme and 099100: Painting for field finish information.

(3) Grade Marks and Labels:

(a) Provide each door with a stamp, brand or label on top or bottom edge which identifies manufacturer, trade association of which he is a member, grade and type of door or industry standard with which it complies.
(b) Provide each labeled fire rated door with a label permanently attached to hinge stile showing testing agency approval for classification scheduled.

(4) Coordinate wood blocking in doors to receive hardware. Do not through bolt hardware exposing fasteners.

3. EXECUTION

A. Fabrication:

(1) Allowable Fabrication Tolerances:

(a) Overall dimension: +/- 1/16"
(b) Maximum warp, bow, cup, or twist: 1/4"
(c) Squareness: Maximum 1/8" difference in diagonal measurement.

(2) Fabricate doors to receive schedule hardware (see 087100: Finish Hardware)

B. Storage and Handling:

(1) Deliver no doors to building until weatherproof storage space is available. Store doors in a space having controlled temperature and humidity. Stack doors flat, off floor supported to prevent warpage and protected from damage and direct exposure to sunlight.
(2) Seal edges of doors immediately after delivery, unless factory sealed.
(3) Use care in handling doors to prevent damage. Damage doors shall be disapproved.

C. Environmental Conditions Criteria: See 3.(B)(1) above. Allow unfinished doors to become acclimated to the site environment before hanging.

D. Preparation of Work: Ensure all openings and door frames are installed and ready for door installation prior to commencing work.

E. Protection of Adjacent Work: Do not damage completed work in and around openings during door installation.

F. Manufacturer's Instructions and/or Literature: Comply with all written information supplied by door manufacturer and finish hardware manufacturer (see 087100: Finish Hardware).

G. Workmanship and Installation:

(1) Machining and Fitting:

(a) Clearances:

1. Hinge Stile: 1/8"
2. Lock Stile: 1/8"
3. Top: 1/8"
4. Bottom: 1/4" above floor finish or threshold except where undercutting is indicated. Confirm installed floor covering thickness before cutting door bottom edges.
5. Meeting stiles, pairs of doors: 1/8"
6. Strictly comply with NFPA 80, Standard for Fire Doors and fire Window, for fire door installation clearances.

(b) Bevels: Bevel strike edge 1/8" in 2"
(c) Fitting:

1. Fit doors for width by planing equally form both stile; for height by sawing not more than 1/4" form each top and bottom rail.
2. Fit fire rated doors for width by planing form lock stile only, with 3/16" maximum removed from edge; for height by sawing from bottom only, with 1" maximum removed from bottom rail.
3. Following cutting or planing sand sharp corners and edges smooth.

(d) Hardware: Prepare doors to receive scheduled hardware using hardware manufacturer's templates. Locate hardware in accord with ANSI/NWMA I.S.1.70-80 unless otherwise indicated.
(e) Allowable erection tolerances:

1. Variation from specified clearances: + 1/32", -0
2. Maximum variation in edge alignment, pairs of doors: 1/16"

(f) Allowable Color and Grain Variation: Doors for natural finish shall be selected for uniformity in color and grain. Joints in face veneers shall be inconspicuous. Adjacent door and doors viewed together shall have similar color and grain.

(g) Finish: To be finished on-site to match cabinet laminate as directed by Architect.

(h) Miscellaneous Installation Notes:

1. Handle Doors with Clean hands or gloves.
2. Do not drag doors across other door surfaces and do not drag across the floor.
3. Do not impair the strength of the door in fitting it, installing hardware or by cutting or altering the door in any manner.
4. Plane doors sparingly to get a good fit with the minimum amount of clearance (1/16" maximum).
5. Glass and Glazing: Make cut-outs. Coordinate installation of glass in accordance with 088100: Glass and Glazing.
6. Install hardware without forcing, with proper clearances and alignment so that cooperation is smooth and easy, free of binding or twisting.

H. Completion of Work:

(1) Adjusting and Cleaning:

(a) Adjust doors for smooth and balanced door movement.
(b) Clean-up hardware and adjacent surfaces upon completion. Do not use abrasives or liquid cleaners that will harm permanent lacquer and plastic finishes. Protect door surface at all times.

I. Protection of Completed Work: Care will be erected to protect all doors and finish hardware until project is turned over to the Owner. Any damage to doors or hardware shall be disapproved.

083300: OVERHEAD COILING DOORS

1. GENERAL

A. Scope: Includes all material, labor, tools, and equipment necessary to install manual insulated and fire rated counter shutters and motorized roll-up door as shown on drawings.

B. Codes and Standards Compliance: IBC, NEC, ASTM, UL, State and Local Codes.

C. Quality Assurance:

(1) Manufacturer: Minimum of five years experience in producing doors of the type specified.
(2) Installer: Installers must be approved by the manufacturer to install doors specified herein.

D. Submittals:

(1) Manufacturer's Product Data
(2) Shop Drawings Indicating the Following: Locations and elevations of doors, guide details, method of anchorage to opening, construction details, configuration and location of hardware, size of material, detail of tracks, rollers, motors, fittings, and other attachments.
(3) Manufacturer's installation instructions.
(4) Provide manufacturer's seismic calculations confirming ASCE7-10.
(5) Close-Out Submittals:

(a) Operation and Maintenance Manual
(b) Certificate stating that installed materials comply with this specification.

E. Warranties and Guarantees: Warrant products in this specification for a period of two (2) years from the time of shipment against defects in workmanship and materials.

F. Cross References: 018000: Cleaning
042100: Brick Masonry Units
042200: Concrete Masonry Units
079000: Caulking and Sealants
087100: Finish Hardware
090001: Color Scheme
Division 26

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Cornell/Cookson Company, Overhead Door, Raynor Rolling Doors. The following specification is based on Cornell products. Alternates must meet or exceed the specification herein. All alternates must be approved by the Architect before bid date.

B. Product Characteristics:

(1) Insulated Rolling Counter Shutters:
Location - Pool Access Building Life Guard Office 103, S01
Location - Main Building Concessions 131, S02 and S03

(a) Curtain:

1. Slat: Stainless Steel No. 1F, interlocking flat-faced slats, 1 ½" high by ½" deep, minimum 22-gauge AISI type 304 #4 finish stainless steel angle bottom bar with lift handles and vinyl astragal, Gray PVC backer slat.

2. Insulation: 3/8" foamed-in-place, closed cell melamine
3. Total Slat Thickness: .545"
4. Flame Spread Index of 15 and a Smoke Developed Index of 450 as tested per ASTM E84.
5. R-Value: 2.0
6. U-Factor: .88
7. STC Rating: Up to 26 for the entire assembly, as tested per ASTM E90 and based on testing a complete, operable assembly.
8. Finish: Stainless steel type 304 #4 finish

(b) Endlocks: Fabricate interlocking slat sections stamped steel endlocks riveted to ends of alternate slats.

(c) Guides:

1. Fabrication: Stainless steel 12 gauge formed shapes.
2. Finish: Stainless steel type 304 #4 finish

(d) Counterbalance Shaft Assembly. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.

(e) Brackets:

1. Fabrication: Fabricate from minimum 3/16" steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
2. Finish: SpectraShield Coating System to match interior and exterior slats.

(f) Hood:

1. Minimum 24-gauge stainless steel with reinforced top and bottom edges. Provide minimum 1/4" steel intermediate support brackets as required to prevent excessive sag.
2. Finish: Stainless steel type 304 #4 finish

(g) Operation: Manual lift.

(h) Locking: Locking: SFIC core operable from coil side of bottom bar. See 087100: Finish Hardware for cylinder.

(i) Operator and Full Bracket Mechanism Cover: 24-gauge stainless steel sheet metal cover to enclose exposed moving operating components at coil area of unit. Finish to match door hood.

(2) Fire Rated Counter Shutter:
Location: Main Building Concessions 131, S01

(a) Curtain:

1. Slat: Stainless Steel No. 1F, interlocking flat-faced slats, 1 ½” high by ½” deep, minimum 22-gauge AISI type 304 #4 finish stainless steel angle bottom bar and vinyl astragal.
2. Finish: Stainless steel type 304 #4 finish

(b) Endlocks: Fabricate interlocking slat sections with high strength galvanized steel endlocks riveted to slats per UL requirements.

(c) Guides:

1. Fabrication: Stainless steel minimum 12 gauge formed shapes.
2. Finish: Stainless steel type 304 #4 finish

(d) Counterbalance Shaft Assembly. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.

(e) Brackets:

1. Fabricate from reinforced steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
2. Finish: SpectraShield Coating System to match interior and exterior slats.

(f) Hood and Mechanism Cover:

1. Minimum 24-gauge stainless steel with reinforced top and bottom edges. Provide minimum 1/4" steel intermediate support brackets as required to prevent excessive sag.
2. Finish: Stainless steel type 304 #4 finish

(g) Smoke Seals and UL Smoke Label:

1. Bottom Bar: UL tested brush seal.
2. Guides and Head: Replaceable, UL listed, brush sealing against fascia side of curtain.

(h) Operation: FireGard Series Manual Push-Up Operation: Conventual spring tension release operating system.

1. Provide bottom bar lift handles and pull-down pole with hook.
2. Activate automatic closure by notification from central alarm system.
3. Maintain automatic closure speed at an average of 6”-24” per second.
4. Reset of spring tension, mechanical dropouts or release devices to be completed on by an approved and trained door systems technician.
5. Notify electrical contractor to supply and install the appropriate disconnect switch, all conduit and wiring per the door system wiring instructions.
6. Drop test and reset door system twice by all means of activation and comply fully with NFPA 80, Section 5.

(i) Locking: Locking: SFIC core operable from coil side of bottom bar. See 087100: Finish Hardware for cylinder.

(j) Fire Emergency Annunciator: Voice warning module fire emergency annunciator to give advanced warning that fire shutter is about to close, activating warning signal upon alarm.

(k) Operator and Full Bracket Mechanism Cover: 24-gauge stainless steel sheet metal cover to enclose exposed moving operating components at coil area of unit. Finish to match door hood.

(3) Insulated Roll-Up Door: Cornell Thermiser Rolling Door ESD20
Location: Gym Storage 119A

(a) Curtain:

1. Slat Material: Aluminum 0.040”
2. Insulation: 7/8" foamed-in-place, closed cell urethane.
3. Total Slat Thickness: 15/16"
4. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
5. R-Value: 8.0
6. The finish on the interior and exterior slats shall be clear anodized aluminum.

(b) Endlocks: Fabricate interlocking sections with high strength nylon endlocks on alternate slats each securing the two 1/4" rivets. Provide windlocks as required.

(c) Bottom Bar: Heavy duty bottom bar. 6" x 2" x 3/8" aluminum tubular extrusion configured to withstand 350% more impact than standard bottom bar. Interior and exterior finish to match clear anodized aluminum slats.

(d) Guides: Minimum 3/16" aluminum angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.

(e) Finish: Clear anodized aluminum.

(f) Counterbalance Shaft Assembly:

1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.
2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.

(g) Brackets: Fabricate from minimum 3/16" steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.

1. Finish: SpectraShield Coating System to match interior and exterior slats.

(h) Hood:

1. Minimum 0.040-inch aluminum with reinforced top and bottom edges. Provide minimum 1/4" steel intermediate support brackets as required to prevent excessive sag.
2. Finish: Clear anodized aluminum

(i) Weatherstripping:

1. Bottom Bar, Motor Operated Door: Sensing/weather edge with neoprene astragal extending full width of door bottom bar.
2. Guides: Replaceable vinyl strip on guides sealing against both sides of curtain.
3. Hood: Neoprene/rayon baffle to impede air flow above coil.
4. Lintel Seal: Nylon brush seal fitted at door header to impede air flow.

(j) Motorized Operation: Standard Use Motor (Model MG) Industrial Duty Gear Head Operator: The operator must not extend above or below the door coil when mounted front-of-coil. Rated for a maximum of 20 cycles per hour, UL listed, totally enclosed non-ventilated gear head operator rated as recommended by door manufacturer for size and type of door. Provide completed with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, emergency manual chain hoist and control stations. Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position. Operator shall be equipped with an emergency manual chain hoist assembly that safely cuts operator power when engaged. A disconnect chain shall not be required to engage or release the manual chain hoist. Operator drive and door driven sprockets shall be provided with #50 roller chain. Provide an integral Motor Mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided. Operator shall be capable of driving the door at a speed of 8 to 9 inches per second. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.

(k) Control Operation:

1. Constant Pressure to Close: 2-wire, electric sensing edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Provide a retracting safety cord and reel connection to control unit.
2. Sensing/Weather Edge: Automatic reversing control by an automatic sensing switch within neoprene or rubber astragal extending full width of door bottom bar. Provide a wireless sensing edge connection to motor operator.

(l) Locking: Locking: SFIC Core operable from both sides of bottom bar. Provide interlock switch on motor operated units. See 087100: Finish Hardware for cylinder.

3. EXECUTION

A. Storage and Handling: Store to protect material and equipment. Do not damage or mar when unpacking.

B. Examination:

(1) Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
(2) Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
(3) Commencement of work by installer is acceptance of substrates.

B. Installation:

(1) General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
(2) Strictly follow manufacturer's installation instructions.

C. Adjusting: Following completion of installation, including related work by others, lubricate, test and adjust doors for ease of operation, free from warp, twist or distortion.

D. Cleaning:

(1) Clean surfaces soiled by work as recommended by manufacturer.
(2) Remove surplus materials and debris from the site.

E. Protection of Completed Work: Care shall be taken to protect all roll-up doors until project is turned over to the Owner. Any damage to motorized roll-up doors shall be disapproved.

F. Demonstration: Demonstrate proper operation to Owner's representative(s) and instruct them in maintenance procedures.

083380: SPECIAL DOORS AND FRAMES

1. GENERAL

A. Scope: Includes all material, labor, tools, and equipment necessary for the complete installation of Fiberglass Reinforced Polyester (FRP) composite construction in accordance with details and schedule shown on the project drawings and as specified herein. Door and frame products of aluminum, steel or wood constructions that use FRP face sheets are strictly excluded.

B. Codes and Standards Compliance: ADA, AAMA 920, AAMA 1304, ASTM C203, ASTM C273, ASTM C272, ASTM C273, ASTM C518, ASTM C1363, ASTM D256, ASTM D638, ASTM D695, ASTM D696, ASTM D790, ASTM D1621, ASTM D1622, ASTM D1623, ASTM D1761, ASTM D2344, ASTM D4226, ASTM D5116, ASTM D6670, ASTM E84, ASTM E90, ASTM E283, ASTM E330, ASTM E1886, ASTM E1996, ASTM F1642-04, ASTM G53, NFRC 100, NFRC 400, UL, State and Local Codes

C. Quality Assurance:

(1) Manufacturer: Continuously engaged in manufacturing of doors of similar type of that specified, with a minimum of 25-years of concurrent successful experience.
(2) Door and frame components must be fabricated by same manufacturer.

D. Submittals:

(1) Product Data: Provide catalog cut of FRP door detailing internal construction and reinforcements, materials used and description of molding process.
(2) Shop Drawings:

(a) Specifications relating to FRP door thickness, resin type, core material, method of construction, finish color, type of glass and glazing, anchor systems, joint construction and complete warranty information.
(b) Complete schedules or drawings of FRP doors and frames and associated hardware showing identifying mark numbers, door and frame types, typical elevations, nominal sizes, handing, actual dimensions and clearances, and required hardware preps and reinforcements.
(c) Supporting reference drawing pertaining to frame mounting details, door light or louver installation, hardware locations and factory hardware cutouts and reinforcements.

(3) Color Samples: Provide a complete set of available finish colors from the manufacturer for color selection upon request.
(4) Installation Instructions: Include manufacturer's specific information describing procedures, sequence and required fasteners for frame and door installation.
(5) Production of FRP doors and frames shall not proceed until final approval of submittals and all necessary manufacturing information is received from customer.

E. Warranties and Guarantees:

(1) Warranty doors, frames and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
(2) Standard Period: 10-years starting on date of shipment
(3) Limited Lifetime: Covers failure of corner joinery, core deterioration, and delamination of bubbling of door skin and corrosion of all-fiberglass product while the door is in its specified application in its original installation.
(4) Painted Finish: 3-years

F. Cross References: 018000: Cleaning
042100: Brick Masonry Units
042200: Concrete Masonry Units
079000: Caulking and Sealants
087100: Finish Hardware
090001: Color Scheme

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality and Performance Standard: Special-Lite AF-100 Smooth Pultruded Fiberglass Doors with AF-150 Frames. Other manufacturers may be acceptable if they meet or exceed the quality standard. All alternates must be submitted to the Architect for approval before bid date.

B. FRP Door Product Characteristics: AF-100 Smooth Pultruded Fiberglass Door

(1) Door Thickness: 1 ¾”
(2) Pultruded as one monolithic panel with integral stiles
(3) Stiles: Seamless 9/16: thick solid FRP
(4) Top Rail: 6” pultruded tube profile designed to fit flush and be chemically welded inside of door cavity.
(5) Bottom Rail: Closed
(6) Core:

(a) Polyurethane foam
(b) Minimum 6 pcf density

(7) Face Sheet: Smooth, pultruded FRP integral to construction of door. Door to be pultruded as one monolithic panel.
(8) Hardware: Pre-machined doors in accordance with templates from specified hardware manufactures including reinforcements.
(9) No metallic reinforcements to be used.

C. AF-150 Smooth Pultruded Fiberglass Frames

(1) Jamb Depth: As required for installation
(2) Perimeter Frame Members:

(a) ¼” thick pultruded fiberglass open throat with return
(b) Factory fabricated
(c) Header size as required for project

(3) Integral Door Stops: 5/8” x 2 ¼”
(4) Frame Assembly: Chemically welded
(5) Frame Member to Member Connections:

(a) Corner mitered with 4” x 4” x 3/8” pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
(b) All member-to-member connections to be chemically welded.

(6) Reinforcements: ¼” thick pultruded FRP chemically welded to frame at all hinge, strike and closer locations.
(7) Hardware: Pre-machined doors in accordance with templates from specified hardware manufactures including reinforcements.
(8) Anchors: Concealed masonry anchors

D. Fasteners: 410 stainless-steel

E. Fabrication:

(1) Factory Assembly:

(a) Door and frame components from the same manufacturer.
(b) Required size for door and fame units, shall be as indicated on the drawings.
(c) Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
(d) All cut edges to be free of burs.
(e) Electrical arc welding of doors or frames is not acceptable.
(f) Maintain continuity of line and accurate relation of planes and angles
(g) Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

(2) Shop Fabrication:

(a) All shop fabrication to be completed in accordance with manufacturer's process work instructions.
(b) Quality control to be performed before leaving each department.

F. Door and Frame Finish:

(1) Two-component acrylic urethane enamel gloss topcoat.
(2) Finish: Smooth
(3) Color: Crystal – Clear Anodized Match

G. Hardware: See 087100: Hardware

H. Thresholds: See 087100: Hardware

3. EXECUTION

A. Delivery, Storage and Handling of Materials

(1) FRP doors and frames are to be delivered to jobsite in adequate crating with foam sheet separations between all components.
(2) Upon receipt of shipment, remove and inspect the doors and frames for damage. Notify the manufacturer immediately of any damage.
(3) Doors are to be stored indoors in a vertical position, clear of the floor, with blocking between the doors to permit air circulation between the doors and prevent damage to the door faces. Rain/water or condensation must not be allowed to collect or lay between stored doors. Do not wrap in plastic sheeting as it will promote condensation formation within. Permanent discoloration can result. Failure to comply with the receiving and reporting instructions shall void the product warranty.
(4) Use care in handling FRP doors and frames to prevent damage to factory finishes. Wear protective gloves and do not slide or drag doors or frames against one another.

B. Identification: Factory mark all doors and frames using a chemical resistant plastic tag or indelible marker with identifying number, keyed to shop drawings, prior to shipment.

C. Installation:

(1) Install doors in accordance with manufacturer's instructions.
(2) Install doors plumb, level, square, true to line and without warp or rack.
(3) Anchor fames securely in place.
(4) Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
(5) Set thresholds in bed of mastic and back seal.
(6) Install exterior doors to be weathertight in closed position.

(7) Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
(8) Remove and replace damaged components that cannot be successfully repairs as determined by Architect.

D. Adjusting: Adjust doors, hinges, and locksets for smooth operation without biding.

E. Protection of Completed Work: Care will be erected to protect all doors and finish hardware until project is turned over to the Owner. Any damage to doors or hardware shall be disapproved.

F. Cleaning: Clean exposed surfaces of FRP doors and frames with a mild, non-abrasive cleaner and water.

084113: ENTRANCES AND STOREFRONTS

1. GENERAL

A. Scope: Includes all labor, materials, tools, and equipment necessary for the complete installation of aluminum windows, sliding transaction windows and doors.

B. Codes and Standards Compliance: ADA, AA, AAMA, ASTM B221, ASTM B456, ASTM B633, ASTM C1401, IBC

C. Quality Assurance:

(1) Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.
(2) Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meets or exceeds performance requirements indicated and of documenting this performance by inclusion of test reports and calculations.
(3) Source Limitations: Obtain framed storefront system through one source from a single manufacturer unless otherwise noted.
(4) Product Options: Drawings indicate size, profiles and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Do not modify size and dimensional requirements unless written approval has been obtained by the Architect.
(5) Pre-Installation Conference: Conduct conference at project site.
(6) Structural-Sealant Glazing: Comply with ASTM C1401, Guide for Structural Glazing for design and installation of structural sealant glazed systems.
(7) Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

D. Performance Requirements:

(1) General Performance: Aluminum-framed storefront system shall withstand the effects of the performance requirements set forth paragraph II-Design Criteria on Drawing S00: Notes and Schedules without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

(2) Aluminum Framed Entrance Performance Requirements:

(a) Wind Loads: Provide storefront system; including anchorage, capable of withstanding wind load design based on information provided in paragraph 11-Desgn Criteria on Drawing S00: Notes and Schedules.
(b) Air Infiltration: The test specimen shall be in accordance with ASTM E283. Air infiltration rate shall not exceed 0.06 cfm/ft^2 at a static air pressure differential of 6.24 psf.
(c) Water Resistance: The test specimen shall be tested in accordance with ASTM E331. There shall be no leakage at a minimum static air pressure differential of 8 psf as defined in AAMA 501.
(d) Uniform Load: A static air design load of 20 psf shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
(e) Thermal Transmittance (U-Factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:

1. Glass to Exterior: 0.47 (low-e) or 0.61 (clear)
2. Glass to Center: 0.44 (low-e) or 0.61 (clear)
3. Glass to Interior: 0.41 (low-e) or 0.56 (clear)

(f) Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:

1. Glass to Exterior: 70-frame and 69-glass (low-e) or 69-frame and 58-glass (clear)
2. Glass to Center: 62-frame and 68-glass (low-e) or 63-frame and 56-glass (clear)
3. Glass to Interior: 56-frame and 67-glass (low-e) or 54-frame and 58-glass (clear)

(3) Structural Performance: Corner strength shall be tested per the manufacturer's dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity.

E. Submittals:

(1) Shop Drawings: Provide drawings indicating all areas to receive materials specified in this section, how they are fabricated, field measurements and dimensions, field connections, anchorage, fastening, sealing, reinforcing (if required), metal finishes, and glazing accessories, and compliance with code requirements.
(2) Samples: Submit 6" x 6" sample of glass (each type with aluminum framing). See 088100: Glass and Glazing.
(3) Product Data: Supply literature of company supplying products in this section, including test reports certifying that the system meets International Building Code. Submit structural calculations for project conditions.
(4) Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of aluminum-framed storefront.
(5) Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware with doors, frames and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
(6) Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on shop drawings.

F. Warranties and Guarantees: Provide manufacturer's standard warranty of two (2) years from the date of Substantial Completion.

G. Cross References: 018000: Cleaning
042100: Brick Masonry Units
042200: Concrete Masonry Units
079000: Caulking and Sealants
087100: Finish Hardware
088100: Glass and Glazing
090001: Color Scheme
092500: Gypsum Board

H. Job Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standard: Kawneer Company, Inc.

(1) One Company Clause: All products specified in this section shall be the products of one (1) manufacturer unless otherwise noted.
(2) Entrances and Storefront work in this section and numbers in this specification and details shown on drawings are based on Kawneer doors and framing. Any substitutions must be approved by the Architect before bid date.

B. Product Types:

(1) Storefront/Windows:

(a) Recreation Center Storefront and Windows: Kawneer 451T Screw Spline Assembly, Front Glazed
(b) Pool Access Building:

1. Front (West) Elevation and Pool Side (East) Elevation Pediment: Kawneer 1600 Wall System 1 Curtain Wall
2. Pool Side (East) Elevation Clerestory Windows, Doors D03 and D04 transoms and sidelites and windows W01 and W02: Kawneer 451T Screw Spline Assembly Front Glazed

(c) Glass: 1" Low-E, Insulated Glass, tempered where required by code.
(d) See drawings.

(2) Sliding Service Windows:

(a) Sliding Service Windows: C.R. Laurence Co. Deluxe Sliding Service Window
(b) OXO (two fixed panels with two center bi-parting panels)
(c) Glass: Tempered
(d) Provide with screens
(e) No bottom track under sliding panels
(f) See drawings for details

(3) Doors:

(a) Coordination Notes:

1. Storefront and finish hardware subcontractor will be required to coordinate with Owner's access control vendor. Materials specified herein are not guaranteed to function with unknown access control equipment. However, every effort has been made to ensure materials specified will function for Owner's intended use.
2. Storefront and finish hardware subcontractor will be required to coordinate hardware specified herein and in 087100: Finish Hardware to ensure hardware is provided and installed for doors to function as indicated.

(b) Recreation Center:

1. Double Doors D01 and D03 (Hardware Set A.1):

a. Doors: Kawneer 350 IR Entrances with 10" bottom rail, 2 ¼" mid-rail, square stops and 4" frame header
b. Pivots: Top, bottom and intermediate offset pivot
c. Panic Devices: Hager 4501 Stainless Steel Concealed Vertical Rod Exit Device w/cylinder dogging (see 087100: Finish Hardware for keyway)
d. Door Operators: Norton 6300, 689 finish (2 units per double door – 4 total)
e. Wave To Open: Norton 674 (2 units).
f. Power supply
g. Glass: 1" Low-E Insulated Tempered Glass, Clear
h. Pulls: CO-12 stainless steel
i. Threshold: To coordinate with pivots. See drawings.
j. Weatherstripping
k. Note: Wave to Open device to operate both sets of double doors when operated from exterior or interior wave devices.

2. Double Doors D02, D04 and D14 (Hardware Set B.1):

    a. Doors: Kawneer 350 IR Entrances with 10" bottom rail, 2 ¼" mid-rail, square stops and 4" frame header
    b. Pivots: Top, bottom and intermediate offset pivots
    c. Panic Devices: Hager 4501 Stainless Steel Concealed Vertical Rod Exit Device w/cylinder dogging (see 087100: Finish Hardware for keyway)
    d. Closers: Calibre concealed overhead closer with single acting offset arm
    e. Glass: 1" Low-E Insulated Tempered Glass, Clear
    f. Pulls: CO-12, stainless steel
    g. Threshold: To coordinate with pivots. See drawings.
    h. Weatherstripping

(c) Pool Access Building:

1. Double Door D01 (Hardware Set A.2):

    a. Doors: Kawneer 350 IR Entrances with 10" bottom rail, 2 ¼" mid-rail, square stops and 4" frame header
    b. Pivots:

        1) Top and bottom offset pivots
        2) Power transfer intermediate offset pivot

    c. Motorized Panic Devices: Hager 4501 Stainless Steel Concealed Vertical Rod Exit Device with Motor Driven Electric Latch Retraction w/Latchbolt Monitoring.
    d. Prepare for cylinder for exterior key access (see 087100: Finish Hardware for keyway)
    e. Door Operators: Norton 6300, 689 finish (2 units)
    f. Wave To Open: Norton 674 (2 units).
    g. Power supply
    h. Glass: 1" Low-E Insulated Tempered Glass, Clear
    i. Pulls: CO-12 stainless steel
    j. Threshold: To coordinate with pivots. See drawings.
    k. Weatherstripping
    l. Notes:

        1) Wave to Open device to operate both sets of double doors when operated from exterior or interior wave devices.
        2) These doors will be connected to access controls provided and installed by the Owner's vendor. Coordination with Owner's vendor will be required.

2. Doors D02, D04 and D05 (Hardware Set B.2A):

    a. Doors: Kawneer 350 IR Entrances with 10" bottom rail, square stops and 4" frame header
    b. Pivots: Top, bottom and intermediate offset pivots
    c. Prepare for cylinder for key access

        (1) See 087100: Finish Hardware for keyway
        (2) Verify location of keyway with Owner before fabrication

    d. Closers: Calibre concealed overhead closer with single acting offset arm
    e. Glass: 1" Low-E Insulated Tempered Glass

        1) Doors D02, D05: Obscure glass
        2) Door D04: Clear glass

    f. Pulls: Stainless Steel, Pull Side: CO-12, Push Side: CP-II Single Acting
    g. Threshold: To coordinate with pivots. See drawings.
    h. Weatherstripping

3. Door D03 (Hardware Set B.2B):
    a. Doors: Kawneer 350 IR Entrances with 10" bottom rail, square stops and 4” frame header
    b. Pivots: Top, bottom and intermediate offset pivots
    d. Prepare for cylinder for key access
        (1) See 087100: Finish Hardware for keyway
        (2) Verify location of keyway with Owner before fabrication
    e. Door Operator: Norton 6300, 689 finish
    f. Wave To Open: Norton 674 (2 units).
    g. Power supply
    h. Glass: 1" Low-E Insulated Tempered Glass, Clear
    i. Pulls: Stainless Steel, Pull Side: CO-12, Push Side: CP-II Single Acting
    j. Threshold: To coordinate with pivots. See drawings.
    k. Weatherstripping

4. Doors D06 and D09 (Hardware Set C.2):
    a. Doors: Kawneer 350 IR Entrances with 10" bottom rail, square stops and 4” frame header
    b. Pivots: Top, bottom and intermediate offset pivots
    c. Closers: Calibre concealed overhead closer with single acting offset arm
    d. Glass: 1" Tempered Obscure Glass
    e. Pulls: Stainless Steel, Pull Side: CO-12, Push Side: CP-II Single Acting

5. Doors D07, D08 and D10 (Hardware Set D.2):
    a. Doors: Doors: Kawneer 350 IR Entrances with 10" bottom rail, square stops and 4” frame header
    b. Pivots: Top, bottom and intermediate offset pivots
    c. Closers: Calibre concealed overhead closer with single acting offset arm
    d. Prepare for cylinder for key access (see 087100: Finish Hardware for keyway)
    e. Glass: 1" Tempered Obscure Glass
    f. Pulls: Stainless Steel, Pull Side: CO-12, Push Side: CP-II Single Acting

C. Components:

(1) Storefront:

(a) Framing Materials:

1. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" wall thickness at any location for the main frame and complying with ASTM B221:6063-T-6 alloy and temper.
2. Fasteners: Aluminum, non-magnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.
3. Anchors, Clips and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 or SC3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
4. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for type SC3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 or SC3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

5. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
6. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

(b) Framing System:

1. Thermal Barrier: Kawneer IsoLock Thermal Break with a 1/4" separation consisting of a two-part chemically curing, high-density polyurethane mechanically and adhesively joined to aluminum storefront sections. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
2. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
3. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, non-bleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
4. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

(c) Glazing System:

1. See 088100: Glass and Glazing
2 Glazing Gaskets: Square glass stops; replaceable, extruded EPDM rubber.
3. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
4. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
5. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:

    a. Structural Sealant: ASTM C1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
    b. Weatherseal Sealant: ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, and A and O; single-component neutral-curing formulation that is compatible with structural sealant and other systems components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use. Color to match.

(d) Fabrication:

1. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

    a. Profiles that are sharp, straight, and free of defects or deformations.
    b. Accurately fit joints; make joints flush, hairline and weatherproof.
    c. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
    d. Physical and thermal isolation of glazing from framing members.
    e. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
    f. Provisions for field replacement of glazing.
    g. Fasteners, anchors, and connection devices that are concealed from view to greatest extend possible.

2. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
3. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
4. Storefront Framing: Fabricate components for assembly using manufacturer's standard installation instructions.
5. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

(2) Finishes:

(a) Comply with AAMA-AFPA "Anodic Finishes/Painted Aluminum" for recommendations for applying and designing finishes.
(b) Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.
(c) Exposed Surfaces Color: AA-M10C22A41 Architectural Class 1 (.7 mils minimum) Clear Anodized Aluminum
(d) Unexposed Surfaces: Mill Finish

3. EXECUTION

A. Packing, Shipping, Handling and Unloading:

(1) Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
(2) Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

B. Examination: Examine openings, substrates, structural support, anchorage, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performing of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.

(1) Masonry Surfaces: Visibly dry and free of excess mortar, sand and other construction debris.
(2) Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
(3) Metal Surfaces: Dry, clean, free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
(4) Proceed with installation only after unsatisfactory conditions have been corrected.

C. Installation:

(1) Comply with drawings, shop drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories and other components.
(2) Install aluminum framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
(3) Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

(4) Install aluminum framed storefront system and components to drain condensation, water penetrating joints and moisture migrating within door to exterior.
(5) Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

D. Adjusting, Cleaning and Protection:

(1) Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealant, glazing materials, dirt and other substances.
(2) Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.
(3) Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

087100: FINISH HARDWARE

1. GENERAL

A. Scope: It is the intent of this specification to give a complete and finished job. Should hardware be omitted which by code or use must be furnished, the Contractor shall furnish same being of like design quality, and finish to hardware on similar openings.

B. Coordination: The General Contractor must coordinate the electrical and low voltage work required to install the door hardware where applicable. This includes but is not limited to rough-in locations and direct connections to the equipment specified.

C. Code and Standards Compliance: ADA, ANSI A115.1, A115.2, A115.4, A115.6, A115.9, A115.10, A115.14, A156.1, A156.2, A156.3, A156.4, A156.7, and A156.9, FS FFH 106c/Gen 7/19/84, ANSI A156, IBC

D. Qualification of Supplier: Only bids from a firm having a registered member of the American Society of Architectural Hardware Consultants in its employment, who will be responsible for scheduling, ordering and consultation, will be acceptable.

E. Submittals: Submit detailed hardware schedule for approval listing the following:

(1) Shop Drawings:

(a) Types of doors and frames
(b) Typical elevations showing location and mounting heights.
(c) Typical head jamb and threshold details.

(2) Door Schedule:

(a) Architectural door mark
(b) Location (from/to)
(c) Handing
(d) Frame size and opening
(e) Door Size
(f) Hardware preparation

(3) Finish Hardware Schedule:

(a) Organize in hardware set format
(b) Indicate manufacturer's name
(c) Product description
(d) Finish and location of each item
(e) Fastening method
(f) Keying schedule

(4) Installation Instructions
(5) Project Data:

(a) Submit manufacturer's cut sheet for each item.
(b) Indicate compliance with ANSI A117.1 (HC) and ADA.
(c) Submit samples if requested by Architect.
(d) Hardware items of the same type shall be products of same manufacturer.

(6) Templates: After finish schedule is approved, submit hardware templates to the one responsible for proper coordination, sizing and locations of the scheduled hardware.
(7) Maintenance: Provide manufacturer's parts list and maintenance instructions.

F. Warranties and Guarantees: Provide manufacturer's guarantees for a period of one (1) year on all items except door closers. Warrant door closers for five (5) years.

G. Cross Reference: 081100: Hollow Metal Doors and Frames
081416: Wood Doors
083300: Overhead Coiling Doors
083380: Special Doors and Frames
084113: Entrances and Storefronts
088100: Glass and Glazing
Architectural and Electrical Drawings

H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Keying: Provide cylinders with seven (7) active pins, keyed, keyed alike, master keyed and grand master keyed as directed by Owner.

(1) Quality Standard: Assa Abloy Small Format Interchangeable Core Cylinder (SFIC) with 6-pin OB7 restricted keyway compatible with Owner's new key system.
(2) Construction Keying: Provide keying to be used in construction as General Contractor deems necessary. However, no construction keys shall be turned over to Architect or Owner in lieu of permanent keying.
(3) Provide four change keys for each cylinder. Provide a total of six (6) master keys for each master key group. Provide a total of six (6) grand master keys for each grand master key group.
(4) Provide lock manufacturer's original key blanks of nickel silver alloy. Number of blanks to equal number of keys.
(5) Deliver all permanent keys, master keys, and grand master keys to General Contractors Project Manager, and deliver copy of transmittal documents to the Architect. General Contractor shall deliver keys to Owner when directed by Architect, and shall deliver copies of transmittal documents to the Architect and review keying with the Facilities Engineer.

B. Quality Standards: (substitutions require approval by Architect before bid date)

(1) Finish: All finish hardware finishes to be Satin Chromium Plated (626/US26D) or Satin Stainless Steel (630/US32D), or Clear Anodized Satin Aluminum (628/US28) unless otherwise noted

(2) Locksets and Exit Devices:

(a) Locksets: Hager 3800 Series Escutcheon Mortise, Archer Lever (ARC)
Note: Owner has requested certain "storeroom" function doors to be fitted with classroom locksets instead so that they remain open when desired.
(b) Exit Devices: Hager 4500 Series Eschutcheon, Archer Lever (ARC)

(3) Hinges: Hager

(a) Acceptable Manufacturers: Hager, Stanley Works, McKinney Manufacturing Co.
(b) Hinges:

1. Comply with applicable requirements of BHMA A156.1
2. Use heavy weight hinges ball bearing hinges, BB1199
3. Use full mortise hinges unless otherwise specified.
4. Size: 4 1/2" x 4 3/8"

5. Pins: Stainless steel pins and hinges. Provide non-removable pins or safety studs for out-swinging doors with keyed lock or exit only function. Provide non-rising pins for interior doors.
6. Provide flat bottom hinge tips with matching finish
7. Provide 3 hinges per doors under 42” wide, 4 hinges for 42” width or more.
8. Provide hinge sizes as follows:

    a. Doors over 4'-0" wide: 6" high.
    b. Doors over 3'-0", but not exceeding 4'-0" wide: 5'-0" high.
    c. Doors 3'-0" wide or less: 4 1/2" high.
    d. Doors 1 3/4" or less thick: 4 1/2" wide.
    e. Doors over 1 3/4" in thickness: 5" wide.
    f. Doors up to 7'-0" high: Provide three (3) 4 1/2" x 4 1/2" mortised hinges.
    g. Doors above 7'-0" high: Provide one extra hinge for each additional 18" or fraction thereof.

(c) Concealed Electric Center Hinges (with mortar box): Hager Electric Through-Wire with Monitoring, Stainless Steel

(d) Continuous Hinges: Hager 790-905 Stainless Steel Concealed Leaf, open up to 180°, electric where required.

(4) Wall Stop: Hager 232W Stainless Steel

(5) Silencers: Hager 307D. Provide each single frame with three (3) silencers and two (2) per leaf of double doors.

(6) Door Closers: Hager 5100 Extra Heavy-Duty Cushion Stop

(a) Use closers of sizes recommended by manufacturer, unless a larger size is specified.
(b) Size closer or adjust closer opening force to comply with applicable codes.
(c) Comply with requirements of BHMA A156.4, Grade 1
(d) Finish: US26D or US32D
(e) Metal Covers

(7) Automatic Flush Bolt Sets for Wood Doors: Hager 296W with strikes

(8) Door Strikes for Card Reader Access: HES 1006 Series with coordinating faceplate for specified mortise locksets.

(9) Door Operators: Norton 6300 (aluminum painted) with power supply

(10) Door Actuators: Norton Wave to Open 674

(11) Door Protection Plates: Hager 190S, Stainless Steel, 10” H x 2” less door width

(12) Recessed Magnetic Hold Open Devices: Hager 380R with optional aluminum extensions where needed.

(13) Thresholds at Exterior Metal Doors: Zero 568AEV3

(14) Saddle Thresholds at Interior 90 min. Doors: Pemko 176 Series, Aluminum

(15) View Panels: US Fire Door VSIG Slimline I.G. Vision Lite Frames, Stainless Steel #4

(16) Fastenings: Provide hardware fastenings required to install hardware items, including wood and machine screws and through bolts. Furnish fastenings having a finish which matches their product.

(17) Coordination Notes:

(a) Storefront and finish hardware subcontractor will be required to coordinate with Owner’s access control vendor. Materials specified herein are not guaranteed to function with unknown access control equipment. However, every effort has been made to ensure materials specified will function for Owner’s intended use.
(b) Storefront and finish hardware subcontractor will be required to coordinate hardware specified herein and in 087100: Finish Hardware to ensure hardware is provided and installed for doors to function as indicated.

C. Finish Hardware Sets:

(1) Main Building:

(a) Set A.1: Double Door Entrance Exit Function with Door Operator
Doors: D01 and D03

Glass Doors/Aluminum Frames

See 084113: Entrances and Storefronts

Each Double Door to Receive:

2 Cylinders (cylinder dogging)	SFIC Keyway OB7	US26D

(b) Set B.1: Double Door Exit Function
Doors: D02, D04 and D14

Glass Doors/Aluminum Frames

See 084113: Entrances and Storefronts

Each Double Door to Receive:

2 Cylinders (cylinder dogging)	SFIC Keyway OB7	US26D

(c) Set C.1: Single Emergency Exit Door Function with Access Controls
Doors: D05, D07 and D15

45 Min. Rated Metal Insulated Door w/45 Min. Rated Metal Frame – Doors D05 and D07
45 Min. Rated FRP Insulated Door w/45 Min. Rated FRP Frame – Door D15

Each Door to Receive:

3 Hinges w/Center Elec. Hinge	BB1199 4.5 x 4.5	US32D
1 Rim Exit w/Motor and Notification	4501 RIM FR MLRLM Trim: 45CE ARC	US32D US32D
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955	ALM metal cover
1 Kickplate	190S, 10”H	US32D
1 Threshold Weatherstripping	568AEV3	US28

Notes:
(1) Owner to provide and install access controls. Conduits and rough-in to be provided by General Contractor. Card reader to activate motorized exit device to open door. Exit device to include notification. Power provided by electric hinge.
(2) FRP Door D15 color and finish to match FRP Doors D12 and D13 (true stainless steel).

(d) Set D.1: Double Emergency Exit Door Function
Doors: D06, D08 and D09

45 Min. Rated Double Metal Insulated Doors
45 Min. Rated Double Metal Frames

Each Double Door to Receive:

6 Hinges	BB1199 4.5 x 4.5	US32D
2 Concealed Vert. Rod Devices	4501 CVR FR, 45CE ARC	US32D
2 Cylinders	SFIC Keyway OB7	US26D
2 Closers	5100x5955	ALM, metal cover
2 Kickplates	190S, 10”H	US32D
1 Threshold	568AEV3	US28
Weatherstripping		

(e) Set E.1: Double Emergency Exit Door Function with Access Controls
Door: D11

45 Min. Rated Double Metal Insulated Door
45 Min. Rated Double Metal Frame

Double Door to Receive:

5 Hinges w/1 Center Elec. Hinge	BB1199 4.5 x 4.5	US32D
1 Concealed Vertical Rod Device	4501 CVR FR, 45CE ARC	US32D
1 Concealed Vertical Rod Device w/Notification	4501 CVR FR MLRLM Trim 45CE ARC	US32D
2 Cylinders	SFIC Keyway OB7	US26D
2 Closers	5100x5955	ALM metal cover
2 Kickplates	190S, 10”H	US32D
1 Threshold Weatherstripping	568AEV3	US28

Note: Owner to provide and install access controls. Conduits and rough-in to be provided by General Contractor. Card reader to activate motorized exit device to open one door leaf and provide notification. Power provided by electric hinge. Second door leaf without motor or notification.

(f) Set F.1: Storage Room Function with Access Controls - FRP
Door: D12

FRP Insulated Door with matching FRP Frame

Door to Receive:

3 Hinges	BB1199 4.5 x 4.5	US32D
1 Lockset	3880ESC, WLS	US32D (True SS)
1 Electric Strike	HES 1006 w/monitoring faceplate for lockset	630
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955 w/hold open	Satin Stainless-Steel
1 Threshold Weatherstripping	568AEV3	US28

Notes:
(1) Owner to provide and install access controls. Conduits and rough-in to be provided by General Contractor. Card reader to activate electric strike with latchbolt monitoring.
(2) It is important that all door/frame material and door hardware is resistant to erosion from chemical exposure.

(g) Set G.1: Double Door Storage Room Function with Access Controls - FRP
Door: D13

FRP Insulated Double Door with matching FRP Double Frame

Double Door to Receive:

5 Hinges w/1 Center Elec. Hinge	BB1199 4.5 x 4.5	US32D
1 Concealed Vertical Rod Device	4501 CVR 45CE WLS	US32D (True SS)
1 Concealed Vertical Rod Device w/Notification	4501 CVR MLRLM Trim 45CE WLS	US32D (True SS)
2 Cylinders	SFIC Keyway OB7	US26D
2 Closers	5100x5955 w/hold open	Satin Stainless-Steel
1 Threshold Weatherstripping	568AEV3	US28

Notes:
(1) Owner to provide and install access controls. Conduits and rough-in to be provided by General Contractor. Card reader to activate motorized exit device to open one door leaf and provide notification. Power provided by electric hinge. Second door leaf without motor or notification.
(2) It is important that all door/frame material and door hardware is resistant to erosion from chemical exposure.

(h) Set H.1: Single Panic Function
Doors: D18, D29, D61, D63, D66,

45 Min. Rated Wood Doors
45 Min. Rated Metal Frames

Each Door to Receive:

3 Hinges	BB1199 4.5 x 4.5	US32D
1 Rim Exit	4501 RIM FR 45CE ARC	US32D
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955	ALM metal cover
2 Kickplates (both sides of door)	190S, 10”H	US32D
1 View Panel	VSIG	US32D, #4
1 Wall Stop	232W	US32D
3 Silencers	307D	Gray

(i) Set I.1: Single Panic Function with Access Controls
Doors: D31A, D32A, D57, D60, D68, D81

45 Min. Rated Metal Doors/45 Min. Rated Metal Frames: D31A, D32A
45 Min. Rated Wood Doors/45 Min. Rated Metal Frames: D57, D60, D68, D81

Each Door to Receive:

3 Hinges w/Center Elec. Hinge	BB1199 4.5 x 4.5 Doors D57, D60, D68, D81	US32D
1 Elec. Continuous Hinge	790-905 Elec. C. Hinge for D31A+D32A	US32D
1 Rim Exit w/Motor and Notification	4501 RIM FR MLRLM Trim: 45CE ARC	US32D US32D
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955	ALM metal cover
2 Kickplates (both sides of door)	190S, 10”H	US32D
1 View Panel	VSIG VP for D57, D60, D68, D81	US32D, #4
1 Wall Stop	232W	US32D
3 Silencers	307D	Gray

Notes for Hardware Set I.1:
(1) Owner to provide and install access controls. Conduits and rough-in to be provided by General Contractor. Card reader to activate motorized exit device to open door. Exit device to include notification. Power provided by electric hinge.

(j) Set J.1: Double Panic Function with Magnetic Hold-Open
Doors: D19, D30, D37

45 Min. Rated Double Wood Doors
45 Min. Rated Double Metal Frames

Each Double Door to Receive:

2 Continuous Hinges	790-905, 180°	US32D
2 Concealed Vertical Rod Devices	4501 CVR FR, 45CE ARC	US32D
2 Cylinders	SFIC Keyway OB7	US26D
2 Closers	5100x5955	ALM metal cover
4 Kickplates (both sides of door)	190S, 10”H	US32D
2 View Panels	VSIG	US32D, #4
2 Magnetic Hold Opens	308R w/extensions where required	LS
2 Silencers	307D	Gray

Note: Magnetic hold opens to be connected to fire alarm system.

(k) Set K.1: Double Panic Function with Access Controls
Door: D42

90 Min. Rated Double Wood Door
90 Min. Rated Double Metal Frame

Double Door to Receive:

1 Continuous Hinge	790-905	US32D
1 Continuous Electric Hinge		
1 Concealed Vertical Rod Device	4501 CVR FR, 45CE ARC	US32D
1 Concealed Vertical Rod Device w/Notification	4501 CVR FR MLRLM Trim 45CE ARC	US32D
2 Cylinders	SFIC Keyway OB7	US26D
2 Closers	5100x5955	ALM metal cover
4 Kickplates (both sides of door)	190S, 10”H	US32D
2 View Panels	VSIG	US32D, #4
1 Saddle Threshold	176A	Aluminum
2 Silencers	307D	Gray

Note: Owner to provide and install access controls including card reader and visual and/or audio notification device(s). Conduits and rough-in to be provided by General Contractor. Card reader to activate motorized exit device to open one door leaf and provide notification. Power provided by electric hinge. Second door leaf without motor or notification.

(l) Set L.1: Classroom Function with Magnetic Hold-Open
Doors: D20A, D20B, D21, D27, D28, D33, D36

45 Min. Rated Wood Doors
45 Min. Rated Metal Frames

Each Door to Receive:

1 Continuous Hinge	790-905, 180°	US32D
1 Lockset	3870ESC, ARC	US32D
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955	ALM metal cover
2 Kickplates (both sides of door)	190S, 10”H	US32D
1 View Panel	VSIG Doors D27 and D28 only	US32D, #4
1 Magnetic Hold Open	308R w/extensions where required	LS
3 Silencers	307D	Gray

Note: Magnetic hold opens to be connected to fire alarm system.

(m) Set M.1: Double Egress Function with Magnetic Hold Open
Door: D73C

45 Min. Rated Double Wood Doors
45 Min. Rated Double Egress Metal Frames

Double Door to Receive:

2 Continuous Hinges	790-905, 180°	US32D
2 Concealed Vertical Rod Devices	4501 CVR FR, 45BE ARC	US32D
2 Closers	5100x5955	ALM metal cover
4 Kickplates (both sides of door)	190S, 10”H	US32D
2 View Panels	VSIG	US32D, #4
2 Magnetic Hold Opens	308R w/extensions if required	LS
2 Silencers	307D	Gray

Note: Magnetic hold-open to be connected to fire alarm system.

(n) Set N.1: Passage Latch Function
Doors: D22, D26, D71, D72

45 Min. Rated Wood Doors
45 Min. Rated Metal Frames

Each Door to Receive:

3 Hinges	BB1199 4.5 x 4.5	US32D
1 Lockset	3810ESC, ARC	US32D
1 Closer	5100x5955	ALM metal cover
2 Kickplates (both sides of door)	190S, 10”H	US32D
3 Silencers	307D	Gray

(o) Set O.1: Privacy Latch Function
Doors: D25, D55, D56

Non-Rated Rated Wood Doors/Non-Rated Metal Frames: Doors D55 and D56

45 Min. Rated Wood Doors/45 Min. Rated Metal Frames: Door D25

Each Door to Receive:

3 Hinges	BB1199 4.5 x 4.5	US32D
1 Lockset	3840ESC, ARC	US32D
1 Closer	5100x5955	ALM metal cover
2 Kickplates (both sides of door)	190S, 10”H	US32D
1 Wall Stop	232W D55 and D56	US32D
3 Silencers	307D	Gray

(p) Set P.1A: Classroom Lock Function (Non-Rated)
Doors: D35, D38, D40, D54, D80

Non-Rated Wood Doors
Non-Rated Metal Frames

Each Door to Receive:

3 Hinges	BB1199 4.5 x 4.5 D35, D38, D54, D80	US32D
4 Hinges	BB1199 4.5 x 4.5 D40	US32D
1 Lockset	3870ESC, ARC	US32D
1 Cylinder	SFIC Keyway OB7	US26D
2 Kickplates (both sides of door)	190S, 10”H	US32D
1 Wall Stop	232W for D35	US32D
3 Silencers	307D	Gray

(q) Set P.1B: Classroom Lock Function (Rated)
Doors: D23, D62, D64, D65, D69, D70B, D73A, D79

45 Min. Rated Wood Doors
45 Min. Rated Metal Frames

Each Door to Receive:

3 Hinges	BB1199 4.5 x 4.5 D23, D64, D65, D70B, D73A, D79	US32D
4 Hinges	BB1199 4.5 x 4.5 D62, D69, D78	US32D
1 Lockset	3870ESC, ARC	US32D
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955	ALM metal cover
2 Kickplates (both sides of door)	190S, 10”H	US32D
1 View Panel	VSIG D70B, D73A, D79	US32D, #4
1 Wall Stop	232W For D62, D64, D65, D69	US32D
3 Silencers	307D	Gray

(r) Set Q.1: Storage Lock Function
Doors: D31B, D32B, D73B

Non-Rated Metal Door and Metal Frame: Doors D31B, D32B

45 Min. Rated Wood Door and 45 Min. Rated Metal Frame: Door D73B

Each Door to Receive:

3 Hinges	BB1199 4.5 x 4.5	US32D
1 Lockset	3880ESC, ARC	US32D
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955	ALM metal cover
1 Kickplate	190S, 10”H	US32D
3 Silencers	307D	Gray

(s) Set R.1: Office Lock Function
Doors: D34, D43, D44, D45, D46, D47, D48, D49, D50, D51, D52, D53

Non-Rated Wood Doors
Non-Rated Metal Frames

Each Door to Receive:

3 Hinges	BB1199 4.5 x 4.5	US32D
1 Lockset	3850ESC, ARC	US32D
1 Cylinder	SFIC Keyway OB7	US26D
2 Kickplates (both sides of door)	190S, 10”H Door 34 only	US32D
1 Wall Stop	232W	US32D
3 Silencers	307D	Gray

(t) Set S.1: Classroom Lock Function with Access Controls
Doors: D39, D70A, D78

45 Min. Rated Wood Door
45 Min. Rated Metal Frame

Doors to Receive:

3 Hinges	BB1199 4.5 x 4.5 Door D70A	US32D
4 Hinges	BB1199 4.5 x 4.5 Door D39, D78	US32D
1 Lockset	3870ESC, ARC	US32D
1 Cylinder	SFIC Keyway OB7	US26D
1 Closer	5100x5955	ALM metal cover
1 Electric Strike	HES 1006 w/monitoring faceplate for lockset	630
2 Kickplates (both sides of door)	190S, 10”H	US32D
1 Wall Stop	232W Doors D39, D70A	US32D
3 Silencers	307D	Gray

Note: Owner to provide and install access controls. Conduits and rough-in to be provided by General Contractor. Card reader to activate electric strike with latchbolt monitoring.

(u) Set T.1: Double Storeroom Function
Door: D67

45 Min. Rated Double Wood Doors
45 Min. Rated Metal Frame

Double Door to Receive:

8 Hinges	BB1199 4.5 x 4.5	US32D
1 Lockset	3880ESC, ARC	US32D
1 Dummy Lockset	3817ESC, ARC	US32D
1 Flush Bolt Set	296W	US32D
2 Closers	5100x5955	ALM metal cover
4 Kickplates (both sides of doors)	190S, 10”H	US32D
2 Silencers	307D	Gray

(v) Set U.1: Double Storeroom Function with Magnetic Hold-Open
Door: D77

45 Min. Rated Double Wood Doors
45 Min. Rated Metal Frame

Double Door to Receive:

2 Continuous Hinges	790-905, 180°	US32D
1 Lockset	3870ESC, ARC	US32D
1 Dummy Lockset	3817ESC, ARC	US32D
1 Flush Bolt Set	296W	US32D
2 Closers	5100x5955	ALM metal cover
4 Kickplates (both sides of doors)	190S, 10”H	US32D
2 Magnetic Hold Opens	308R w/extensions, if needed	LS
2 Silencers	307D	Gray

Notes:
(1) Magnetic hold-open to be connected to fire alarm system.
(2) This door has a classroom function so Owner can unlock and leave unlock when desired.

(w) Set V.1: Double Panic Entrance/Exit Function
Doors: D75 and D76

90 Min. Rated Double Wood Door w/90 Min. Rated Metal Frame: Door D75
45 Min. Rated Double Wood Door w/45 Min. Rated Metal Frame: Door D76

Each Double Door to Receive:

2 Continuous Hinges	790-905	US32D
2 Concealed Vertical Rod Devices	4501 CVR FR, 45CE ARC	US32D
2 Cylinders	SFIC Keyway OB7	US26D
2 Closers	5100x5955	ALM metal cover
4 Kickplates (both sides of door)	190S, 10”H	US32D
2 View Panels	VSIG	US32D, #4
1 Saddle Threshold	176A Door D75 only	Aluminum
2 Silencers	307D	Gray

(2) Pool Access Building

(a) Set A.2: Double Door Entrance Exit Function with Door Operator and Access Controls
Door: D01

Glass Doors/Aluminum Frame

See 084113: Entrances and Storefronts

Door to Receive:

2 Cylinders	SFIC Keyway OB7	US26D

(b) Set B.2A: Single Door Exit/Entrance Function
Doors: D02, D04, D05

Glass Doors/Aluminum Frames

See 084113: Entrances and Storefronts

Each Door to Receive:

1 Cylinder	SFIC Keyway OB7	US26D

(c) Set B.2B: Single Door Exit/Entrance Function with Door Operator
Door: D03

Glass Doors/Aluminum Frames

See 084113: Entrances and Storefronts

Each Door to Receive:

1 Cylinder	SFIC Keyway OB7	US26D

(d) Set C.2: Push/Pull Function
Doors: D06 and D09

Glass Doors/Aluminum Frames

See 084113: Entrances and Storefronts

(e) Set D.2 Lock Function
Doors: D07, D08 and D10

Glass Doors/Aluminum Frames

See 084113: Entrances and Storefronts

Each Door to Receive:

1 Cylinder	SFIC Keyway OB7	US26D

(3) Doors not Used: D16, D17, D24, D41, D58, D59 and D74

(4) Note: The Athletic Wood Flooring subcontractor will be installing saddle thresholds over the gap between the wood gym flooring and resilient flooring at the following locations in Gymnasium 120: Near doors D30, D33, D36 and D37 and at the alcove entrance to Exit Corridors 118 and 122.

(5) Coiling Door D10:

Aluminum Coiling Door/Frame

See 083300: Overhead Coiling Doors

Door to Receive:

2 Cylinders	SFIC Keyway OB7	US26D

(6) Shutters:
Main Building: S01 (rated), S02, S03
Pool Access Building: S01

Stainless Steel Door/Frame

See 083300: Overhead Coiling Doors

Each Door to Receive:

1 Cylinder	SFIC Keyway OB7	US26D

(7) Gates:
G01 and G02

Aluminum Gates/Frames

See 323113: Fence and Gates

Each Gate to Receive:

1 Cylinder	SFIC Keyway OB7	US26D

3. EXECUTION

A. Fabrication: Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in some other way, coordinate removal, storage and installation or application of surface protections with finishing work required. Do not install surface-mounted items until finishes have been completed on surrounding areas.

B. Storage of Material and Equipment:

(1) Deliver finish hardware to jobsite in original manufacturer's packaging in sets in accordance with approved hardware schedule. Clearly mark all cartons with set and door number as scheduled. Include all installation instruction, fasteners and special tools as provided by the manufacturers.
(2) Inventory and account for all hardware sets when delivered. If any sets missing report immediately.
(3) Store all finish hardware in a clean, dry, locked storage areas provided by General Contractor. Supplier to be responsible for setting up hardware room. Inventory all hardware with General Contractor at time of delivery to insure accurate count.
(4) Index, tag and deliver all permanent keys to Owner at time of substantial completion.

C. Preparation of Area: Installer of finish hardware shall not install any hardware in conditions which might impair work or finish of the final product.

D. Protection of Adjacent Work: Protect finishes on adjacent work while finish hardware is being done.

E. Manufacturer's Instructions and/or Literature: All finish hardware must be installed in accordance to the written instruction of the manufacturer. Failure to do so may make the work unacceptable.

F. Workmanship of Installation:

(1) Install finish hardware plumb, level and true to line, in accordance with manufacturer's printed instructions and job conditions. Locations of hardware, where applicable, shall be in accordance with the following:

(a) "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".
(b) NWDA Industry standard 1.5.7 Hardware Locations for Wood Doors.

(2) Install finish hardware to template. Cut and fit to substrate to avoid substrate damage or weakening. Completely cover cut-outs with hardware item. Mortise work to correct location and size, without gouging, splintering or causing irregularities in exposed finished work.

(3) Where cutting and fitting is required on substrates to be painted or stained, install, fit, and adjust hardware prior to finishing. Then remove and place in original packaging. Reinstall hardware after finishing.

a. At time of hardware installation, adjust each hardware item to perform function intended. Lubricate moving parts using lubricant acceptable to manufacturer.
b. Prior to date of substantial completion, readjust and relubricate hardware. Repair or replace defective materials. Clean hardware to remove dust and stains.
c. Instruct Owner's designated personnel in adjustment and maintenance of hardware and finishes during hardware adjustment.
d. Final Adjustment: Wherever hardware installation is made more than 1 month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

(4) All doors to be machined fitted, finished and hung before installation of hardware, (other than butts).
(5) Attach thresholds to concrete and other hard surfaces using plastic or lead expansion shields and countersunk flat head bronze or stainless screws, as required to match threshold color.
(6) Completion of Work: At the completion of the job, all the hardware manufacturer's tools, wrenches, instructions and maintenance information, key-list, and key inventory must be turned over to the Owner. The Contractor shall be responsible for protection of all hardware until completion of construction and delivery of all keys properly labeled to Owner.

088100: GLASS AND GLAZING

1. GENERAL

A. Scope: Includes all glass and glazing shown, noted, or implied on the construction documents.

B. Codes and Standards compliance: IBC, Federal Register: 16 CFR part 1201, ANSI 297.1-75, ASTM C509-84, ASTM C864-84, ASTM C1036-85, ASTM C1048-85, ASTM E774-84a, FS DO-G-451-C, FS TT-S-230A, FGMA Glazing Manual, NAAMM SS-1B-68, State and Local Codes

C. Qualifications of Installer: The installer must have demonstrated experience in glazing of the type called for in the contract documents. The glazing company must have been in business five (5) years or submit a minimum of 5 products of the size and scope of this project.

D. Submittals:

(1) Product Data: Be prepared to submit manufacturer's technical data if required.
(2) Samples: Be prepared if requested by the Architect to submit 12" x 12" samples of products to be used.
(3) Shop Drawings: Required of all glazing work in this project in sufficient detail to cover all conditions shown or implied by the Contract Documents.
(4) Calculations: Submit calculations prepared by glazing material manufacturer indicating recommendations for glass thickness and heat-strengthening or tempering of glazing materials as a result of heat stress, building orientation, treatments, shading by exterior building components or wind loading.
(5) Compatibility Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion (this requirement may be waived by the Architect).

E. Warranties and Guarantees:

(1) Submit copy of insulating glass manufacturer's ten (10) year written warranty which guarantees the sealed glass units from seal failure, interpane dusting or misting, internal condensation at temperatures of -20 degrees F. and other evidence of hermetic seal failure.

(a) Written warranty shall also guarantee the quality of sealed glass units meets or exceeds SIGMA No. 64-7-2 "Specification for Sealed Insulating Glass Units".
(b) Warranty period of 10-years shall begin when seal date is permanently imprinted on sealed glass units, by the sealed glass units shall be guaranteed for not less than 9 years from Date of Substantial Completion.

F. Cross References: 018000: Cleaning
057310: Dry Glazed Glass Railing System
079000: Caulking and Sealants
081100: Hollow Metal Doors and Frames
081416: Wood Doors
084113: Entrances and Storefronts
087100: Finish Hardware
104260: Signage

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard:

(1)	Insulated and Tempered LoE:	PPG Industries, Inc.
(2)	Clear Tempered Glass:	PPG Industries, Inc.
(3)	Obscure Glass:	PPG Industries, Inc.
(4)	Fire Rated Glass:	Fire-Lite Plus 5/16” Clear

B. Project Uses:

(1) Exterior: Insulated Glass
(2) Interior: Tempered Glass
(3) Rated Walls and Doors View Panels: Rated Glass

C. Accessories:

(1) Glazing Gaskets:

1. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of neoprene or EPDM, complying with ASTM C864, Option 1.
2. Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene or profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.
3. Manufacturer: Provide products of one of the following:

D.S. Brown Co.
Maloney Precision Products Co.
Tremco

(g) Miscellaneous Glazing Material:

1. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
2. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
3. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing materials, 80 to 90 Shore A durometer hardness.
4. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions as required for compatibility with glazing materials, of size shown and hardness recommended by glass and sealant manufacturers for application indicated.
5. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing materials, of size and hardness required limit lateral movement side-walking) of glass.
6. Mirror Mastic: Type recommended by mirror manufacturer.

3. EXECUTION

A. Fabrication:

(1) Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.
(2) Examine work of glass framing erector for compliance with manufacturer and installation tolerances, including those for size, squareness, Ø at corners; for presence and functioning of weep system; for existence minimum required face or edge clearances; and for effective sealing at joinery. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

B. Storage of Materials, Delivery, and Handling:

(1) Store glazing materials indoors in cool, dry area, off floor, equally supported to prevent stress and breakage.
(2) Move no cases which have been partially unpacked. Unpack glazing materials in accord with manufacturer's product data for type of material being handled. Stack individual lites as recommended by manufacturer.
(3) Utilize rolling blocks to rotate glazing materials.
(4) Handle insulating units without rotating, warping or "cartwheeling" units. Prevent damage to glazing materials or edge seal.

C. Preparation:

(1) Pre-Installation Meeting: At Contractor's direction, Glazer manufacturers' technical representative, glass framing erector and other trades whose work affects glass and glazing shall meet at project site to review procedures and time schedule proposed for glazing and coordination with other work.
(2) Clean glazing channels and other framing members to receive glass before glazing. Remove coatings which are not bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

D. Manufacturer's Instruction: Comply with combined printed recommendations of glass manufacturer or manufacturers of gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

E. Workmanship and Installation:

(1) Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face tolerance and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
(2) Protect glass from edge damage during handling and installation; put rolling block in rotating glass units to prevent damage to glass at corners. Do not impact glass with metal framing. use suction cups to shift glass units within openings; do not raise or drift glass with pry bar. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

(3) Glazing:

(a) Install setting blocks of proper size in sill rabbet, located on quarter of glass width from each corner, but no closer than 6 inches. Set blocks in thin course of sealant which is acceptable for heel bead use.
(b) Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
(c) Set units of glass in each series with uniformity of pattern draw, bow and similar characteristics.
(d) Where wedge-shaped gaskets are driven into one side of channel to pressurize gasket will not "walk" out when installation is subjected to movement.
(e) Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

F. Protection and Cleaning:

(1) Protect exterior glass from breakage by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.
(2) Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove by method recommended by glass manufacturer.

(3) Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.
(4) Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

090001: COLOR SCHEME

1. GENERAL

   A. Scope: Includes finishes of all major interior surfaces using brands specified. Alternates must be approved by the Architect for approval before bid date. No substitutions will be considered during construction.

   B. Codes and Standards Compliance: See cross referenced specifications.

   C. Qualifications of Installer: See cross referenced specifications.

   D. Submittals: See cross referenced specifications.

   E. Warranties and Guarantees: See cross referenced specifications.

   F. Cross References: 013000: Contractor Submittal Requirements
   041000: Mortar
   042100: Brick Masonry Units
   042200: Concrete Masonry Units
   051200: Structural Steel Framing
   052000: Steel Joists
   053000: Metal Decking
   055100: Metal Stairs
   055800: Miscellaneous Metal
   057310: Dry Glazed Glass Railing Systems
   064100: Cabinetry
   066116: Solid Surface Fabrications
   066123: Ultracompact Surfacing Countertops
   074113: Metal Roof, Gutters & Downspouts
   074400: Cementitious Panels and Trim
   075300: Thermoplastic Polyolefin Roofing Membrane (TPO)
   077113: Metal Coping
   079000: Caulking and Sealants
   081100: Hollow Metal Doors and Frames
   081416: Wood Doors
   083300: Overhead Coiling Doors
   083380: Special Doors and Frames
   084113: Entrances and Storefronts
   092500: Gypsum Board
   093100: Tiling
   095000: Acoustical Metal Ceiling System
   095100: Acoustical Ceiling Systems
   096466: Wood Athletic Flooring
   096500: Resilient Flooring
   096510: Rubber Base, Stair Treads and Risers
   096820: Carpet
   098413: Sound Control
   099100: Painting
   101650: Toilet Partitions
   102226: Operable Partitions
   102600: Wall Protection
   104260: Signage
   105000: Lockers
   105200: Fire Protection Specialties
   105300: Hanger Supported Aluminum Canopy
   108000: Accessories
   112213: Walk-Up Depositories
   122413: Window Roller Shades
   126600: Telescopic Seating
   142123: Electric Traction Passenger Elevator

2. PRODUCTS: See Cross Referenced Specifications
3. EXECUTION: Submittals to be submitted during construction.
   A. Exterior:
      (1) Administration/Recreation Building:

(a) Brick/Mortar:	Palmetto Brick Company Modular Red Wirecut Mortar Color: Holcim Frosty
(b) Metal Roof and Trim:	MBCI LokSeam, 24-Gauge, 16” Panels Color: Silver Metallic
(c) TPO Roof:	Johns Manville, Grey
(d) Coping:	Pac-Clad Anodic Clear
(e) Storefront:	Clear Anodized Aluminum/Clear Glass
(f) Aluminum Plank Ceiling:	ACS-1
(g) Metal Doors and Frames:	P-1
(h) Fiberglass Doors:	Special-Lite, Color: Crystal Clear Anodized Match
(i) Counter Shutters/Fire Shutter:	Cornell, Color: Stainless Steel
(j) Roll-Up Door:	Cornell, Color: Clear Anodized Aluminum
(k) Hanger Supported Canopies:	Anodized Aluminum
(l) Cementitious Facade:	P-1
(m) Steel Lintels:	P-1
(n) CMU at Parapet:	P-1
(o) Pool Equip. Fence:	Palmshield, RAL 7037 Dusty Grey
(p) Terrace Pavers:	Florida Tile, Passenger, Color: Leisure Gray PSG40U Grout: Laticrete Permacolor, Color:#78 Sterling Silver
(q) Signage:	See 104260: Signage

      (2) Pool Access Building:

(a) Brick/Grout:	Palmetto Brick Company Modular Red Wirecut Mortar Color: Holcim Frosty
(b) Metal Roof and Trim:	MBCI BattenLok HS, Size: 16”, Color: Silver Metallic
(c) TPO Roof:	Johns Manville, Grey
(d) Coping:	Pac-Clad Anodic Clear
(e) Storefront:	Clear Anodized Aluminum
(f) Counter Shutter:	Cornell, Color: Stainless Steel
(g) Hanger Supported Canopies:	Anodized Aluminum
(h) Exposed Steel:	P-1
(i) Exposed Soffit:	P-5
(j) Fence:	Black coated chain link
(k) Signage:	See 104260: Signage

B. Interior Finish Legend:

(1) Paint, Epoxy and Dry Fall: See also 099100: Painting

P-1	Sherwin Williams SW 7072 Online
P-2	Sherwin Williams to match SW 9557 Autonomous
P-3	Sherwin Williams SW 6250 Granite Peak
P-4	Sherwin Williams SW 6249 Storm Cloud
P-5	Tnemec Tneme-Tufcoat (Series 113), Color to Match SW7646 First Star (product to be sprayed onto acoustic metal decking)
EP-1	Not Used
EP-2	Epoxy Coating to Match Sherwin Williams SW 9557 Autonomous
EP-3	Epoxy Coating to Match Sherwin Williams SW 6250 Granite Peak
EP-4	Epoxy Coating to Match Sherwin Williams SW 6249 Storm Cloud
EP-5	Epoxy Coating (flooring) to Match Sherwin Williams SW 7650 Ellie Gray
DF-1	Dry Fall White

(2) Resin Flooring and 8" Cove Base (Pool Access Building):

RF-1 Sherwin Williams Resuflor Deco Quartz BC23, Color: Winter Sky

(3) Resin Wall Surfaces (Pool Access Building):

RW-1 Sherwin Williams Resutile, Color: To match SW 9561 Guild Grey

(4) Porcelain Floor Tile:

PFT-1 American Olean, Series: Theoretical, Color: Creative Gray TH96,
Size: 24" x 24"
Grout: Laticrete Spectralock Pro Premium, Color: #78 Sterling Silver

Tile Transitions: See details 01/A2.09 and 01/A2.10.
Metal Transitions Color: Satin Stainless Steel
Rubber Transitions Color: Burke 660 Rocky

(5) Porcelain Wall Base:

PWB-1 American Olean, Series: Theoretical, Color: Creative Gray TH96,
Size: Public Restrooms 8" x 24" (verify with Architect before cutting)
Size: Staff Restrooms 4" x 24" (verify with Architect before cutting)
Grout: Laticrete Spectralock Pro Premium, Color: #78 Sterling Silver
Trim Cap: Schlüter Jolly. Color: Brushed Stainless Steel

(6) Porcelain Wall Tile:

PWT-1 American Olean, Series: Theoretical, Color: Creative Gray TH96,
Size:12" X 24". See elevations and 093100: Tiling for installation details
Grout: Laticrete Spectralock Pro Premium, Color: #78 Sterling Silver
Cap/Edge Trim (where needed): Schlüter Jolly. Color: Brushed Stainless Steel

(7) Backsplash Tile:

CT-1 American Olean, Series: Color Story Wall, Color: Matte Designer White 0061,
Size: 4” x 12”
Grout: Laticrete Permacolor Select, Color: #09 Frosty
Cap/Edge Trim (where needed): Schlüter Jolly. Color: Brushed Stainless Steel

CT-2 American Olean, Series: Color Story Wall. Color: Sapphire Sky 0070,
Size: 4” x 16”
Grout: TEC AccuColor Plus Grout, Color: #953 Starry Night

(8) Carpet

CPT-1 Shaw Contract, All Access Collection, Path Tile 5T034 Modular,
Size 24” x 24”, Color: 34557 Sterling
Install Direction: To be selected by Architect and Owner during construction

CPT-2 J&J Flooring, Kinetex, Renewal 1857 Modular, Size: 24” x 24”,
Color: 3517 Stand-In
Install Direction: To be selected by Architect and Owner during construction

Carpet Transitions: See details 01/A2.09 and 01/A2.10.
Metal Transitions Color: Satin Stainless Steel
Rubber Transitions Color: Burke 660 Rocky

(9) Resilient Flooring:

RES-1 Patcraft, Admix 36x36, Size: 36” x 36”, Color: Sundial 00130
Note: This product requires a specific topcoat by the floor manufacturer

RES-2 Patcraft Admix 36x36, Size: 36” x 36”, Color: Scallop 00520
This color to be used as a floor accent. Locations to be selected during construction.

Resilient Transitions: See details 01/A2.09 and 01/A2.10.
Metal Transitions Color: Satin Stainless Steel
Rubber Transitions Color: Burke 660 Rocky

(10) Athletic Flooring:

AF-1 Robbins Air-Channel Star, Color: Clear Maple

(11) Wood Doors:

WD-1 Oshkosh Flush Wood Doors, Plain Sliced White Maple, stained on-site to match cabinetry laminate PL-1

(12) Special Doors/Frames – Fiberglass Reinforced Polyester (FRP):

FRP-1 Special-Lite, Color: Crystal – Clear Anodized Match

(13) Rubber Base:

RB-1 Johnsonite Baseworks Thermoset Rubber Base (Type TS),
Size: 4” Cove Rubber Base, 120 ft. roll, Color: 38 Pewter CG

RB-2 Base provided by Athletic flooring manufacturer

RB-3 Johnsonite Baseworks Thermoset Rubber Base (Type TS),
Size: 4” Cove Rubber Base, Color: 83 Midnight

(14) Rubber Stair Treads and matching Risers:

RSTR-1: Johnsonite Resilient Rubber Integrated Stair Tread and Riser with contrasting grit tape, Color: 92 Blue Lagoon

(15) Plastic Laminate:

PL-1 Pionite, Color: Cool Autumn Night WT880, SD Finish

PL-2 Nevamar, Color: Meditation Elm WE2700-T

PL-3 Nevamar, Silver Alu Metalx MCT003T

PL-4 Melamine, White

(16) Quartz Countertops:

QZ-1 LG Hausys 3cm, Viatera, Color: Lento

QZ-2 LG Hausys 3cm, Viatera, Color: Iberia

(17) Dekton Countertops:

DK-1 Cosentino USA Dekton Natural 30mm, Color: Kovik

(18) Acoustical Ceiling:

ACT-1 Rockfon Sonar Activity, 2' x 2' x 1 1/2", White
15/16" White Suspension System

ACT-2 Sheetrock Brand Lay-In Ceiling Panel ClimaPlus, Vinyl 2' x 2' x 1/2", White
15/16" White Aluminum Suspension System

(19) Aluminum Ceiling, Soffit and Accessories:

ACS-1 Armstrong Synchro Ceiling Planks, 6” wide, Color: Silver Grey,
M1 Unperforated (exterior locations)

ACS-2 Armstrong Synchro Ceiling Planks, 6” wide, Color: Silver Grey,
M2 Microperforated (interior locations)

(20) Toilet Partitions:

TP-1 ASI Global Partitions, Solid Plastic HDPE, Finish: Pebble Grain Texture,
Color: Metallic Silver #9511

TP-2 ASI Global Partitions, Solid Plastic HDPE, Finish: Pebble Grain Texture,
Color: Blue #9509 (to match lockers)

(21) Lockers:

LK-1 ASI Storage Solutions, Solid Plastic HDPE, Finish: Pebble Grain Texture,
Color: Blue #9509 (to match toilet partitions)

(22) Operable Partitions:

OP-1 Modernfold Acousti_Seal Legacy Paired Panel 932,
Reinforced Heavy-Duty Vinyl: Serenity 572H
Panel Seals and Hardware: Modernfold Smoke Gray
One markerboard either side of each partition (4 markerboard total)

(23) Window Roller Shades:

SR-1: Mecho Shade UrbanShade Single Roll System with clear aluminum fascia
Shade Fabric: 1550 Series EcoVeil Screen 3% Open, Color: 1569 Silver Birch

DR-1: Mecho Shade UrbanShade Double Roll System with clear aluminum fascia
Shade Fabric: 1550 Series EcoVeil Screen 3% Open, Color: 1569 Silver Birch
Blackout Fabric: 0700 Series Classic Blackout, Color: 0702 Light Grey

(24) Stainless Steel Wall Protection:

CG-1 InPro Stainless Steel Corner Guards, 2” x 2” x 48”H
EW-1 InPro Stainless Steel Custom Endwall Protection, 48”H

(25) Signage: See 104260: Signage

C. Interior Finish Schedule: Administration/Recreation Building

(1) **Stair 1 100:**

(a)	Floors/Landings:	RES-1
(b)	Base:	RB-1
(c)	Stair Treads/Risers:	RSTR-1
(d)	Stair System/Rails:	Painted to match rubber stair treads/risers
(e)	Walls: North-South-East:	EP-2
	West:	EP-4
(f)	Ceiling:	ACT-1
(g)	Interior Door Frame:	P-2
(h)	Interior Door with VP:	WD-1 (D18)
(i)	Exterior Door/Frame:	Interior Side: P-2 (D05)

(2) **Vestibule 101:**

(a)	Floor:	CPT-1
(b)	Base:	Aluminum Storefront
(c)	All Walls:	Aluminum Storefront/Glass
(d)	Ceiling:	ACS-2
(e)	Doors/Frames:	Aluminum/Glass (D01, D02, D03, D04)

(3) **Entrance Lobby 102:**

(a)	Floor:	RES-1 with accents to be determined of RES-2
(b)	Base:	RB-1, Aluminum Storefront
(c)	Walls: South-East:	P-2, East: Sound Control
	North-West:	Aluminum Storefront/Glass/D14 + P-2/FE Cabinet
	South @ Door D19:	Sound Control
(d)	Ceilings: Lobby:	ACS-2 (at second level)
	Under Bridge:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D18 w/VP, D19 w/VP, D20B, D42 w/VP)
(g)	Window Sills:	QZ-1
(h)	Wall Protection:	CG-1 (2 units)

(4) **Reception 103:**

(a)	Floor:	RES-1 with accents to be determined of RES-2
(b)	Base:	RB-1
(c)	Walls: North-South:	P-2
	East Recess:	P-3
(d)	Canopy Ceiling:	ACS-2
(e)	Canopy Facia and Top:	PL-3
(f)	Cabinetry:	PL-1
(g)	Countertops:	QZ-1
(h)	Wall Protection:	CG-1 (2 units)

(5) **Community Room 1 104:**

(a)	Floor:	CPT-2 w/transition at Door D19
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceilings: GB Soffits:	P-2
	Remaining:	ACT-1
(e)	Interior Door Frames:	P-2
(f)	Interior Doors:	WD-1 (D19 w/VP, D20A, D27 w/VP)
(g)	Exterior Doors/Frame:	Interior Side: P-2 (D06)
(h)	Window Sills:	QZ-1
(i)	Shades:	DR-1 (5 units)

(6) **Service Area 105:**

(a)	Floor:	RES-1 w/transition
(b)	Base:	RB-1
(c)	Walls: North-South:	P-2
	East Recess:	P-3
(d)	Ceiling: GB soffit:	P-2
(e)	Cabinetry:	PL-1
(f)	Countertop:	QZ-1
(g)	Wall Protection:	CG-1 (2 units)

(7) **Stair 2 106:**

(a)	Floors/Landings:	RES-1
(b)	Base:	RB-1
(c)	Stair Treads/Risers:	RSTR-1
(d)	Stair System/Rails:	Painted to match rubber stair treads/risers
(e)	Walls: South-East-West:	EP-2
	North:	EP-4
(f)	Ceiling:	ACT-1
(g)	Interior Door Frame:	P-2
(h)	Interior Door with VP:	WD-1 (D29)
(i)	Exterior Door/Frame:	Interior Side: P-2 (D07)

(8) **Catering Kitchen 107:**

(a) Floor:		RES-1
(b) Base:		RB-1
(c) Walls:	North:	EP-2, CT-1, Cabinetry
	South:	EP-2
	East-West:	EP-2, Cabinetry
(d) Ceiling:		ACT-2
(e) Door Frames:		P-2
(f) Doors:		WD-1 (D27 w/VP, D28 w/VP)
(g) Cabinetry:		PL-1
(h) Countertops:		QZ-1

(9) **Furniture and Equipment Storage 108:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	EP-2
(d) Ceiling:	ACT-1
(e) Door Frames:	P-2
(f) Doors:	WD-1 (D20A, D20B, D21)

(10) **Vending Storage 109:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	EP-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D40)

(11) **Vending 110:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	EP-2
(d) Ceiling:	ACT-1
(e) Door and CO Frames:	P-2
(f) Door:	WD-1 (D40)

(12) **Corridor 111:**

(a) Floor:		RES-1
(b) Base:		RB-1
(c) Walls:	North-South-East:	P-2
	West:	P-2, PWT-1 at drinking fountain recess, FE Cabinet
(d) Ceilings:	GB Soffits:	P-2
	Remaining:	ACT-1
(e) Interior Door + CO Frames:		P-2
(f) Interior Doors:		WD-1 (D21, D22, D23, D25, D26, D28 w/VP, D29 w/VP)
(g) Exterior Doors/Frame:		Interior Side: P-2 (D08)
(h) Wall Protection:		CG-1 (11 units)

(13)**Men Restroom 112:**

(a) Floor:		PFT-1
(b) Base:		PWB-1
(c) Walls:	North-South-East:	EP-2
	West:	EP-2, EP-4 at recess, changing station and hook
(d) Ceiling:		ACT-2
(e) Door Frame:		P-2
(f) Door:		WD-1 (D22)
(g) Toilet Partitions:		TP-1

(14)**Plumbing Service 113:**

(a) Floor:	EP-5
(b) All Walls:	EP-2
(c) Ceiling:	DF-1
(d) Door Frame:	P-2
(e) Door:	WD-1 (D23)

(15)**Family Restroom 114:**

(a) Floor:		PFT-1
(b) Base:		PWB-1
(c) Walls:	North-South-East:	EP-2
	West:	EP-2, PWT-1 at changing station recess
(d) Ceiling:		ACT-2
(e) Door Frame:		P-2
(f) Door:		WD-1 (D25)
(g) Notes:		Changing stations on west and east walls

(16)**Women Restroom 115:**

(a) Floor:		PFT-1
(b) Base:		PWB-1
(c) Walls:	North-South-East:	EP-2
	West:	EP-2, EP-4 at recess, changing station and hook
(d) Ceiling:		ACT-2
(e) Door Frame:		P-2
(f) Door:		WD-1 (D26)
(g) Toilet Partitions:		TP-1

(17)**Corridor 116:**

(a) Floor:		RES-1
(b) Base:		RB-1
(c) Walls:	North:	P-2, cabinetry
	South-East:	P-2
(d) Ceilings:	GB Soffit:	P-2
	Remaining:	ACT-1
(e) Door Frame:		P-2
(f) Doors:		WD-1 (D30 w/VP)
(g) Cabinetry:		PL-1 and glass (trophy case)

(18)**Corridor 117:**

(a) Floor:	AF-1 w/transition by AF-1 installer
(b) Base:	RB-2
(c) All Walls:	EP-2, South Wall: FE Cabinet
(d) Ceiling:	DF-1
(e) Door Frame:	P-2
(f) Doors:	WD-1 (D30 w/VP)

(19)**Exit Corridor 118:**

(a) Floor:	RES-1 w/transition by AF-1 installer
(b) Base:	RB-2 (coordinate with AF-1 installer)
(c) All Walls:	EP-2, West Wall: FE Cabinet
(d) Ceiling:	DF-1
(e) Interior Door/Frame:	P-2 (D31A)
(f) Exterior Doors/Frame:	Interior Side: P-2 (D09)

(20)**Gym Storage 119A:**

(a) Floor:	EP-5
(b) All Walls:	EP-2
(c) Ceiling:	DF-1
(d) Doors/Frames:	P-2 (D31A, D31B, D32B, D32A)
(e) Roll-Up Door:	Aluminum
(f) Stairs/Railing:	Black

(21)**Main Electrical Room 119B:**

(a) Floor:	EP-5
(b) All Walls:	EP-2
(c) Ceiling:	DF-1
(d) Door/Frame:	P-2 (D32B)

(22)**Sprinkler Riser Room 119C:**

(a) Floor:	EP-5
(b) All Walls:	EP-2
(c) Ceiling:	DF-1
(d) Door/Frame:	P-2 (D31B)

(23)**Mezzanine Storage 119D:**

(a) Floor:		EP-5
(b) Walls:	North-South:	Black coated chain link fencing
	East-West:	EP-2
(c) Ceiling:		DF-1, roof hatch

(24)**Gymnasium 120:**

(a) Floor:		AF-1
(b) Base:		RB-2
(c) Walls:	North-South:	EP-2, wall pads
	East:	EP-2, Sound Control
(d) Ceiling:		DF-1, basketball backboards

(25)**Telescopic Seating 121:**

(a) Floor:	AF-1
(b) Base:	RB-2
(c) Walls: West:	Bleachers, Sound Control
(d) Ceiling:	DF-1

(26)**Exit Corridor 122:**

(a) Floor:	RES-1 w/transition by AF-1 installer
(b) Base:	RB-2 (coordinate with AF-1 installer)
(c) All Walls:	EP-2, West Wall: FE Cabinet
(d) Ceiling:	DF-1
(e) Interior Door/Frame:	P-2 (D32A)
(f) Exterior Doors/Frame:	Interior Side: P-2 (D11)

(27)**Space 123: Not Used**

(28)**Pool Equipment 124:**

(a) Floor:	Concrete
(b) Walls: North-East:	Brick, exterior aluminum fencing
South-West:	Brick
(d) Ceiling:	DF-1

(29)**Pool Pump Room 125:**

(a) Floor:	EP-5
(b) All Walls:	EP-2
(c) Ceiling:	DF-1
(d) Doors/Frame:	FRP-1 (D13)

(30)**Pool Chemical Storage 125-1:**

(a) Floor:	EP-5
(b) All Walls:	EP-2
(c) Ceiling:	DF-1
(d) Door/Frame:	FRP-1 (D12)

(31)**Storage 126:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	EP-2
(d) Ceiling:	ACT-1
(e) Door Frames:	P-2
(f) Doors:	WD-1 (D36)

(32)**Utility Workroom 127:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	EP-2
(d) Ceiling:	ACT-2
(e) Door Frames:	P-2
(f) Doors:	WD-1 (D33, D34, D35)

(33)**Janitor's Office 128:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	Walls: North-South-East:	EP-2
	West:	EP-4
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D34) with coat hook
(g)	Window Sill:	QZ-1
(h)	Shade:	SR-1 (1 unit)

(34)**Corridor 129:**

(a)	Floor:	AF-1 w/transition by AF-1 installer
(b)	Base:	RB-2
(c)	All Walls:	EP-2, North Wall: FE Cabinet
(d)	Ceiling:	DF-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D33, D36, D37 w/VP)

(35)**Pantry 130:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	EP-2
(d)	Ceiling:	ACT-2
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D38)

(36)**Concessions 131:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	Walls: North-South-West	EP-2, cabinetry
	East Recess:	EP-2, CT-1, cabinetry
(d)	Ceiling:	ACT-2
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D38, D39)
(g)	Counter Shutters:	Stainless-steel (S02 + S03 with sliding glass)
(h)	Cabinetry:	PL-1
(i)	Countertops:	DK-1 (back/side splash at north-south-west counters)
		Note: Counters extend outside of Concessions 131 into the RC and the exterior.

(37)**Corridor 132:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	Walls: North:	P-2, DK-1 counter
	South:	P-2, cabinetry
	South Plaque Wall:	P-2, PWT-1
	East:	P-2
(d)	Ceilings: GB Soffits:	P-2
	Remaining:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D37 w/VP, D39), stainless steel elevator doors
(g)	Counter Shutter:	Stainless steel
(g)	Cabinetry:	PL-1 and glass (trophy case)
(h)	Wall Protection:	CG-1 (4 units)

(38)**Elevator 133:**

(a)	Floor:	RES-1
(b)	Base:	By Elevator Manufacturer
(c)	Walls:	By Elevator Manufacturer
(d)	Ceiling:	By Elevator Manufacturer
(e)	Door Frame:	By Elevator Manufacturer
(f)	Door:	By Elevator Manufacturer

(39)**Waiting 134:**

(a)	Floor:	CPT-2 with transition
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Doors:	WD-1 (D42 w/VP)
(g)	Window Sills:	QZ-1
(h)	Shades:	SR-1 (2 units)
(i)	Wall Protection:	CG-1 (1 unit)

(40)**Workroom 135:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	Walls: North-West:	P-2
	South-East:	P-2, Cabinetry
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D43) with coat hook
(g)	Cabinetry:	PL-1
(h)	Countertops:	QZ-1

(41)**Staff Office 136:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	Walls: North-East-West:	P-2
	South:	P-4
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D44) with coat hook

(42)**Staff Office 137:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	Walls: North-East-West:	P-2
	South:	P-2, cabinetry, depository
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D45) with coat hook
(g)	Cabinetry:	PL-1
(h)	Countertop:	QZ-1
(i)	Window Sill:	QZ-1
(j)	Shade:	SR-1 (1 unit)

(43)**Corridor 138:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D43, D44, D45)

(44)**Director 139:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	Walls: North-East-West:	P-2
	South Recesses:	P-4 (coordinate with Director before painting)
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D47) with coat hook
(g)	Window Sill:	QZ-1
(h)	Shade:	SR-1 (1 unit)

(45)**Staff Office 140:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	All Walls	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D46) with coat hook
(g)	Window Sills:	QZ-1
(h)	Shades:	SR-1 (2 units)

(46)**Staff Office 141:**

(a) Floor:	CPT-2
(b) Base:	RB-1
(c) All Walls	P-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D49) with coat hook
(g) Window Sills:	QZ-1
(h) Shades:	SR-1 (2 units)

(47)**Director 142:**

(a) Floor:	CPT-2
(b) Base:	RB-1
(c) Walls: South-East-West:	P-2
North Recesses:	P-4 (coordinate with Director before painting)
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D48) with coat hook
(g) Window Sill:	QZ-1
(h) Shade:	SR-1 (1 unit)

(48)**Staff Office 143:**

(a) Floor:	CPT-2
(b) Base:	RB-1
(c) All Walls	P-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D50) with coat hook
(g) Window Sills:	QZ-1
(h) Shades:	SR-1 (2 units)

(49)**Staff Office 144:**

(a) Floor:	CPT-2
(b) Base:	RB-1
(c) All Walls	P-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D51) with coat hook
(g) Window Sills:	QZ-1
(h) Shades:	SR-1 (2 units)

(50)**Staff Office 145:**

(a) Floor:	CPT-2
(b) Base:	RB-1
(c) All Walls:	P-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D53) with coat hook
(g) Window Sills:	QZ-1
(h) Shades:	SR-1 (2 units)

(51)**Corridor 146:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D46, D47, D48, D49, D50, D51, D52, D53)
(g)	Wall Protection:	CG-1 (5 units)

(52)**Director of DRD 147:**

(a)	Floor:		CPT-2
(b)	Base:		RB-1
(c)	Walls:	North-East-West:	P-2
		South:	P-4 (coordinate with Director before painting)
(d)	Ceiling:		ACT-1
(e)	Door Frame:		P-2
(f)	Door:		WD-1 (D52) with coat hook
(g)	Window Sill:		QZ-1
(h)	Shade:		SR-1 (1 unit)

(53)**Corridor 148:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D54)

(54)**Breakroom 149:**

(a)	Floor:		RES-1
(b)	Base:		RB-1
(c)	Walls:	North-South:	P-2
		East:	P-2, Bar
		West:	P-2, CT-1, Cabinetry
(d)	Ceiling:		ACT-1
(e)	Cabinetry:		PL-1
(f)	Countertops:		QZ-1

(55)**Storage 150:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D54)

(56)**Men Restroom 151:**

(a)	Floor:	PFT-1
(b)	Base:	PWB-1
(c)	Walls: North-West:	P-2
	South-East:	PWT-1, P-2
(d)	Ceiling:	ACT-2
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D55) with coat hook

(57)**Women Restroom 152:**

(a)	Floor:	PFT-1
(b)	Base:	PWB-1
(c)	Walls: North-East:	P-2
	South-West:	PWT-1, P-2
(d)	Ceiling:	ACT-2
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D56) with coat hook
(g)	Window Sills:	QZ-1
(h)	Note:	Windows W20 and W21 to have obscure glass

(58)**Corridor 153:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	All Walls:	P-2, North Wall: FE Cabinet
(d)	Ceiling:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D55, D56, D57 w/VP)
(g)	Wall Protection:	CG-1 (2 units)

(59)**Stair 3 154:**

(a)	Floors/Landings:	RES-1
(b)	Base:	RB-1
(c)	Stair Treads/Risers:	RSTR-1
(d)	Stair System/Rails:	Painted to match rubber stair treads/risers
(e)	Walls: North-South-East:	EP-2
	West:	EP-4
(f)	Ceiling:	ACT-1
(g)	Interior Door Frame:	P-2
(h)	Interior Door with VP:	WD-1 (D57)
(i)	Exterior Door/Frame:	Interior Side: FRP-1 (D15)

(60) **Stair 1 200:**

(a)	Floors/Landings:	RES-1
(b)	Base:	RB-1
(c)	Stair Treads/Risers:	RSTR-1
(d)	Stair System/Rails:	Painted to match rubber stair treads/risers
(e)	Walls: North-South-East:	EP-2
	West:	EP-4
(f)	Ceiling:	ACT-1
(g)	Door Frame:	P-2
(h)	Door with VP:	WD-1 (D60)
(i)	Window:	Aluminum Storefront/Glass
(j)	Window Sill:	QZ-1

(61) **Activity Room 1 201:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	Walls: North-East-West:	P-2
	South:	OP-1 w/markerboard
(d)	Ceiling:	ACT-1 with OP-1 track
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D61 w/VP, D62)
(g)	Window Sill:	QZ-1
(h)	Shade:	DR-1 (1 unit)

(62) **Activity Room 2 202:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	Walls: North-South:	OP-1 w/markerboard each side
	East-West:	P-2
(d)	Ceiling:	ACT-1 with OP-1 track
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D63 w/VP, D64)
(g)	Window Sill:	QZ-1
(h)	Shade:	DR-1 (1 unit)

(63) **Activity Room 3 203:**

(a)	Floor:	CPT-2
(b)	Base:	RB-1
(c)	Walls: South-East-West:	P-2
	North:	OP-1 w/markerboard
(d)	Ceiling:	ACT-1 with OP-1 track
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D65, D66 w/VP)
(g)	Window Sills:	QZ-1
(h)	Shade:	DR-1 (3 units)

(64) **Corridor 204:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	P-2
(d) Ceiling:	ACT-1
(e) Door Frames:	P-2
(f) Doors:	WD-1 (D66 w/VP)
(g) Window Sill:	QZ-1

(65) **Storage 205:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	P-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D65)

(66) **Storage 206:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	P-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D64)

(67) **Stair 2 207:**

(a) Floors/Landings:	RES-1
(b) Base:	RB-1
(c) Stair Treads/Risers:	RSTR-1
(d) Stair System/Rails:	Painted to match rubber stair treads/risers
(e) Walls: South-East-West:	EP-2
North:	EP-4
(f) Ceiling:	ACT-1
(g) Door Frame:	P-2
(h) Door with VP:	WD-1 (D68)

(68) **Corridor 208:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	P-2
(d) Ceiling:	ACT-1
(e) Door Frames:	P-2
(f) Doors:	WD(D63 w/VP, D69)

(69)**Storage 209:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D62, D69)

(70)**Corridor 210:**

(a)	Floor:	RES-1
(b)	Base	RB-1
(c)	All Walls:	P-2
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D61 w/VP)

(71)**IT Closet 211A:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	EP-2
(d)	Ceiling:	DF-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D70A)

(72)**Mechanical 211B:**

(a)	Floor:	EP-5
(b)	All Walls:	EP-2
(c)	Ceiling:	DF-1, roof hatch
(d)	Door Frame:	P-2
(e)	Doors:	WD-1 (D67)

(73)**Corridor 212:**

(a)	Floor:		RES-1
(b)	Base		RB-1
(c)	All Walls:		P-2, West Wall: FE Cabinet
(d)	Ceilings:	GB Soffits:	P-2
		Remaining:	ACT-1
(e)	Door Frames:		P-2
(f)	Doors:		WD-1 (D67, D68, D70A, D70B, D71, D72, D73C, D73A)
(g)	Wall Protection:		CG-1 (9 units)

(74)**Women Restroom 213:**

(a)	Floor:		PFT-1
(b)	Base:		PWB-1
(c)	Walls:	North-South-East:	EP-2
		West:	EP-2, EP-4 at recess, changing station and hook
(d)	Ceiling:		ACT-2
(e)	Door Frame:		P-2
(f)	Door:		WD-1 (D71)
(g)	Toilet Partitions:		TP-1

(75)**Men Restroom 214A:**

(a)	Floor:	PFT-1
(b)	Base:	PWB-1
(c)	Walls: North-South-East:	EP-2
	West:	EP-2, EP-4 at recess, changing station and hook
(d)	Ceiling:	ACT-2
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D72)
(g)	Toilet Partitions:	TP-1

(76)**Elevator Disconnect Room 214B:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	EP-2
(d)	Ceiling:	ACT-1
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D73B)

(77)**Activity Room 4 215:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	Walls: North-South:	EP-4
	East:	EP-2
	West:	EP-2, Cabinetry
(d)	Ceiling:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D70B w/VP, D73A w/VP)
(g)	Cabinets:	PL-1
(h)	Countertop:	QZ-1

(78)**Space 216: Not Used**

(79)**Elevator 217:**

(a)	Floor:	RES-1
(b)	Base:	By Elevator Manufacturer
(c)	Walls:	By Elevator Manufacturer
(d)	Ceiling:	By Elevator Manufacturer
(e)	Door Frame:	By Elevator Manufacturer
(f)	Door:	By Elevator Manufacturer

(80)**Corridor 218:**

(a)	Floor:	RES-1
(b)	Base:	RB-1, Glass Rail Base
(c)	Walls: North-East-West:	P-2, East Wall near D75: FE Cabinet
	South:	Glass Rail System, P-2
(d)	Ceiling:	ACT-1 (connects with ACS-2 over Entrance Lobby 102)
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D60 w/VP, D73B, D75 w/VP), SS elevator doors
(g)	Window Sills:	QZ-1
(h)	Wall Protection:	CG-1 (3 units)

(81)**Vestibule 219:**

(a)	Floor:	CPT-1
(b)	Base:	RB-1
(c)	Walls: North-East-South:	P-2
	West:	P-4
(d)	Ceiling:	ACT-1
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D75 w/VP, D76 w/VP)
(g)	Window Sill:	QZ-1
(h)	Shade:	DR-1 (1 unit)

(82)**Furniture and Equipment Storage 220:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	EP-2
(d)	Ceiling:	DF-1, roof hatch
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D77)

(83)**Community Room 2 221:**

(a)	Floor:	CPT-1
(b)	Base:	RB-1
(c)	All Walls:	P-2
(d)	Ceilings: GB Soffits:	P-2
	Remaining:	ACT-1
	Lt. Cove Interior:	PL-4
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D76 w/VP, D77)
(g)	Window Sills:	QZ-1
(h)	Shades:	DR-1 (6 units)

(84)**Pantry Storage 222:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	All Walls:	EP-2
(d)	Ceiling:	ACT-2
(e)	Door Frame:	P-2
(f)	Door:	WD-1 (D80)

(85)**Catering Kitchen 223:**

(a)	Floor:	RES-1
(b)	Base:	RB-1
(c)	Walls: North-South:	EP-2, CT-1, Cabinetry
	East-West:	EP-2
(d)	Ceiling:	ACT-2
(e)	Door Frames:	P-2
(f)	Doors:	WD-1 (D79 w/VP, D80)
(g)	Cabinetry:	PL-1
(h)	Countertops:	QZ-1

(86) **Exit Corridor 224:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	P-2, East Wall: FE Cabinet
(d) Ceiling:	ACT-1
(e) Door Frames:	P-2
(f) Doors:	WD-1 (D78, D79 w/VP, D81 w/VP)
(g) Wall Protection:	CG-1 (4 units)

(87) **IT Closet 225:**

(a) Floor:	RES-1
(b) Base:	RB-1
(c) All Walls:	EP-2
(d) Ceiling:	ACT-1
(e) Door Frame:	P-2
(f) Door:	WD-1 (D78)

(88) **Stair 3 226:**

(a) Floors/Landings:	RES-1
(b) Base:	RB-1
(c) Stair Treads/Risers:	RSTR-1
(d) Stair System/Rails:	Painted to match rubber stair treads/risers
(e) Walls: North-South-East:	EP-2
West:	EP-4
(f) Ceiling:	ACT-1
(g) Door Frame:	P-2
(h) Door with VP:	WD-1 (D81)
(i) Window:	Aluminum Storefront/Glass
(j) Window Sill:	QZ-1

D. Interior Finish Schedule: Pool Access Building

(1) **Lobby 101:**

(a) Floor w/Integral Base:	RF-1
(b) Walls: North-South:	RW-1, CT-2 @ Recesses, South at D04 Exit: FE Cabinet
East:	RW-1
West:	Aluminum Storefront/Glass
(c) Ceiling Metal Decking:	P-5
(d) Exposed Structural Steel:	P-1
(e) Doors/Frames:	Aluminum/Glass (D01, D03, D04)
(f) Countertop:	QZ-2

(2) **Reception 102:**

(a) Floor w/Integral Base:	RF-1
(b) All Walls:	RW-1
(c) Ceiling Metal Decking:	P-5
(d) Exposed Structural Steel:	P-1
(e) Cabinetry:	PL-2
(f) Countertops:	QZ-2
(g) Base at Cabinetry Toekick:	RB-3
(h) Roof over Life Guard 103:	PL-4

(3) **Life Guard Office 103:**

(a)	Floor w/Integral Base:	RF-1
	Base at Cabinetry:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Door/Frame:	Aluminum/Obscure Glass (D08)
(f)	Counter Shutter:	Stainless Steel
(e)	Cabinetry:	PL-2
(f)	Countertop at Cabinetry:	QZ-2
(g)	Shutter Sill:	DK-1

(4) **Hall 104:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Doors/Frames:	Aluminum/Obscure Glass (D05, D06)

(5) **Locker Room 105:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Lockers:	LK-1

(6) **WC and Lavatories 106:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Toilet Partitions:	TP-2

(7) **Showers 107:**

(a)	Floor w/Integral Base:	RF-1
(b)	Walls: North:	RW-1, Changing Station
	South:	RW-1, Showers w/SS Seats, Shower Rods/Curtains
	West:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1

(8) **Storage 108:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Door/Frame:	Aluminum/Obscure Glass (D07)

(9) **Hall 109:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Doors/Frames:	Aluminum/Obscure Glass (D02, D09)

(10) **Locker Room 110:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Lockers:	LK-1

(11) **WC and Lavatories 111:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Toilet Partitions:	TP-2

(12) **Showers 112:**

(a)	Floor w/Integral Base:		RF-1
(b)	Walls:	North:	RW-1, Changing Station
		South:	RW-1, Showers w/SS Seats, Shower Rods/Curtains
		West:	RW-1
(c)	Ceiling Metal Decking:		P-5
(d)	Exposed Structural Steel:		P-1

(13) **Utilities: 113:**

(a)	Floor w/Integral Base:	RF-1
(b)	All Walls:	RW-1
(c)	Ceiling Metal Decking:	P-5
(d)	Exposed Structural Steel:	P-1
(e)	Door/Frame:	Aluminum/Obscure Glass (D10)

092500: GYPSUM BOARD

1. GENERAL
   A. Scope: Includes all labor, materials, tools, and equipment necessary for the complete installation of gypsum wall surfaces on walls and ceilings shown on drawings and finish schedules.
   B. Codes and Standards Compliance: ANSI A108, ANSI A118.9. ASTM C475, ASTM C840, ASTM C919, ASTM C1002, ASTM C1047, ASTM C1178, ASTM C1288, ASTM C1325, ASTM C1396, ASTM C1629, ASTM C1658, ASTM C1766, ASTM D3273, ASTM E119, ASTM E814, ASTM G21, IBC, ASTM, UL, State and Local Codes
   C. Quality Assurance:
      (1) For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
      (2) Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
      (3) Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
   D. Pre-installation Meeting: Prior to start of each type of gypsum wallboard system, and at the General Contractors direction, meet at the site and review the installation procedures and coordination with other work. Meeting shall include Contractor, Architect and major material manufacturer as well as the Installer and other subcontractors whose Work must be coordinated with the gypsum wallboard work.
   E. Submittals: Submit product data description complying with specified requirements and installation requirements for each type of gypsum product. Mark manufacturer's literature to include only those products proposed to be used.
   F. Mockup: Provide 8' x 8' mockup of gypsum work for approval before proceeding in level finish required for the project (level 5).
   G. Warranties and Guarantees: Warrant against all defects in material and workmanship for a period of one (1) year.
   H. Cross References: 018000: Cleaning
      042200: Concrete Masonry Units
      054000: Light Gage Metal Framing
      055140: Fixed Wall Ladders
      057310: Dry Glazed Glass Railing System
      072000: Insulation
      079000: Caulking and Sealants
      079500: Expansion Control
      081100: Hollow Metal Doors and Frames
      084113: Entrances and Storefronts
      090001: Color Scheme
      093100: Tiling
      095000: Acoustical Metal Ceiling System
      095100: Acoustical Ceiling Systems
      096510: Rubber Base, Treads and Risers
      098413: Sound Control
      099100: Painting
      102600: Wall Protection
      104260: Signage
      105000: Lockers
      105200: Fire Protection Specialties
      108000: Accessories
      122413: Window Roller Shades
      142123: Machine-Room-Less Electric Traction Passenger Elevators

I. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Framing Members: See 054000: Light Gage Metal Framing

B. Interior Gypsum Board:

(1) Quality Standard: National Gypsum, USG, Georgia-Pacific Gypsum, Custom Building Products. Alternates must be submitted to the Architect before bid day for approval.

(2) High-Flex Gypsum Board: ASTM C1396. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

(a) Thickness: ¼”
(b) Long Edges: Tapered
(c) Mold Resistance: ASTM D3273
(d) Must be applied in two layers.
(e) Quality Standard: Gold Bond High Flex Gypsum Board

(3) Abuse-Resistant Gypsum Board: ASTM C1629

(a) Thickness: 5/8”, Type X
(b) Long Edges: Tapered
(c) Mold Resistance: ASTM D3273
(d) To be used for wall and ceiling applications
(e) Quality Standard: Gold Bond XP Hi Impact Gypsum Board

(4) Moisture and Mold-Resistant Gypsum Board: ASTM C1396. With moisture and mold resistant core and paper surfaces.

(a) Core: 5/8”, Type X
(b) Long Edges: Tapered
(c) Mold Resistance: ASTM D3273
(d) Quality Standard: Gold Bond XP Gypsum Board

(5) Glass Mat Tile Backboard: ASTM C1178

(a) Core: Water-resistant gypsum core covered with coated fiberglass mat facer and back
(b) Edges: Manufacturer’s standard edge
(c) Mold Resistance: ASTM D3273
(d) Quality Standard: Durock

(6) Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325

(a) Core: 7/16” Stable Portland cement, EPS beads, aggregates with fiberglass mesh-reinforcement.
(b) Edges: Manufacturer’s standard edge
(c) Mold Resistance: ASTM D3273
(d) Quality Standard: WonderBoard Lite

C. Exterior Gypsum Board:

(1) Exterior Gypsum Soffit Board: ASTM C1396

(a) Core: 5/8”, Type XP with heavy, mold and moisture resistant paper
(b) Edges: Manufacturer’s standard edge
(c) Containing extra mold-inhibiting properties
(d) Quality Standard: National Gypsum XP Fire-Shield Gypsum Board

D. Trim Accessories:

(1) Interior Trim: ASTM C1047

(a) Corner Reinforcement: Galvanized steel with 1 - 1/4" wide, fine expanded mesh flanges.
(b) Metal Jamb, Ceiling and Casing Trim: Manufacturer's standard "L" and "U" shaped galvanized members with fine expanded mesh flanges; "mud-in" type for finishing with joint compound.
(c) Control Joints: Roll-formed galvanized steel.
(d) "Z" Furring Channels: Minimum 25 ga. galvanized steel 1/2" depth.
(e) Cold-Rolled Channels: Minimum 16 ga. steel galvanized or black asphaltum painted 3/4" deep.
(f) Furring Channel Clips: Manufacturer's standard type for attachment of furring channels to cold-rolled runner channels.
(g) Ceiling Hangers: Minimum eight ga. galvanized annealed steel wire.
(h) Tie Wire: Minimum 18 ga. galvanized annealed steel wire.

(2) Exterior Trim: ASTM C1047

(a) Material: Hot-dip galvanized steel sheet, plastic or rolled zinc.
(b) Shapes:

1. Cornerbead
2. LC-Bead: J-shaped
3. Expansion Control Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

E. Joint Treatment Materials: Comply with ASTM C475

(1) Joint Tape:

(a) Interior Gypsum Board: 10-by-10 self-adhesive glass mesh.
(b) Exterior Gypsum Soffit Board: 10-by-10 self-adhesive glass mesh
(c) Glass-Mat Gypsum Sheathing Board: 10-by-10 self-adhesive glass mesh.
(d) Tile Backing Panels: As recommended by panel manufacturer.

(2) Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

(a) Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
(b) Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

1. Use setting-type compound for installing paper-faced metal trim accessories.

(c) Fill Coat: For second coat, use setting-type, sandable topping compound.
(d) Finish Coat: For third coat, use setting-type, sandable topping compound.
(e) Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

(3) Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

(4) Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.
3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting type, sandable topping compound.

(5) Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Sound Attenuation Control:

(1) Fibrex, Inc., Sound Control Blankets
(2) Rockwool Industries, Premium Brand Sound Attenuation Batts.
(3) U.S. Gypsum Co., Thermafiber Sound Attenuation Blankets.
(4) Certainteed: Fiber Glass Sound Control Batts.

(a) Characteristics: Thickness indicated on drawings, 3.0 pcf density, paperless, semi-rigid mineral wool fiber blanket.

(5) Acoustical Sealant: Non-hardening, non-skinning synthetic rubber.
(6) Acoustical Tape: Closed cell polyvinyl chloride foam tape 1/4" thickness by 1" wide.

G. Fasteners:

(1) For attaching metal runner and furring channels to concrete and masonry surfaces: Powder actuate type capable of withstanding 193 lbs. single shear and 200 lbs. bearing force without exceeding allowable stress design of fastener or member being fastened.

(2) For fastening to metal decking and for fastenings framing members together: Type S, pan head, in sizes recommended by wallboard manufacturer for applications indicated.

(3) Screws for Wallboard and Accessory Application:

(a) For application of single layer or base layer of wallboard to metal framing: 1" Type S, bulge head.
(b) For application of face layer of wallboard to metal framing in double layer construction: 1 - 5/8" Type S, bugle head.
(c) For wallboard-to-wallboard application: 1 - 1/2" Type G, bugle head.

1. Nails: Meeting ASTM C514-77, annular-ring type, 1 - 1/4" long.
2. Nails for Fire-Rated Board: 1 - 5/8" long cement coated 13 ga. nail.

H. Gypsum Board Finishes: The project requires a level 5 finish throughout.

(1) Level 0: No taping, finishing or accessories required. Level 0 applied to temporary construction.
(2) Level 1: All joints and interior angles shall have tape embedded in joint compound. Surfaces shall be free of excess joint compound. Tool marks and ridges are acceptable. Level 1 applies to plenum areas above ceilings and attics.

(3) Level 2: All joints and interior angles shall have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Level 2 applies to water resistant gypsum board used as a substrate for tile.
(4) Level 3: All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks with ridges. The prepared surface is to be coated with primer prior to the application of final finishes. Level 3 applies to surfaces to receive heavy texture spray finishes or heavy grade wallcoverings.
(5) Level 4: All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges. The prepared surface is to be coated with primer prior to the application of final finishes. Level 4 applies to surfaces to receive light textures or wallcoverings.
(6) Level 5: All joint and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. The prepared surface is to be coated with primer prior to the application of final finishes. Level 5 applies to all gloss, semi-gloss, enamel or non-textured flat painted surfaces.

I. Design Assembly: See Appendix A for wall design assemblies required for this project.

3. EXECUTION

A. Storage and Handling of Material:

(1) Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
(2) Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging. Stack gypsum board so that long lengths are not over short lengths.
(3) Handle gypsum board to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads and trim.
(4) Store adhesives in dry area. Provide protection against freezing at all times.
(5) Do not over load floor systems.

B. Project Conditions: Installation of wallboard joint treatments shall not start until the space to receive treatments is heated to maintain a continuous and uniform temperature of not less than 55° F one week prior to beginning of joint treatment application and until joint treatment is completed and thoroughly dry. Ventilation, either natural or supplied by fans, circulators or air conditions systems shall be provided to remove excess moisture during joint treatment application and dry time.

C. Workmanship and Installation:

(1) Framing and Furring Installation:

(a) Runners:

1. Attach at floor and underside of 1/2" plywood underlayment with specified fasteners spaced at 1'-4" o.c. maximum.
2. Where partitions are indicated to stop at 6" above finish ceiling, attach to ceiling suspension system using 1/8" toggle bolts or sheet metal screws spaced at 1'-4" o.c., maximum.

3. Install runners indicated to receive sound attenuation blankets in two beads of acoustical sealant, continuous.

(b) Studs:

1. Position full length studs vertically, spaced at 2'-0" o.c. maximum, except for 1-5/8" studs which are spaced at 12" o.c. maximum, engaging floor and ceiling runners. Attach with specified fasteners.
2. Provide double studs at interior and exterior corners, expansion joints, partition termination and within 2" of door and borrowed lite openings in partitions. Locate next stud not more than 6" from double studs.
3. Secure abutting and intersecting walls with fasteners through stud flanges.
4. For horizontal reinforcement at door and borrowed lite frames, install cut to length runner sections with slit flanges secured to studs.
5. Install acoustical tape on metals studs in walls to receive sound attenuation blankets which abut to other studs or dissimilar surfaces.

(c) Furring:

1. Attach to APC substrate with fasteners spaced at 2'-0" o.c. on alternating furring channel flange.
2. Position channels vertically, spaced at 2'-0" o.c. maximum.

(2) Ceiling and Soffit Suspension Systems:

(a) Provide complete suspension system including hangers, main runner channel, furring channels and attachments. Sizes, locations and spacing shall conform to wallboard manufacturer's product data.
(b) Secure to structural framing members by attaching to metal clips designed for the type of member involved or, where possible, by looping and wire-tying directly to member. For steel joist spacing of 2'-0" or less, tie furring channels directly to joists. For spacing greater than 2'-0" o.c., suspend furring channels on cold-rolled channels at spacing specified hereinafter.
(c) Secure to concrete by wire-tying to cast-in-place hanger wires or hanger inserts, installed prior to placing of concrete, or by powder actuated fasteners which develop full strength of hanger. Coordinate placement of wire hangers or inserts with concrete work.
(d) Hangers:

1. Space hangers at 4'-0" o.c., maximum, in each direction.
2. Wrap wire a minimum of three times horizontally, turning ends upwards.

(e) Provide extra hangers within 6" of ends of main runners and to support light fixtures, ceiling diffusers and grilles, access panels and other items resting in or on ceilings. At control joints, provide extra hangers to support discontinuous runners.
(f) Locate hangers plumb in relation to main runners and to avoid contact with insulation covering ducts and pipes. Do not pass hangers through ducts. Alter spacing of hangers or splay hangers to avoid ducts and other obstructions, but do not exceed maximum allowable ceiling areas to be supported by each hanger. Offset horizontal forces of splayed hangers by countersplaying or bracing.
(g) Install cold-rolled channels at 4'-0" o.c., maximum, running perpendicular to structure. Install furring channels perpendicular to cold-rolled channels at 1'-4" o.c., maximum for 1/2" thickness wallboard or 2'-0" o.c., maximum for 5/8" thickness wallboard.
(h) Locate main runners within 6" of parallel walls to support ends of cross-furring.
(i) Locate furring channels perpendicular to main runners and not more than 2" from parallel walls. Attach to main runners at each intersection with a double strand of 16 ga. wire.
(j) Do not abut runners or furring into masonry or concrete construction; allow not less than 1" clearance between such construction and ends of runners or furring.

(k) Splice main runners and furring channels by overlapping, with flanges of channels interlocked, and wire tie each end of splice with not less than double strand of 16 ga. wire. Overlap not less than 1'-0" for main runner splices and not less than 8" for furring channels.
(l) Provide additional ceiling framing as required to frame openings. Coordinate support framing with the work of other trades.
(m) At control joints, provide discontinuous lap in main runners and accessories occurring over joints. Do not bridge joints with cross-furring where joints run perpendicular to furring. Where joints run parallel to furring, provide furring to support each side of joint.

(3) General Drywall Application:

(a) Install wallboard in accord with manufacturer's product data, except where more stringent requirements are specified.
(b) Use wallboard of maximum lengths to minimize end joints. Stagger end joints.
(c) Abut wallboards without forcing. Fit ends and edges of wallboard. Do not place butt ends against tapered edges.
(d) Support ends and edges of wallboard panels on framing or furring members except for face layer of multiple layer work.
(e) Install wallboard accessories in accord with wallboard manufacturer's product data and as follows:

1. Control Joints: Install in walls and ceilings at locations show, not exceeding 30'-0" o.c.
2. Corner Bead: Install at all external corners.
3. Metal Trim Shapes: At exposed edge of wallboard at door and window openings, at intersections with other materials and at intersections of walls with ceilings.
4. Install accessories using specified fasteners.

(f) Install sound attenuation blankets at locations indicated.
(g) Install moisture resistant wallboard in toilet areas.
(h) For fire rated construction, comply with requirement of tested assemblies scheduled on the drawings.
(i) Continue all required components of fire rated wall assembly to overhead structure. Apply joint tape and one coat of compound to wallboard joints concealed from view in completed work.
(j) Seal openings and penetrations in fire rated construction using mineral fiber or foam firestop safing insulation specified in Building Insulation section.
(k) Identify fire rated partitions above finished ceiling line with stenciled red lettering reading "FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS". Apply lettering in approximately 1-1/2" high letters. Space approximately 10'-0" o.c. Apply to both sides of partitions.

(4) Installation of Cement Backer Board:

(a) General:

1. Framing members shall comply with local building codes and be spaced a maximum of 16" on center.
2. Control Joints: Finished surfaces longer than 16' in a continuous plane or surface abutting a dissimilar structure should be protected from structural movements with control (expansion) joints. Location width and details of control joint should follow local building codes.
3. Waterproofing: If the area behind the backerboard is to be kept free from moisture or steam a water-proof membrane must be installed to protect the cavity.

(b) Floors:

1. Subfloor: Plywood shall be securely glued and fastened to floor joists spaced a maximum of 16" o.c. A 1/8" wide gap shall be provided at all plywood joints to allow for expansion.
2. Underlayment: Using a 1/4" square-notched trowel apply a setting bed of latex-portland cement mortar to the subfloor. Install Wonder-Board to subfloor leaving a 1/8" to 3/16" space between boards at all joints and corners. Fasten backerboard every 8" o.c. throughout board field and around all edges while setting bed mortar is still workable. Around perimeter of each board locate fasteners within 1/2" to 2" of edge. Fill all joints solid with latex-portland cement mortar. Taping of floor joints is not required.

(c) Walls:

1. Framing: Studs shall be spaced a maximum of 16" o.c. (Edges/ends of backerboard parallel to framing shall be continuously supported. Provide additional blocking when necessary to permit proper backerboard attachment). Do not install backerboard directly over protrusions from stud plane such as heavy brackets
or fastener heads. Studs above shower floor shall be either notched or furred to accommodate the
thickness of the waterproof membrane or pan. The surround opening for a tub or precast shower receptor shall not be more than 1/4" longer than unit to be installed.
2. Backerboard: Precut Wonder-board panels and made necessary cutouts. Install backerboard leaving a 1/8" to 3/16" space at all joints and corners. Stagger board joints with those of adjacent rows. Fasten backerboard every 8" o.c. in field and within 1/5" to 2" of edges around backerboard perimeter. At all joints and corners pre-fill gap with bonding material then imbed 2" mesh tape and smooth material over joint and corner.
3. See details.

(5) Single Layer Application:

(a) Ceilings: Apply 5/8" gypsum board with long dimension at right angles to framing. Terminate edges of wallboard running parallel to framing on framing members.
(b) Walls:

1. Apply 1/2" gypsum board vertically or horizontally at Contractor's option except as required by wallboard manufacturer's product data for system design, including acoustical and fire rated partitions.
2. Stagger end joints in opposite sides of partitions.
3. Terminate edges of wallboard running parallel to framing or furring on framing or furring members.

(c) Fastening: Attach wallboard using fasteners specified at spacing required by manufacturer's product data.

(6) Joint Treatment:

(a) Apply joint compound to joints and angles in wallboard and embed joint tape. Apply two additional coats of compound over tape, featheredging and sanding each coat.
(b) Apply minimum of three coats of compound to fastener depressions, sanding each coat and bringing to level plane with wallboard surface.

(c) Fastener Pop: Drive new fastener approximately 1-1/2" from popped fastener and repair to match wallboard finish.
(d) Fill cracks with joint compound and sand smooth and flush.
(e) Dust surfaces and leave ready for decoration. Joint and fastener treatment shall be indistinguishable in finished work.

(7) Tolerances:

(a) Allowable Tolerances in Finished Ceilings:

1. Deflection: Suspension system components, hangers and fastening devices supporting lighting fixtures, ceiling grilles and acoustical units shall have maximum deflection 1/360 of span, tested in accord with ASTM C635-83.
2. Bow, camber, and twist. Not exceeding tolerances established by ASTM C635-83.
3. Variation from level in finished ceiling: +/- 1/8" in 12'-0".
4. Variation in plane of adjacent wallboard panels prior to joint treatment: 1/16".

(b) Allowable Tolerances in Framed Wallboard Construction:

1. Position: +/- 1/4" maximum variation from design position.
2. Alignment: 1/8" in 8'-0"; 1/4" maximum in any continuous wall, line or surface.
3. Surface Plane: 1/8" in 12'-0"; 1/16" in 1'-0", maximum variation in true surface plane.
4. Surface Smoothness: No joint or fastener location, roughness or blemish discernible after application of finish when viewed at any angle from a distance of 5'-0" under occupancy lighting conditions with surface preparation as specified in Painting section.

C. Protection of Adjacent Work: Contractor shall insure no damage is done to finishes that are completed. Specifically, do not get compound and gypsum dust on marble flooring, ceramic tile, vinyl base, ceiling tile. If sanding of gypsum board is necessary after these materials are installed drop clothes will be installed while work is being done.

D. Cleaning: See 018000: Cleaning

093100: TILING

1. GENERAL

A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete installation of the work shown on the drawings, finish schedule and specified herein.

B. Codes and Standards Compliance: ADA, ANSI A108.1, ANSI A108.5, ANSI A108.10, ANSI A108.13, ANSI A118.3, ANSI A118.4, ANSI A118.4, ANSI A118.5, ANSI A118.6, ANSI A118.7, ANSI A118.10, ANSI A136.1, ANSI A137.1, ASTM C136, ASTM C144, ASTM C150, ASTM C207, ASTM C373, ASTM C503, ASTM C623, ASTM C627, ASTM C847-95, ASTM C933-96a, ASTM C1028, ASTM D87, ASTM D226, ASTM D4397, ASTM E90, ASTM E413, ASTM E492, ASTM E989, TCA 245, TCA F113, TCA B422-01, TCA W202-CE, IBC

C. Quality Assurance:

(1) Only craftsmen who have a demonstrable skill to perform the work specified herein shall be employed. A firm with a minimum of five (5) years successful documented experience with work comparable to that required for this project shall be used.
(2) Conform to ANSI Recommended Standard Specifications for Ceramic Tile – A137.1
(3) Conform to TCA Ceramic Tile: The Installation Handbook.

D. Submittals:

(1) Shop Drawings:

(a) Submit shop drawings indicating tile layout, patterns, color arrangements, perimeter conditions, junctions with dissimilar materials, thresholds and setting details.
(b) Locate and detail expansion and control joints.

(2) Product Data: Submit product data, specifications, and instructions for using mortars, adhesives and grouts.
(3) Samples:

(a) Submit color samples illustrating full color range of each type tile.
(b) Install a mock-up onsite of all tile types used on project for approval by Architect. Mock-up should be a minimum of 4 tiles and 4’ x 4'. If approved, mock-up may be a part of the project.
(c) Submit manufacturer’s full range of grout samples for Architect’s selection.

(4) Submit manufacturer’s maintenance instructions.

E. Warranties and Guarantees:

(1) Provide a one (1) year installation warranty.
(2) Provide manufacturer’s standard material warranty.

F. Cross Reference: 018000: Cleaning
035410: Underlayment
064100: Cabinetry
066116: Solid Surface Fabrications
066123: Ultracompact Surfacing Countertops
079000: Caulking and Sealants
090001: Color Scheme
092500: Gypsum Board
095100: Acoustical Ceiling Systems
104260: Signage
108000: Accessories
Interior Elevations

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Products: Tile by American Olean and Florida Tile. See 090001: Color Scheme for specific tile and trim information. Other tile may be acceptable if it meets or exceeds the quality standard. All alternates must be submitted to the Architect for approval before bid date.

(1) Porcelain Floor Tile PFT1:

(a) Style: American Olean Theoretical
(b) Color/Finish: Creative Gray TH96
(c) Size: 24" x 24"
(d) Grout: Laticrete, #78 Sterling Silver
Spectralock Pro Premium Grout
(e) Transitions: See paragraph 2.E herein, drawing details on A2.09 and A2.10 and 090001: Color Scheme
(f) Locations: Men Restroom 112, Family Restroom 114, Women Restroom 115, Men 151, Women 152, Women 213, Men 214A

(2) Porcelain Wall Tile PWT-1:

(a) Style: American Olean Theoretical
(b) Color/Finish: Creative Gray TH96
(c) Size: 12" x 24"
(d) Grout: Laticrete, #78 Sterling Silver
Spectralock Pro Premium Grout (in bathrooms)
Permacolor (behind drinking fountain and plaques)
(e) Locations: Corridor 111 (drinking fountain recess), Family Restroom 114, Corridor 132 (behind plaques), Men 151, Women 152

(3) Porcelain Wall Base PWB-1:

(a) Style: American Olean Theoretical
(b) Color/Finish: Creative Gray TH96
(c) Sizes: 12” x 24” cut as directed:
1. Men 151, Women 152: Install base at walls without wall tile to match wall tile bottom cut tile (+/-4”). Verify with Architect before cutting tile.
2. Men Restroom 112, Family Restroom 114, Women Restroom 115, Women 213, Men 214A: Base height at first CMU course (+/-8”). Verify with Architect before cutting tile.
(d) Grout: Laticrete, #78 Sterling Silver
Spectralock Pro Premium Grout
(e) Trim Cap: See paragraph 2.E(3) herein and 090001: Color Scheme
(f) Locations: Men Restroom 112, Family Restroom 114, Women Restroom 115, Men 151, Women 152, Women 213, Men 214A

(4) Backsplash Tile CT-1:

(1) Style: American Olean Color Story Wall
(2) Color/Finish: Matte Designer White, 0061
(3) Size: 4” x 12”
(4) Grout: Laticrete Permacolor Select, #09 Frosty
(5) Edge Trim: See paragraph 2.E herein and 090001: Color Scheme.
(6) Locations: Catering Kitchen 107, Concessions 131, Breakroom 149, Catering Kitchen 223

(4) Wall Tile: CT-2

(1) Style: American Olean Color Story Wall
(2) Color/Finish: Sapphire Sky, 0070
(3) Size: 4” x 16”
(4) Grout: TEC AccuColor Plus, #953 Starry Night
(5) Locations: Pool Access Building Drinking Fountain and Bulletin Board Alcoves. Tile to cover full alcove wall recess and side walls.

(5) Exterior Terrace Pavers:

(1)	Style:	Florida Tile Passenger
(2)	Color/Finish:	Leisure Gray, PSG40U
(3)	Size:	24” x 36” x 2cm thick
(4)	Paver Thin Set:	Laticrete 4XLT
(5)	Grout:	Laticrete Permacolor, Color: #78 Sterling Silver
(6)	Location:	Recreation Center Terrace

B. Mortar (Setting Materials):

(1) TCA Specification F113/CE
(2) Dry Set Mortar confirming to ANSI A118.1 (Dry Set Portland Cement Mortar)
(3) Latex-Portland Cement Mortar conforming to ANSI A118.4 (Latex-Portland Cement Mortar)
(4) Water: Potable without impurities and debris.

C. Bonded Waterproof Membrane: Laticrete Hydro Ban Sheet Membrane. Coordinate membrane with drainage system.

D. Elastomeric Waterproof Membrane: Laticrete Hydro Ban. Coordinate with bonded membrane.

E. Tile Edge Transitions:

(1) Between Porcelain Tile and Resilient Flooring: Schlüter Reno-U. Color: Brushed Stainless Steel.
(2) Between Porcelain Tile and Carpet: Schlüter Reno-TK. Color: Brushed Stainless Steel.
(3) Exposed Porcelain Tile Edges and Wall Base Cap: Schlüter Jolly. Color: Brushed Stainless Steel.

F. Cementitious Backer Units: Durock Cement Board

(1) Product Characteristics:

(a) Cementitious composition with glass fiber reinforcement.
(b) Product specifically manufactured as substrate material for application of ceramic tile in wet areas.
(c) Comply with ANSI A118.9
(d) Thickness: ½ inch minimum or as indicated on drawings.

(2) Accessories:

(a) Fasteners: Corrosion resistant type required by board manufacturer for securing units.
(b) Joint Reinforcement Tape:
1. 2-inch nominal width
2. Polymer coated fiberglass mesh of type recommended by board manufacturer.

(3) Vapor Retarder:

1. Comply with ASTM D4397
2. Thickness and Maximum Permeance Rating: 4.0 Mils
3. Vapor Retarder Tape: Pressure-sensitive tape of type require by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

G. See drawing details for specific installation requirements for all tile installation locations. See also TCNA F115, F115A, W202E, W244E and F102 for TCNA installation details specific to this project.

3. EXECUTION

A. Storage and Handling of Materials:

(1) Deliver materials in original containers with labels legible and intact, identifying brand name and contents.

(a) Tile cartons shall be grade-sealed by manufacturer in accord with ANSI A137.1 with grade seals unbroken.
(b) Manufactured mortars, and adhesives and grouts shall bear hallmarks certifying compliance with specified standards.
(c) Keep tile, mortar, and grout in dry areas.
(d) Provide one carton of extra tile in each size.

(2) Environmental Conditions:

(a) Set and grout tile in Portland cement mortar and grout when ambient temperature is at least 50 degrees F and maintained for seven (7) days thereafter.
(b) Comply with minimum temperature recommendations of manufacturers for manufactured setting and grouting materials.

B. Preparation of Area:

(1) Surface to be tiled shall be firm, clean, and free of loose dirt, foreign matter, oily or waxy films.
(2) Surface to be tiled shall be checked for variations in surface level, which shall not exceed 1/4" in 10'. Report all unacceptable surfaces to Architect, and do not tile such surfaces until they are leveled to meet above requirements.

C. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

D. Manufacturer's Instructions and/or Literature: Strictly comply with Manufacturer's written instructions.

E. Workmanship and Installation:

(1) Floor Tile Specifications:

(a) B422-01: Solid Backing with Integrated Bonding Flange for Bonded Waterproofing Membranes (showers):

1. Requirements:

a. To be used with Methods W201, W241, W243, or W244. These methods to be used in conjunction with ANSI A118.10 bonded waterproof membrane.
b. Slope mortar bed ¼” per ft. to drain collar.
c. Bonded waterproof membrane (ANSI A118.10).

2. Materials:

a. Liquid applied waterproofing per ANSI A118.10.
b. Latex Portland cement mortar per ANSI A118.4.
c. 100% Epoxy Resin Grout per ANSI 118.3

3. Preparation by Other Trades:

    a. Maximum variation in subfloor ¼" in 10'-0" from the required plane.
    b. Slope subfloor ¼" per foot to drain.

4. Preparation by Tile Trade: Waterproof membrane installed to comply with pertinent codes and manufacturer's directions.
5. Membrane Installation: Membrane manufacturer's directions.
6. Installation Specifications: Tile ANSI A108.5.
7. Movement Joint: See Drawings.

(b) F115-01: Dry-Set Mortar, Epoxy Grout

1. Requirements: Concrete must be free of cracks.
2. Materials: Epoxy Grout per ANSI A118.3
3. Preparation by Other Trades:

    a. Steel trowel slab and fine broom finish free of curing compounds (when used, mechanical scarifying is necessary).
    b. Maximum variation in the slab ¼" in 10'-0" from the required plane.

4. Tile Installation and Movement Joints: Follow method F112 or F113.

5. Installation Specifications:

    a. Tile: ANSI A108.5
    b. Epoxy Grout: ANSI A108.6

(a) W202-01 Dry-Set Mortar or Latex-Portland Cement Mortar:

1. Materials:

    a. Dry-set mortar per ANSI A118.1
    b. Latex-Portland cement mortar per ANSI A118.4.
    c. 100% Epoxy Resin Grout per ANSI 118.3

2. Preparation by Other Trades:

    a. Surface must be free of coatings, oil, wax.
    b. All concrete should be bush-hammered or heavily sand-blasted.
    c. Maximum variation in the masonry surface ¼" in 10'-0" from the required plane.

3. Movement Joint: See drawings.
4. Installation Specification:

    a. Tile: ANSI A108.5
    b. Epoxy Mortar/Grout: ANSI A108.6

(2) Layout

(a) Center tile within areas to avoid tiles of unequal widths at opposite walls and tiles of less than 1/2 tile width.
(b) Align tile joints straight and parallel to walls.
(c) Align joints in floor and base or wall tile.
(d) See drawings for details.

(3) Cutting and Fitting:

(a) Cut and drill tiles without damaging exposed tile face. Rub cut edges smooth with carborundum stone.

(b) Grind and fit tile at intersections, against trim and at built-in fixtures and accessories.
(c) Fit tile around outlets, pipes, fixtures and fittings so that tile edges are concealed under applied escutcheons, collars or plates.

(4) Joints:

(a) Provide uniform joint widths, equal to pre-spaced tile for ceramic mosaic tile.
(b) Provide 1/16" wide joints flush with tile face.
(c) Form joints in internal vertical corners of wall tile, and where tile abuts dissimilar materials, using sealant in lieu of grout.

F. Completion of Work: Subcontractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

G. Cleaning and Protection of Work:

(1) Apply to all clean, completed tile walls and floors a protective coat of neutral cleaner solution. Do not use Muractic Acid.
(2) In addition, cover all tile floors with heavy-duty, non-staining construction paper, taped in place.
(3) Prohibit all foot and wheel traffic from newly tiled floor for at least three days, preferably seven days.
(4) Place large, flat boards in walkways and wheel ways for seven days where use of newly tiled floors with cement type grout is unavoidable.

095000: ACOUSTICAL METAL CEILING SYSTEM

1. GENERAL

A. Scope: Includes all materials, labor, tools and equipment necessary to provide and install aluminum ceilings, soffits and accessories shown on drawings.

B. Code and Standards Compliance: ASTM A1008, ASTM A641, ASTM A653, ASTM C423, ASTM C635, ASTM C636, ASTM D3273, ASTM E84, ASTM E580, ASTM E1111, ASTM E1414, ASTM E1264, NFPA 70, Federal, State and Local Codes

C. Quality Assurance:

(1) Provide metal ceiling system components produced by a single manufacturer with a minimum 10 years' experience in actual production of specified products and with resources to provide consistent quality in appearance and physical properties, including production in an environmentally controlled indoor facility.
(2) Provide suspension system components produced by a single manufacturer to provide compatible components for a complete metal ceiling system installation.
(3) Perform installation using a firm with installers having no less than 3 years of successful experience on projects of similar size and requirements.
(4) Fire Rating Performance Characteristics: Install system to provide f lame spread of 0-25, complying with certified testing to ASTM E84
(5) Structural Criteria: Install and certify system to comply with structural and wind load requirements of governing codes.
(6) Installation Standard for Suspension System: Comply with ASTM C636
(7) Mock-Up: Prior to beginning installation erect a mock-up section, where directed, suing all system components. Mock-up may be included as a part of construction if approved by the Owner and/or Architect.
(8) Pre-Installation Conference: Prior to start of installation, to review system requirements, shop drawings and all coordination needs.

D. Submittals:

(1) Submit under provisions of 013000: Contractor Submittal Requirements
(2) Product Certification: Manufacturer's certification that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.
(3) Shop Drawings:

(a) Reflected Ceiling Plans: Indicating metal ceiling layout, ceiling mounted items and penetrations.
(b) Suspension System, Carrier and Component Layout. Exterior support system must be stamped by a Georgia licensed structural engineer.
(c) Details of system assembly and connections to building components.
(d) Shop drawings of soffit area and design analysis must bear the seal of a registered professional engineer licensed in the State of Georgia. Design analysis must be on file and furnished by manufacturer upon request.

(4) Samples for Verification: Full-Size units of each type of ceiling assembly indicated; in sets for each color, texture and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.

(a) 11" square metal panel units.
(b) 11" long samples of each exposed molding or trim.
(c) 11" long samples of each suspension component.

(5) Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of components.

E. Warranties and Guarantees:

(1) Provide specified manufacturer's warranty against defects in workmanship, discoloration, or other defects considered undesirable by the Owner and/or Architect.
(2) The warranty shall remain in effect for a minimum period of one (1) year from date of initial acceptance.

F. Cross References: 018000: Cleaning
054000: Cold Formed Metal Framing
072000: Insulation
076000: Flashing and Venting
079000: Caulking and Sealants
090001: Color Scheme
092500: Gypsum Board
095100: Acoustical Ceiling Systems
098413: Sound Control
Division 21: Fire Suppression
Division 23: HVAC
Division 26: Electrical
Reflected Ceiling Drawings
Fire Protection Drawings
Mechanical Drawings
Electrical Drawings

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Armstrong World Industries, Inc. Metalworks Linear Synchro System. Other manufacturers may be acceptable if they meet or exceed the quality standard. All alternates must be submitted to the Architect for approval before bid date.

B. Product Characteristics:

(1) Panel Type: 6” Linear Plank
(2) Finish: Silver Grey
(3) Perforation:

(a) Interior Locations: M2 (Microperforated)
(b) Exterior Locations: M1 (Unperforated)

(4) Edge Profile: Linear
(5) Flame Spread: Class A
(4) Accessories: Provide end caps, splice plates, spreader hold down, cut plan support, main beam carrier, carrier molding, hemmed angle molding, cross tees, pressure spring as required for the installation of the specified plank herein and in location shown on the drawings.
(5) Coordinate integrated lighting and concealed sprinkler heads with covers.
(6) Suspension System (concealed): As required for installation of the linear plank system specified herein.

(a) Hanger Wire: 12-gauge galvanized carbon steel.

C. Extra Materials: Furnish full sized units of panels and ceiling suspension system components equal to 2% of amount installed.

3. EXECUTION

A. Delivery, Storage and Handling of Materials:

(1) Deliver system components in manufacturer's original unopened packages, clearly labeled.
(2) Store components in fully enclosed dry space. Carefully place on skids, to prevent damage from moisture and other construction activities.
(3) Handle components to prevent damage to surfaces and edges, and to prevent distortion and other physical damage.

B. Project Conditions:

(1) Begin system installations only after spaces are enclosed and weather-tight, and after all wet work and overhead work have been completed.
(2) Prior to starting installations, allow materials to reach ambient room temperature and humidity intended to be maintained for occupancy.

C. Coordination: Coordinate work with installation of windows, louvers, and adjacent components or materials.

D. Examination:

(1) Examine substrates and structural framing to which acoustical metal panels attach or about, with installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage, and other conditions affecting performance of metal panel ceilings.
(2) Proceed with installation only after unsatisfactory conditions have been corrected.

E. Preparation: Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

F. Installation: Strictly follow manufacturer’s installation instructions.

G. Adjust and Cleaning:

(1) Adjust components to provide uniform tolerances.
(2) Replace all ceiling panels that are scratched, dented or otherwise damaged.
(3) Clean exposed surfaces with non-solvent, non-abrasive commercial type cleaner.

H. Protection:

(1) Protect installed products until completion of project.
(2) Touch-up, repair or replace damaged products before substantial completion.

095100: ACOUSTICAL CEILING SYSTEM

1. GENERAL

A. Scope: Includes all acoustical suspended ceilings including suspension system and acoustical ceiling tiles. Locations as shown and drawings and 090001: Color Scheme.

B. Codes and Standards: ASTM A1008, ASTM A641, ASTM A653, ASTM C423, ASTM C635, ASTM C636, ASTM E84, ASTM E1414, ASTM E1111, ASTM E1264, ASTM E1477, ASTM D3273, ASTM E119, AWCI, CISCA 0-2, UL, IBC, State and Local Codes

C. Qualifications:

(1) Installer Qualifications: An entity experienced in the installation of acoustical ceiling systems similar to requirements for this project, and acceptable to, or licensed by, acoustical ceiling systems manufacturer.
(2) Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
(3) Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organizations.
(4) Surface Burning Characteristics: Tested per ASTM E84 and complying with ASTM E1264 for Class A products.

a. Flame Spread: 25 or less
b. Smoke Developed: 50 or less

(5) Seismic Performance: Provide acoustical ceiling system that has been evaluated by an independent party and found to be compliant with the 2003 International Building Code, Seismic Category D.

a. Tested per International Code Council: Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-Structural Components as evidenced by International Code Council Evaluation Report, ESR-1308.

D. Cross Reference: 042200: Concrete Masonry Units
079500: Expansion Control
090001: Color Scheme
092500: Gypsum Board
093100: Tiling
095100: Acoustical Metal Ceiling System
102226: Operable Partitions
Division 21: Fire Suppression
Division 23: HVAC
Division 26: Electrical
Division 27: Communications
Reflected Ceiling Drawings
Fire Protection Drawings
Mechanical Drawings
Electrical Drawings
Communication Drawings

E. Submittals:

(1) Product data for each type of ceiling product including acoustical units and suspension system components.
(2) Samples not less than 6 inches square of each type of acoustical ceiling unit.
(3) Samples 8 inches long of each suspension system component including main runner and cross tees.
(4) Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
(5) Manufacturer’s certificate that products meet or exceed specified requirements.

F. Coordination: With all trades, especially with athletic equipment installation and HVAC and electrical contractors.

G. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

(1) Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
(2) Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

H. Warranties:

(1) Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

(a) Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
(b) Grid System: Rusting and manufacturer's defects.
(c) Acoustical Panels designed to resist growth of micro-organisms: Warranty against visible sag and the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

(2) Warranty Period for Humidity Protection: Thirty years (30) from the date of Substantial Completion.

(3) The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

I. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standards: Rockfon and Chicago Metallic. Other manufacturers may be acceptable if they meet or exceed the Quality Standards listed below. All alternates must be submitted to the Architect for approval before the bid date.

(1) Acoustical Lay-In Ceiling Tile:

(a) Rockfon Sonar #16100

1. Size: 2’ x 2’ x 1"
2. Color: White
3. Edge Profile: Square Lay-In
4. Composition: Stone Wool
5. Noise Reduction Coefficient (NRC): 0.95
6. Flame Spread: Class A
7. Minimum Light Reflectance Coefficient (LR): .85
8. Locations: See 090001: Color Scheme for specific locations.

(b) Product Characteristics: USG Sheetrock Brand Lay-In Acoustical Ceiling Panels ClimaPlus 3260

1. Size: 2’ x 2’ x 1/2"
2. Color: White
3. Edge Profile: SQ Lay-In for interface with compatible grid.
4. Composition: Gypsum with vinyl laminated face with sealed back and edge
5. Noise Reduction Coefficient (NRC): NA
6. Ceiling Attenuation Class (CAC): 35
7. Flame Spread: ASTM E1264; Class A
8. Minimum Light Reflectance Coefficient (LR): .77
9. Locations: See 090001: Color Scheme for specific locations.

(2) Suspended Ceiling:

(a) Chicago Metallic Snap-Grid 200 15/16" Double Web Intermediate Duty Non-Fire Rated Suspension System manufactured by Rockfon.

1. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE 7 and ICC ES AC 156. Seismic Zone: C
2. Basic Steel Material and Finish: Commercial quality, CS Type A to ASTM A653, hot-dip galvanized to not less than G30 zinc coating designation.
3. Main Tees and Cross Tees: All suspension main tee and cross tee components to be manufactured from commercial quality steel with factory punched cross tee slots, hanger holes, and integral bayonet-style end couplings. The main tees are to be capped with steel capping affixed to a flange and coated with factory applied baked-on enamel paint.

    a. Structural Classification Standard: ASTM C635 Intermediate Duty
    b. Color: White

4. Perimeter Treatment Components:

    a. Angle Moldings: Manufactured from 0.020” thick steel and finished identical to main tees and cross tees.
    b. Channel Moldings: Manufactured from 0.018” thick steel with factory applied standard white baked-on enamel paint finish.
    c. Shadow Line Moldings: Manufactured from 0.020” thick steel with 3/4” and 3/8” hemmed edge and finished with factory applied standard baked-on enamel paint.

5. Locations: See 090001: Color Scheme for specific locations.

(b) Chicago Metallic 830 Aluminum Light Duty Double Web Suspension System manufactured by Rockfon

1. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE 7 and ICC ES AC 156. Seismic Zone: C
2. Basic Steel Material and Finish: Commercial quality, CS Type A to ASTM A653, hot-dip galvanized to not less than G30 zinc coating designation.
3. Main Tees and Cross Tees: All suspension main tee and cross tee components to be manufactured from commercial quality steel with factory punched cross tee slots, hanger holes, and integral bayonet-style end couplings. The main tees are to be capped with white aluminum capping affixed to a flange and coated with factory applied baked-on enamel paint.

    a. Structural Classification Standard: ASTM C635 Light Duty.
    b. Color: White

4. Perimeter Treatment Components:
    a. Angle Moldings: Manufactured from 0.024” thick aluminum 15/16" wide by 3/4" high by 144" with hemmed edges finished identical to main tees and cross tees.
5. Locations: See 090001: Color Scheme for specific locations.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver ceiling system components in manufacturer’s original unopened packages or containers, with labels intact.
(2) Store all components to provide suitable protection against deleterious effects from exposure to moisture, direct sunlight, or other causes.
(3) Handle all components to preclude damage. Take special precaution to prevent damage to acoustical ceiling unit edges and corners.
(4) Comply with manufacturer’s MDS Sheets for delivery, storage and handling of components.
(5) Before installing acoustical ceiling units, permit them to reach room temperature and at a stabilized moisture content.

B. Project Conditions:

(1) All ceiling products and suspension systems must be installed and maintained in accordance with the manufacturer's installation instructions for that product in effect at the time of installation and best industry practices. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F and 120°F and not subject to abnormal conditions. Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust build-up.
(2) The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supporting insulation materials.

C. Preparation:

(1) Layout ceiling system in accordance with reflected ceiling plans and as acceptable to Architect.
(2) Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
(3) Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

D. Coordination: Coordinate layout and installation with other work supported by, or penetrating through ceiling, including, as applicable, light fixtures, HVAC equipment, fire suppression system components, and partition systems.

E. Installation:

(1) Install suspension system and panels in accordance with the IBC, Section 1621.

(2) Seismic Design Category C Installation: Terminal ends of the runners are secured by attaching the beam end retaining clip to the wall molding and attaching the runners to the beam end retaining clip. The runners have zero clearance at the perimeter on two adjacent walls and with 3/8" clearance on the opposite walls. The clip is attached to the wall molding by sliding the locking lances over the hem of the vertical leg of the wall molding. Beam end retaining clips installed in this manner are an acceptable means of preventing runners from spreading, in lieu of spacer bars required in CISCA 0-2, which is referenced in ASCE 7, Section 9.6.2.6.2.1, which is referenced in IBC Section 1621. Except for the use of the beam end retaining clips as noted above, installation of the ceiling system must be as prescribed by the applicable code. Maximum ceiling weight permitted is 3.35 pounds per square foot.
(3) For Revel Edge Panels: Cut and reveal or rabbet edges of ceiling plans at border areas and vertical surfaces.
(4) Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

F. Adjusting and Cleaning:

(1) Replace damaged and broken panels.
(2) Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
(3) Ceiling Touch-Up Paint: Use manufacturer's matching touch-up paint to hid minor scratches and nicks in the surface.
(4) Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
(5) Remove debris, which may have been caused during installation of this work. See 018000: Cleaning.

096466: WOOD ATHLETIC FLOORING

1. GENERAL

A. Scope: Includes all materials and labor required to install wood athletic flooring throughout project where designated on finish schedule on drawings or otherwise implied in the drawings and the addendum where applicable. Includes game lines and court design as shown on drawings.

B. Codes and Standards Compliance: ASTM F2170, MFMA (Maple Flooring Manufacturers Association), DIN 108032 (part 2) – Performance Test, FSC (Forest Stewardship Council)

C. Quality Assurance:

(1) Manufacturer:

(a) Manufacturer must be an established firm experienced in the field of wood athletic flooring and have been in business for a minimum of ten (10) years.
(b) Manufacturer must be in good standing and a member of MFMA.

(2) Floor Installer:

(a) Installer must be trained and certified by the flooring manufacturer.
(b) Installer must have accredited MFMA installers on-site for the entire duration of the wood flooring installation.
(c) Flooring installer must submit a list of three recently completed projects of similar size and system.
(d) Flooring installer must be in good standing with the wood athletic flooring manufacturer.

D. Submittals:

(1) Shop drawings showing detailed installation especially at thresholds and areas requiring height modifications.
(2) Shop drawings showing floor layout dimensions, game lines, colors and graphics.
(3) Manufacturer's product information including paint used for flooring graphics, game lines and floor finish.
(4) Sample of product.
(5) MFMA recommendations for correct preparation, finishing and testing of concrete subfloor to receive wood flooring. Note: All testing and preparation must be completed by wood athletic flooring installer.
(6) Maintenance Guidelines.

E. Warranties and Guarantees:

(1) Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.
(2) Wood athletic flooring shall be warranted to be free from manufacturing defects for a period of one (1) year. The warranty is in lieu of all other warranties, expressed or implied including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the party of the manufacturer. In the event of breach of any warranty, the liability of the manufacturer shall be limited to repairing or replacing the wood athletic floor system and components supplied by the manufacturer and proven to be defective in manufacture, and shall not include any other damage, either direct or consequential.

F. Cross Reference: 018000: Cleaning
033000: Concrete
035410: Underlayment
042200: Concrete Masonry Units
071900: Underslab Vapor Barrier
090001: Color Scheme
096500: Resilient Flooring
096510: Rubber Base, Treads and Risers
116600: Interior Athletic Equipment
126600: Telescopic Seating

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standard: Robbins Air-Channel Star with Subfloor. Other manufacturers may be acceptable alternates if they meet or exceed the quality standard. Any substitutions to the Quality Standard must be submitted to the Architect before bid date for approval by the Owner and Architect. No substitutions after the bid date will be considered for approved.

B. Product Characteristics:

(1) Vapor Barrier: 6-mil polyethylene.
(2) Subfloor:

(a) Air Channel Star Sleeper that has been factory drilled and assembled with 7/16” Bio-Pads.
(b) 15/32” thick, 4’ x 8’ Exposure 1, APA Rated Sheathing.
(c) Solid blocking at doorways, under bleachers in the stacked position and below portable goals. Install bleacher blocking per manufacturer’s recommendations.

(3) MFMA Northern Hard Maple Wood Flooring:

(a) 25/32” thick x 2 ½” facewidth
(b) Factory Sanded Advantage XL
(c) Seasoning: Kiln Dried
(d) Matching: Tongue and groove on side-match and end-match
(e) Continuous Strip XL
(f) Grade: 2nd and Better
(g) FSC Certified Wood
(h) Flooring to have XL technology to reduce or eliminate routine spacing for expansion.

(4) Fasteners as Recommended by Manufacturer:

(a) Flooring: 1 3/4” barbed cleats or staples.
(b) Subfloor: 1 5/8” to 1 3/4" subflooring nails or staples.
(c) Channel Anchors: 1 1/2" long steel Power Spike anchors or Tapcons

(5) Finishing Materials:

(a) MFMA approved Sealer
(b) MFMA approved Finish

(6) Game Lines and Court Design: Game line and Court Design Paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with finish. See drawings for design and colors.

(7) Perimeter: 3" x 4" ventilating type in black. Note: Provide additional base at walls at Exit Corridors 118 and 122.

(8) Saddle Thresholds: Provide and install ADA compliant saddle thresholds at Wood Athletic Flooring transition to resilient flooring near doors D30, D33, D36, and D37 and at transition to resilient flooring at alcove entrance to Exit Corridors 118 and 122.

(9) Volleyball Inserts: Volleyball inserts will be installed by others for this project. Coordinate with athletic equipment subcontractor as needed. Four inserts to be installed.

(10) Power/Data Floor Boxes: Floor boxes will be provided and installed electrical subcontractor. Coordinate with electrical subcontractor as needed.

(11) Protective floor Covering:

(a) Quality Standard: Facility Armor
(b) Size: Provide 8'-0" wide
(c) Fabrication: 100% recycled polyester nonwoven top cloth fused together with non-skid, extruded moisture barrier backing.
(d) Antimicrobial
(e) Cart: Provide storage transportation cart specifically for floor system with roller for easy storage, installation and removal.
(f) Warranty: 4 years

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, marble and terrazzo work is complete and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of 55-80° F and relative humidity of 35-50% are to be maintained. Ideal installation/storage conditions are the same as those that will prevail when building is occupied.
(2) Materials shall not be stored at the installation location if the in-slab relative humidity level for the concrete slab is above 85% using ASTM F2170 In-Slab Relative Humidity test.

B. Site conditions:

(1) Concrete Slab:

(a) Concrete Slab Depression: 2 5/8" using 25/32" flooring and subfloor.
(b) Surface Finish: Steel Troweled and finished smooth.
(c) Concrete Tolerance: +/1 1/8" in radius of 10'-0"
(d) Floor Flatness and Floor Levelness numbers are not recognized.
(e) Compressive Strength: Concrete shall be a minimum of 3,000 psi and a maximum of 4,000 psi compressive strength after 28 days. No lightweight concrete.
(f) High spots shall be ground level and low spots shall be filled in with approved leveling compound by the general contractor to meet the tolerance above. See 035410: Underlayment.

(2) Do not install floor system until concrete has been cured 60 days and the temperature and humidity levels provided in paragraph 3.A.(1) and (2) above are met.
(3) General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.
(4) Permanent heat, lighting and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55-80°F and a relative humidity range of 35-50%. Consult MFMA for additional guidelines if necessary.
(5) After floors are finished, area to be kept locked by General Contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of gym, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptable by Owner or Owner's agent of complete gymnasium floor.

C. Inspection:

(1) Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the General Contractor and Architect. Slab shall be level within 1/8" in a 10' area. Moisture content of the concrete slab shall not exceed 80% in accordance to an In-Slab Relative Humidity test or shall not exceed 4% or 4.5 pounds per 1,000 SF vapor transmission.
(2) All work required to put the concrete subfloor in acceptable condition **shall be the responsibility of the wood athletic flooring installer.**
(3) Subfloor shall be broom cleaned by General Contractor when released to the wood athletic flooring installer to begin work.

C. Installation: Review manufacturer's printed instructions prior to installation. Installer must strictly comply with manufacturers written instructions.

(1) Vapor Barrier: Install Polyethylene with joints lapped a minimum of 6" and turned up 4" at the walls.
(2) Subfloors:
(a) Install sleepers end to end at right angles to finished flooring. Sleepers shall be staggered with rows spaced 16 1/16" on center or sleeper/subfloor system. Allow for a 1/4" gap between sleepers. Provide 1 1/2" to 2" expansion void at the perimeter and all vertical obstructions.
(b) Properly anchor sleepers suing Posi-Anchors 3 per sleeper. Maintain a 2" minimum expansion void at all walls and other permanent vertical obstructions.
(c) Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
(d) Install Bleacher Blocking per manufacturer's recommendations.
(e) Install 15/32" sub-flooring with the 8'-0" dimension parallel to the Air Channel sleepers staggering panels in adjacent rows. Fasten plywood subfloor to sleepers using 1 1/4" staples placed 6" on center along each sleeper. Allow for a ¼" gap between sheets.

(3) Flooring: Machine nail maple finish flooring 10" to 12" on center with end joints properly driven up and proper spacing provided for humidity conditions in specific regions. Consult manufacturer's local representative. Provide 2" expansion voids at the perimeter and at all vertical obstructions.

D. Finishing:

(1) Sanding:

(a) Sand per manufacturer's recommendations.
(b) After sanding, buff entire floor using 100 grit screen or equal grit sandpaper, with a heavy-duty buffing machine.
(c) Inspect entire area of floor to ensure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
(d) Vacuum and/or tack floor before first coat of seal.
(e) Floor should be clean and completely free of dirt and sanding dust.

(2) Finishing:

(a) Apply seal, game line paint, and finish in accordance with manufacturer's instructions.
(b) Buff and vacuum and/or tack between each coat after it dries.
(c) Apply game lines accurately after the buffing and vacuuming the coated surfaces. Game lines shall be painted between seal coats and finish coats. Layout in accordance with drawings. For game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors shown on the court design layout.

(2) Wall Base Installation: Install vent cove base anchored to walls with base cement or screws. Use pre-molded outside corners and neatly mitered inside corner.
(4) ADA Compliant Saddle Thresholds: Install saddle thresholds at wood athletic flooring transition to other flooring materials.
(5) Clean up all unused materials and debris and remove it from the premises.

096500: RESILIENT FLOORING

1. GENERAL

A. Scope: Includes all materials and labor required to install resilient flooring throughout project where designated on finish schedule on drawings or otherwise implied in the drawings and the addendum where applicable.

B. Codes and Standards Compliance: ADA, ASTM D570, ASTM F710, ASTM F925, ASTM F1869, ASTM F2170, NFPA 101, IBC, State and Local Codes

C. Quality Assurance:

(1) Installer Qualification: Firm with minimum five (5) years successful experience completing resilient flooring installation similar to that required.
(2) Pre-installation Conference: Conduct meeting at site prior to commencing work related to resilient flooring installation

(a) Require attendance of parties directly affecting resilient flooring installation.
(b) Review site conditions, procedures, and coordination required with related work.

(3) Field Mock-Up: Provide mock-up of each type of installation suing approved materials and specified methods of installation.

(a) Obtain Architect's acceptance of mock-up prior to start of resilient flooring installation.
(b) Approved mock-up may be incorporated into project.

D. Submittals:

(1) Product Data: Furnish manufacturer's literature for each type of material to be provided for project including manufacturer's adhesive and top coat system.
(2) Samples: Furnish each type of flooring and edge strip required for project.
(3) Color Charts: Upon request submit resilient flooring selections showing full range of colors and patterns available.
(4) Certification: Furnish manufacturer's certification based on independent testing laboratories indicating compliance with specified requirements.

E. Warranties and Guarantees: Provide manufacturer's standard 15-year commercial warranty.

F. Cross Reference: 018000: Cleaning
033000: Cast in Place Concrete
035410: Underlayment
055100: Metal Stairs
057310: Dry Glazed Glass Railing System
079000: Caulking and Sealants
079500: Expansion Control
090001: Color Scheme
096510: Rubber Base, Treads and Risers
096466: Wood Athletic Flooring
096820: Carpet

G. Jobsite Safety: Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standards: Patcraft Admix Homogenous Tile. Alternates may be acceptable if they meet or exceed the quality standard herein. Alternates must be submitted to the Architect for approval before bid date.

(a) Monolithic solid vinyl tile meeting ASTM F1700
(b) Size: 36" x 36"
(c) Thickness: 1/8"
(d) Adhesive: Only use flooring manufacturer's adhesive for material type and location.
(e) Top Coat: Only use flooring manufacturer's top coat system.
(f) Colors and Locations: See 090001: Color Scheme for color and size selections and locations. Note: Two colors will be used for this project. Pattern TBD during construction.

B. Transition Strips: See drawings A2.09 and A2.10 and 090001: Color Scheme.

(1) Between Resilient and Porcelain Tile: Schlüter, Color: Brushed Stainless Steel.
(2) Between Resilient and Concrete: Burke, Color: 660 Rocky
(3) Between Resilient and Carpet: Burke, Color: 660 Rocky

C. Subfloor Filler: See 035410: Underlayment

3. EXECUTION

A. Storage and Handling of Materials:

(1) Acceptance: Deliver materials in manufacturer's original, unopened containers with labels indicating brand names, colors, and patterns, and quality designations legible and intact.
(2) All floor covering products require care during storage and handling. It is important to store flooring products in a dry, temperature-controlled interior area.
(3) Material must be conditioned for at least 48 hours before beginning the installation.
(4) The temperature range should be between 65º F and 100º F, and the relative humidity should be controlled and maintained between 30% to 70%.

B. Examination of Site Conditions:

(1) Verify conditions of substrate are suitable for installation of resilient flooring in accordance with manufacturer's recommendations:

(a) The building envelope must be sealed.
(b) Installation area and materials to be installed shall maintain a temperature and relative humidity as required by the manufacturer.
(c) Surface Flatness: Surface shall be within flatness tolerances recommended by flooring material manufacturer.
(d) Concrete Subfloors:

1. Concrete to comply with ASTM F710, to be free of materials which could interfere with adhesion of resilient flooring
2. Concrete to be tested using the In-Situ Relative Humidity (RH) Test (ASTM F2170) or Moisture Vapor Emission Rate (MVER) Test (ASTM F1869). Moisture limits to be within limits required by adhesive manufacturer.
3. Alkalinity: Must be within limits required by flooring manufacturer.
4. Consult with flooring manufacturer for installation of flooring material on concrete subfloors that have moisture exceeding the recommended limits.

C. Concrete Floor Preparation: See 035410: Underlayment

D. Resilient Flooring Installation:

(1) Check that the quantity of flooring and adhesive are sufficient for area to be installed. Check for visual defects before installation. Installation of flooring acknowledges acceptance of materials.
(2) Expansion joints, isolation joints or other moving joints are incorporated into concrete floor slabs to permit moving without causing random cracks in the concrete. These joints must be honored and not be filled with underlayment products or other materials, and floor coverings must not be laid over them. Expansion joint covering systems should be detailed by the Architect or Engineer based upon intended usage and aesthetic considerations.
(3) Strictly comply with manufacturer's installation instructions only using manufacturer's adhesive.
(4) Consult with Architect and/or Interior Designer for floor pattern desired in each area.
(5) **Strictly comply with manufacturer's top coat application instructions using only the product provided by the manufacturer. It is important that the top coat is installed exactly as required by the manufacturer including number of applications so warranty is maintained. No alternative products or application systems will be approved by the Architect.**

E. Resilient Flooring Cleaning and Polishing:

(1) Remove excess adhesive from floor, base and wall surfaces without causing damage to surfaces due to cleaning operations, and repair damage to adjacent materials caused by resilient flooring installation using methods recommended by adjacent material and manufacturers.
(2) Clean floors taking care not to wash floors prior to adhesive set.
(3) If required, apply floor finish and/or polish in accordance with manufacturer's recommendations.

F. Protection:

(1) Prohibit traffic from floor for 48 hours after installation recommendations.
(2) Protect floors from damage during remainder of construction operations; do not move heavy objects over resilient flooring, which could damage flooring; replace flooring damaged by subsequent construction operations.

096510: RUBBER BASE, TREADS AND RISERS

1. GENERAL

   A. Scope: Includes all materials and labor required to install rubber base throughout project where designated on finish schedule on drawings or otherwise implied in the drawings.

   B. Codes and Standards Compliance: ADA, ASTM D412, ASTM D2047, ASTM D2240, ASTM D3389, ASTM E84, ASTM E137, ASTM E648, ASTM E662, ASTM F1515, ASTM F1861, ASTM F2169, State and Local Codes

   C. Quality Assurance:

      (1) Installer Qualifications: Firm with minimum five years successful experience completing rubber wall base installation similar to that required.

   D. Submittals:

      (1) Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions.
      (2) Submit the manufacturer's standard samples showing the required colors for wall base, corners and applicable accessories.
      (3) Submit the manufacturer's certification that the wall base has been tested by an independent laboratory and complies with the required fire tests.
      (4) Attic stock: Provide fifty (50) linear feet for maintenance. Turn over to Owner at completion of project.

   E. Warranties and Guarantees: Provide manufacturer's standard warranty.

   F. Cross Reference: 018000: Cleaning
      055100: Metal Stairs
      064100: Cabinetry
      079500: Expansion Control
      090001: Color Scheme
      092500: Gypsum Board
      096466: Wood Athletic Flooring
      096500: Resilient Flooring
      096820: Carpet

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality or Performance Standard: Johnsonite, Inc. All alternates must be submitted to the Architect for approval before bid date.

   B. Rubber Base: Johnsonite Baseworks Thermoset Rubber (Type TS)

      (1) Profile: Cove
      (2) Height: 4"
      (3) Thickness: 1/8"
      (4) Coil Length: 120 ft.
      (5) Meets ASTM F1861 standard for covebase, rubber type TS
      (6) Finish: Matte
      (7) Colors: See 090001: Color Scheme

C. Stair Treads and Risers: Johnsonite Rubber Integrated Stair Tread with Riser

(1) Surface: Visually impaired diamond with square nose
(2) Size: To accommodate stair tread size. See drawings for details.
(3) Insert:

(a) 2” contrasting color grit tap insert
(b) Insert Color: Grey grit tape

(4) Manufactured from a homogeneous composition of 100% synthetic rubber
(5) Color: See 090001: Color Scheme

D. Accessories:

(1) Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement-based formulation manufactured and warranted by a reputable manufacturer.
(2) Adhesives: Use only adhesives recommended by the rubber base manufacturer.
(3) Stair Treads and Nose Filler: Use manufacturer’s two-part epoxy caulking compound to fill nosing substrates that do not conform to tread contours.

3. EXECUTION

A. Storage and Handling of Materials:

(1) Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification and shipping and handling instructions.
(2) Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store wall base, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.
(3) Maintain a minimum temperature in the spaces to receive the wall base and accessories of 65°F and maximum temperature of 85°F for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.
(4) Install wall base and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the wall base.

B. Inspection:

(1) Examine walls prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
(2) Inspect walls prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
(3) Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
(4) Failure to call attention to defects or imperfections will be construed as acceptance and approval of the wall. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

C. Preparation: Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations. Avoid organic solvents.

D. Protection of Adjacent Work:

(1) Protect finished floors, walls, etc. from staining, marking, or other physical damage.
(2) Cover or mask finish surfaces adjacent to rubber base installation as required to prevent damage.

E. Workmanship and Installation:

(1) Strictly comply with manufacturer's written instructions.
(2) Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
(3) Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
(4) Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
(5) Do not scratch wall base during installation.
(6) On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
(7) Pre-mitered Corners: Install pre-mitered corners to match profile selection(s) before installing straight pieces.
(8) Job-formed Corners:

(a) Outside and Inside Corners: Install pre-mitered corners first. Seat the bottom of the wall base snugly to the floor on either side of the corner. Anaerobic adhesive (Super Glue) may be used to adhere the two mitered pieces together. This can eliminate any slight gapping. Butt straight pieces of maximum lengths on either side of the pre-mitered corners. Make sure heights of the corner returns and the straight base match up.
(b) Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

F. Completion of Work:

(1) General Contractor is to inspect work prior to inspection of Architect correcting any visual damage or faulty and defective work.
(2) Completion of work incomplete until Architect makes final inspection.
(3) Provide fifty (50) linear feet for maintenance. Turn over to Owner at completion of project.

G. Cleaning and Protecting Finished Work:

(1) Upon completion of installation, clean surfaces using a neutral cleaner acceptable to material manufacturer. Paint and/or gypsum compound on base in unacceptable areas.
(2) Just prior to date of Substantial Completion, buff and dust all rubber base areas.
(3) General Cleaning: See 018000: Cleaning

096820: CARPET

1. GENERAL

A. Scope: Furnish all materials, labor, tools, and equipment to provide and install all carpet in all spaces designated in finish schedules on Floor Plan and 090001: Color Scheme.

B. Codes and Standards Compliance: ADA, AATCC 16, AATCC 134, AATCC 165, ASTM D1335, ASTM D2859, ASTM D3936, ASTM D5848, ASTM E648, ASTM E662, ISO 2551, State and Local Codes.

C. Qualifications of Manufacturer and Installer:

(1) Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a ten (10) year history of successful production.
(2) Installation and Quality Assurance:

(a) Installer to be a specialty contractor normally engaged in this type of work and shall have prior experience in the installation of these types of materials.
(b) Installer to provide references, if required by Architect.
(c) Installer must be certified by the manufacturer.
(d) Installer will be responsible for the prior product installation, including floor preparation, in those areas indicated in the drawings.
(e) Installer to provide Owner a written warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of one (1) year after job completion.
(f) Manufacturer to provide field service experts to assist in project start-up as required by the job. Manufacturer will notify Owner, Architect, General Contractor or another designated contact if any installation instructions are not followed.

D. Submittals:

(1) Submit two (2) 24" x 24" finished samples or proposed carpet in the quality, pattern and color proposed.
(2) Submit shop drawings showing areas to be carpeted, seam locations, moldings, edge strips and details of all special treatments.
(3) Prior to carpet delivery submit certified laboratory copies of the reports required in this document.
(4) Prior to installation submit a copy of the manufacturer's installation instructions.
(5) Prior to completion of project submit manufacturer's maintenance instructions including cleaning equipment type, spot cleaning methods and cleaning cycles.

E. Warranties and Guarantees: Manufacturer's standard warranty

F. Cross References: 018000: Cleaning
035410: Underlayment
061213: Structural Panel Concrete Subfloor
079500: Expansion Control
090001: Color Scheme
096500: Resilient Flooring
096510: Rubber Base, Treads and Risers
102226: Operable Partitions

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Walk-Off Carpet Quality or Performance Standards: Shaw Contract Group, Dalton, GA. Alternates must be submitted to Architect for approval before bid date.

(1) Carpet 1 (CPT-1) Product Characteristics:

(a) Manufacturer: Shaw Contract
(b) Style Name: Path Tile (All Access collection)
(c) Style Number: 5T034
(d) Construction: Multi-Level Pattern Loop
(e) Fiber: Eco Solution q Nylon
(f) Dye Method: 100% solution
(g) Weight: 28.0 oz.
(h) Gauge: 1/12 inch
(i) Product Size: Modular 24" x 24"
(j) Backing: Primary - synthetic, Secondary - Ecoworx
(k) Protective Treatments: SSP Shaw Soil Protection
(l) Location: Vestibule 101
(m) Transitions: Thresholds. See 084113: Entrances and Storefronts

(2) Adhesive System: Only use carpet manufacturer's recommended adhesive system specified above.
(3) Sundries: As required by carpet manufacturer.

B. Carpet Quality or Performance Standard: J&J Flooring, Dalton, GA.

(6) Carpet 2 (CPT-2) Product Characteristics:

(a) Manufacturer: J&J Flooring
(b) Style Name: Renewal Modular
(c) Style Number: 1857
(d) Construction: Textile Composite
(e) Wear Layer: Polyester – Applied Pattern
(f) Dye Method: Solution Dyed
(g) Weight: 4.5 oz – 5.2 oz/SF
(h) Product Size: Modular 24" x 24"
(i) Thickness: .205 inches
(j) Backing: Polyester Felt Cushion with Pre-Fix
(k) Locations: See Finish Schedule and 090001: Color Scheme, Drawings A2.09 and A2.10
(l) Transitions: See drawings A2.09: Entrance Level Floor Patterns and Transitions, A2.10: Upper-Level Floor Patterns and Transitions and 090001: Color Scheme.

1. Schluter transitions color: Brushed stainless steel
2. Burke rubber transitions color: 660 Rocky

(7) Adhesive System: Pre-fix pre-applied releasable adhesive backing with lifetime warranty
(8) Sundries: As required by carpet manufacturer.

3. EXECUTION

A. Delivery, Storage, and Handling of Material: Deliver all material to the installation site in the Manufacturers original packaging. Packaging to contain Manufacturers name, product name and identification number and other related information.

B. Environmental Conditions Criteria: All materials to be stored in a cool (above 65° F and below 90°F), dry location, safe from damage and soiling. Stack rolls horizontally no higher than two (2). All materials installed should have a minimum temperature of 65°F and below 90°F at least 72 hours prior and 48 hours after installation. Note: Humidity exceeding 65% will retard set-up or drying time of adhesive.

C. Preparation of Work:

(1) Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified in the Manufacturers installation instructions.
(2) Sub-floor preparation will include, as required, the removal and repair of the existing floor surface. The General Contractor shall inspect the sub-floor of this renovation project prior to installation.
(3) All materials used in sub-floor preparation and repair shall be recommended by the carpet manufacturer or shall be chemically and physically compatible with the carpet system.
(4) Site conditions shall include those specified in the carpet manufacturer's installation instructions and shall also include area heat, light and power required for effective and efficient working conditions.
(5) Sweep and vacuum floors after patching and cleaning to remove all grit and debris. Note: Oil based sweeping compounds should not be used.

D. Protection of Adjacent Work:

(1) Installer shall be responsible for any damage to walls or base in the areas to receive carpet.
(2) Protect all adjacent work from damage during the execution of this project.

E. Workmanship and Installation: Installer to strictly comply with manufacturer's installation instructions.

F. Protection and Cleaning:

(1) All rubbish, wrappings, debris, trimmings, etc. to be removed from the site and disposed of properly.
(2) All usable scraps of carpet should be left for use by the Owner (usable defined as 4' x 6' strips).
(3) Carpet to be completely vacuumed using a beater brush/bar commercial vacuum after installation.
(4) Carpet to be protected as needed from damage from other trades.

098413: SOUND CONTROL

1. GENERAL

A. Scope: Includes all materials, labor, tools and equipment to install flat and 3-dimensional acoustic materials and accessories for wall and ceiling hung installations. Specifications provided herein includes material information and Owner's design aspirations. Subcontractor to provide artwork based on design direction provided herein with cost proposal for materials and installation. Subcontractor's cost proposal may include optional designs for Owner's consideration as long as the cost is the same for all design options.

B. Codes and Standard: ASTM E84, ASTM C423,

C. Quality Assurance:

(1) Manufacturer Qualifications: Manufacturer shall have a minimum of three (3) years' experience in production of specified products and shall furnish supporting documentation showing completed jobs of approximately the same size and scope.
(2) Fire Test Reports: Provide acoustical wall panels test results per ASTM E84.
(3) Acoustical Test Report: Provide acoustic test report indicating wall panel NRC per ASTM C423.
(4) Installer: Manufacturer's installer shall have a minimum of three (3) years' experience in installing materials specified herein.

D. Cross Reference: 013300: Delegated Design Procedures
042200: Concrete Masonry Units (CMU)
090001: Color Scheme
092500: Gypsum Board
095000: Acoustical Metal Ceiling System
099100: Painting

E. Submittals:

(1) Shop Drawing showing design of wall and ceiling-hung (3-dimensional) acoustic installations.
(2) Color specific artwork of acoustic installations.
(3) Materials samples of each material and color.

F. Warranty: Manufacturer's ten (10) year limited warranty.

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Owner's Design Intent:

(1) Recreation Center Lobby 102: Tree with 3-dimensional leaves, birds. Colors to be representative of natural tree colors such as brown and green. Birds to be vivid colors for interest.
Locations: East wall north of Reception 103, recess above door D19.
(2) Gymnasium 120: Adult and child silhouettes in athletic positions such as playing basketball, soccer, tennis, pickleball, volleyball and swimming. Colors to coordinate with finish selections provided in 090001: Color Scheme.
Locations: Full length of wall above Telescopic Seating 121, full length of wall above grilles on Gymnasium 120 east wall.

(3) See 095000: Acoustical Metal Ceiling System for ceiling materials used for this project where 3-dimensional sound control may be suspended.
(4) See A2.02: RC: Entrance Level Floor Plan for Lobby 102 and Gymnasium 120 floor plans.
(5) See A2.07 RC: Reflected Ceiling Plan at Upper Level for metal plank ceiling, lighting and fire protection for Lobby 102 ceiling.
(6) See A2.21 RC: Lobby Interior Elevations and Sections for Lobby 102 elevations.
(7) See detail A:A/A2.22 for Gymnasium 120 east wall elevation. Gymnasium 120 west wall similar but with telescoping bleachers.

B. Product Characteristics:

(1) Fire Rating: Class A per ASTM E84
(2) 100% Polyester
(3) 60% post-consumer content
(4) Solid color through and through
(5) Formaldehyde-free
(6) Product can be fabricated into custom shapes, dual layers, 3-dimensional installations.
(7) High-impact resistant
(8) Weight: 4.9 oz./SF
(9) Thickness: .350”
(10) Sheet Size: 48” x 96”

C. Accessories:

(1) Edge Trim: Aluminum perimeter in locations where edge protection is needed to protect the material from damage.
(2) Adhesive: Manufacturer’s recommended mounting adhesive.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver acoustic components in manufacturer’s original unopened packages or containers, with labels intact.
(2) Protect acoustic materials from excessive moisture when storing or handling.
(3) Deliver materials in unopened skids and store in a dry place with adequate air circulation.
(4) Do not deliver materials until all wet-work has been completed and HVAC system is in full operation.

B. Installation: Install acoustic material in locations approved by Owner and Architect.

C. Cleaning:

(1) After completion of installation of panels, remove dust and other foreign material according to manufacturer’s written instructions.
(2) Remove surplus material, rubbish, and debris resulting from panel installation, on completion of the work, and leave areas of installation in a neat and clean condition

099100: PAINTING

1. GENERAL

A. Scope: This section includes painting, including surface preparation and field application of paints, coatings and specialty resin floor and wall surfaces. Primers listed in paint schedule are in addition to shop applied primers specified in other sections.

(1) These specifications cover the complete painting and finishing of all surfaces through the exterior and interior of the building, unless otherwise specified.
(2) The Painting Contractor shall furnish all material, labor, and equipment required to complete all painting and finishing as shown on drawings, plans, and specifications.
(3) The Painting Contractor shall examine the specifications for the various other trades and shall thoroughly familiarize himself with all their provisions regarding their painting. All surface that are left unfinished by the requirements of other specifications shall be painted or finished as a part of this contract.

B. Code Compliance:

(1) Authorities: ASTM, SSPC, ANSI, AWWA, NACE, IBC, SSBC, USDA, UL, Local Codes, Applicable State Requirements for Volatile Organic Compounds (VOC)
(2) Specular gloss readings in accordance with ASTM D523, and as follows:

(a) Flat: Less than 5%, measured at 85 degrees
(b) Eggshell: 5-20%, measured at 60 degrees
(c) Satin: 15-35%, measured at 60 degrees
(d) Low Luster: 25-35%, measured at 60 degrees
(e) Semi-Gloss: 30-65%, measured at 60 degrees
(f) Gloss: 65% or more, measured at 60 degrees

C. Cross References: 042200: Concrete Masonry Units
051200: Structural Steel Framing
055100: Metal Stairs
053000: Metal Decking
055800: Miscellaneous Metal
074400: Cementitious Panels and Trim
076000: Flashing and Venting
079000: Caulking and Sealants
081100: Hollow Metal Doors and Frames
081416: Wood Doors
090001: Color Scheme (for all color selections)
092500: Gypsum Board
098413: Sound Control
101650: Toilet Partitions
104260: Signage
105000: Lockers
108000: Accessories
116643: Indoor Scoreboards
122413: Window Roller Shades

D. Submittals:

(1) Product Data: Submit product data, including manufacturer's data sheet, for specified products.
(a) Submit manufacturer's literature including descriptive and performance data.
(b) Submit application instructions and methods, including mixing, surface preparation, compatible primers and topcoats, recommended wet and dry and film thickness.
(2) Samples: Submit selection and verification samples for finishes, colors and textures.
(a) Prepare 6" x 8" samples of each color in the product specified.
(b) Identify each sample with color name and number, and product name and number.

(3) Quality Assurance Submittals: Submit the following:

(a) Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

(b) Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
(c) Submit material safety data sheets (MSDS) for each product.

(4) Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, textures and pattern and workmanship standard.

(a) Mock-Up Size: Where directed, provided a field sample 10'L x 10'W in each paint system specified unless directed to be smaller by Architect.
(b) Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
(c) Mock-up may be incorporated into final construction upon Owner's approval.

(6) Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual. Manual shall include an area summary with finish schedule, area detail designating where each product/color/finish was used, product data pages, MSDS sheets, care and cleaning instructions, touchup procedures, and color samples of each color and finish used.

E. Quality Assurance: Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project and has had a minimum of three (3) years' experience.

F. Warranties and Guarantees: Submit, for Owner's acceptance, manufacturer's standard warranty documents executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

G. Coordination: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with 012000: Project Conferences. The Painting Contractor shall be responsible for inspecting the work of others prior to the application of any paint or finishing material. If any surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding, and puttying operations, the Painting Contractor shall immediately notify the General Contractor or the Architect in writing or assume responsibility for and rectify any unsatisfactory finish resulting.

H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Sherwin Williams and Tnemec. Alternates may be acceptable if they meet or exceed the Quality Standard. All alternates must be submitted to the Architect for approval before bid date. No exception.

B. Exterior:

(1) Cementitious Panels and Trim, Exposed Concrete Block: Satin Finish

Primer: SW Loxon Concrete & Masonry Primer-Sealer, LX02W0050 Series
1st Coat: SW Loxon XP Waterproofing Masonry Coating, LC21-50 Series
2nd Coat: SW Loxon XP Waterproofing Masonry Coating, LC21-50 Series

(2) Misc. Iron, Structural Iron, Steel, Galvanized Metal, Metal Bollards: Semi-Gloss Finish

Primer: SW Pro-Industrial Pro-Cryl Universal Acrylic Primer
1st Coat: SW Pro-Industrial SherCryl High Performance Acrylic
2nd Coat: SW Pro-Industrial SherCryl High Performance Acrylic

(3) PAB Exterior Metal Decking (spray applied by manufacturer approved painter)

Primer: Natacoat factory applied by metal decking manufacturer
1st Coat: Tnemec Tneme-Tufcoat (Series 113)
2nd Coat: Tnemec Tneme-Tufcoat (Series 113)

C. Interior:

(1) Metal Door Frames, Metal Stairs, Exposed Metal, Wood Trim: Semi-Gloss Finish

1st Coat: SW Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series (if not pre-primed)
2nd Coat: SW Pro Industrial Waterbased Alkyd Urethane Enamel, B53-2150 Series
3rd Coat: SW Pro Industrial Waterbased Alkyd Urethane Enamel, B53-2150 Series

(2) Gypsum Board Ceilings: Eg-Shel

1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W02600 Series
2nd Coat: SW ProMar 200 Zero VOC Interior Latex Eg-Shel, B20W12651 Series
3rd Coat: SW ProMar 200 Zero VOC Interior Latex Eg-Shel, B20W12651 Series

(3) Gypsum Board Walls: Semi-Gloss

1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W02600 Series
2nd Coat: SW ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W02651 Series
3rd Coat: SW ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W02651 Series

(4) Mechanical, Storage and IT Closet Concrete Floors: Gloss

Prep: SW SSPC-SP13 Surface Preparation of Concrete
1st Coat: SW Armorseal 8100 Two Part System A & B
2nd Coat: SW Armorseal 8100 Two Part System A & B

(5) Concrete Masonry Walls: Gloss Finish

Primer: SW Prep-Rite Interior/Exterior Latex Block Filler, B25W00025 Series
1st Coat: SW Pro Industrial Waterbased Epoxy Gloss, B73W00311 Series
2nd Coat: SW Pro Industrial Waterbased Epoxy Gloss, B73W00311 Series

D. Exposed Structural Metal Ceilings: Flat

Prep: SW SSPC-SP1 Solvent Clean
To remove all visible oil, grease, dirt, drawing or cutting compounds or other soluble contaminants before protective coating is applied.
1st Coat: SW Pro Industrial Waterborne Acrylic Dryfall White, B42W00181 Series
2nd Coat: SW Pro Industrial Waterborne Acrylic Dryfall White, B42W00181 Series

E. Wood Doors: Stain

Before Stain: Minwax Pre-Stain Wood Conditioner
1st Coat: Minwax Water-Based Wood Stain (to match cabinetry laminate)
2nd Coat: Sherwin Williams Wood Classics Waterbourne Polyurethane (Satin Finish)
3rd Coat: Sherwin Williams Wood Classics Waterbourne Polyurethane (Satin Finish)
Finishing: See paragraph 3.F(3) herein.

F. PAB Interior Metal Decking (spray applied by manufacturer approved painter)

Primer: Natacoat factory applied by metal decking manufacturer
1st Coat: Tnemec Tneme-Tufcoat (Series 113)
2nd Coat: Tnemec Tneme-Tufcoat (Series 113)

D. Specialty Areas:

(1) Resin Flooring:

Primer: SW Resuprime 3579 Standard Epoxy Primer/Primer, Part A and B
1st Coat: SW Resuflor 3561 Epoxy Resin Glaze, Part A and B
2nd Coat: Quartz Aggregate Broadcast
Broadcast at 4 pounds per square foot to rejection
Start cove base finishing at this step and finish with floor system (see below)
3rd Coat: SW Resuflor 3561 Epoxy Resin Glaze, Part A and B
4th Coat: Quartz Aggregate Broadcast
Broadcast at 4 pounds per square foot to rejection
5th Coat: SW Resuflur 3746 High Performance Epoxy, Part A with Antimicrobial Agent and Part B
Topcoat: SW Elladur 4850 Polyaspartic SS Coating, Part A and B

Note: Final texture of resin flooring finish to be determined during construction. Owner, Architect, General Contractor and Installing Subcontractor to meet before installation begins. See also notes in paragraph 2.D.(2) herein.

(2) Resin 8" Cove Base (to first CMU course):

Primer: SW Resuprime 3579 Standard Epoxy Primer/Binder, Part A and B
1st Coat: SW Resuflor 3561V Epoxy Cove Paste, Part A and B
Finish: Finish with floor system starting with broadcast (see above)

Notes:

(a) Cove base to align flush with ceramic wall tile at recess areas in PAB lobby. Depth of cove to be approximately ¼".
(b) Cove in all other areas to receive a Schluter Jolly stainless-steel cap.
(c) Owner, Architect, Contractor, tile subcontractor and resinous flooring/wall system subcontractor to meet before resinous flooring wall system installation commences.

(3) Resin Walls:

Primer: SW Resuflor Aqua 3462 Water-Based Epoxy, Part A and B
Note: Walls to receive the finish must be properly prepared to receive coating system as required by manufacturer
1st Coat: SW Resuflor Aqua 3462G Reinforced Water-Based Epoxy, Part A and B
2nd Coat: SW Resuflor Aqua 3462 Water-Based Epoxy, Part A and B
3rd Coat: SW Resutile Aqua 4410 Water-Based Urethane, Part A and B Semi-Gloss
Top Coat: SW Resutile Aqua 4410 Water-Based Urethane, Part A and B Semi-Gloss

Note: See 090001: Color Scheme for finish color. See also notes in paragraph 2.D.(2) herein.

3. EXECUTION

A. Storage and Protection:

(1) Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction debris.
(2) Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
(3) All materials used on the job shall be stored in a single place designated by the Owner or the Architect. Such storage place shall be kept neat and clean and all damage thereto or to its surroundings shall be made good by the Painting Contractor. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by the manufacturer.

(a) Store paint materials at minimum ambient temperature of 45 degrees F in well-ventilated area. Follow manufacturer's requirements for maximum temperatures.
(b) Place waste, cloths and material which may constitute fire hazard in water filled closed metal containers and remove at tend of each workday on site.

(4) The Painting Contractor shall protect surfaces and objects inside and outside the building, as well as the ground, lawns, shrubbery, and adjacent properties against damage. The Painting Contractor shall hold himself responsible for damage to adjacent furnishings.

(5) Protect installed product's finish surfaces from damage during construction.

(a) Protect painted surfaces against damage until fully cured.
(b) Provide signs identifying wet surfaces until dry.
(c) Restore any damaged surfaces by recoating surface.

(6) At completion of work, the Painting Contractor shall remove from the premises all surplus painting materials and all debris created by him; he shall remove all spatters and leave his part of the work in a clean and finished condition.

B. Environmental Conditions Criteria: Substrate and ambient air temperature shall be in accordance with manufacturer's instructions:

(1) Measure moisture of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of interior and exterior surfaces is 12% or less.
(2) Apply materials under the following prevailing conditions or follow manufacturer's instructions:

(a) Air and surface temperatures are not below 50 degrees F or above 110 degrees F.

(b) Relative humidity is not above 70% and the surface temperatures is at least 5 degrees above dew point.

(3) Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 50 degrees F for 24 hours before, during and 48 hours after application of finishes.

C. Manufacturer's Instruction: Strictly comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

D. Examination:

(1) Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

(a) Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing any conditions that may affect proper application. Do not commence work until such defects have been corrected.
(b) Where materials are being applied over previously painted surfaces, apply samples and perform in place test to check for compatibility, adhesion and film integrity of new materials to existing painted surfaces. Report in writing any condition that may affect application, appearance or performance of the paint.
(c) Test shop applied primers for compatibility with subsequent cover materials.
(d) Painting of surface constitutes contractor's acceptance of surface and responsibility for any paint failure.

E. Preparation:

(1) Adjacent Surface Preparation: Protect adjacent work areas and finish surfaces from damage during product installation.

(2) General Surface Preparation:

(a) Remove electrical plates, hardware, light fixture trim and fittings prior to preparing surfaces or finishing. Mask in place items that cannot be removed.
(b) Surfaces are to be clean and dry, free of dirt, dust, grease and contaminants.
(c) Existing Painted Surfaces: Remove loose and peeling paint. Degloss surface if recommended by manufacturer. Sand smooth. Clean entire surface prior to painting.
(d) Remove mildew by scrubbing with solution of bleach and water. Rinse with clean water and allow surface to thoroughly dry.

(3) Substrate Surface Preparation:

(a) Aluminum: Remove surface contaminants by steam, high pressure detergent wash or solvent washing. Apply etching primer to acid etch. Apply paint immediately following cleaning and etching.
(b) Asphalt, Cresote, or Bituminous Surfaces: Remove foreign substances to permit adhesion of finishing materials. Apply compatible sealer or primer.
(c) Cotton and Canvas Coverings: Remove dirt, grease, oil and surface contaminants.
(d) Concrete Floors: Remove dirt and surface contamination, acid etch and rinse floors with clear water. Thoroughly dry.
(e) Copper Surfaces: Remove surface contamination by steam, high pressure detergent wash or solvent washing. Apply etching primer or acid etch. Apply paint immediately following cleaning and etching.
(f) Gypsum Board: Fill minor defects with patching/filling compound and spot prime.
(g) Galvanized Surfaces: Remove surface contamination and oils and wash with solvent rinse and thoroughly dry. Pretreat and apply an acid etch or vinyl wash primer.
(h) Concrete and Concrete Block: Remove stains, dirt, loose mortar, scale, salt or alkali powder and other contaminants. Remove oil and grease with a solution of trisodium phosphate; rinse with clean water and thoroughly dry. Allow concrete, mortar and plaster to cure a minimum of 28 days before painting.
(i) Plaster Surfaces: Fill hairline cracks, small holes and imperfection with latex patching compound. Sand smooth and flush with adjacent surfaces. Clean area and allow to dry.
(j) Uncoated Steel and Iron Surfaces: Remove grease, rust, scale, dirt and dust from steel and iron surfaces in accordance with SSPC-1. Where heavy coatings of scale are evident, remove by wire brushing or any other approved method. Ensure steel surfaces are satisfactory before paint finishing.
(k) Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal areas.
(l) Interior Wood Surfaces: Wipe off dust and dirt prior to priming. Seal knots, pitch streaks and sappy sections. Apply prime coat and fill nail holes with tinted exterior caulking compound. Back prime exterior woodwork.

(m) Exterior Wood Surfaces: Remove dust, dirt and surface contaminants prior to priming. Seal knots, pitch streaks and sappy sections. Apply prime coat and fill nail holes with tinted exterior caulking compound. Back Prime exterior woodwork.
(n) Glue Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease, dirt and surface contaminants. Remove any residue of solvent remaining on surface.

F. Installation/Application:

(1) Application:

(a) Apply products in accordance with manufacturer's printed instructions.
(b) Allow each coat of finish to thoroughly dry before application of following coats. Follow manufacturer's instructions for recoat time.
(c) Apply products no thinner than the manufacturer's recommended film thickness.
(d) Apply products to dry surfaces.
(e) Apply each coat to uniform finish without runs, sags, brush or roller marks, skips, ropiness or other defects.
(f) Apply each coat tinted to a slightly darker color than preceding coats.
(g) Sand and dust wood and metal lightly between coats to achieve smooth finish.
(h) Clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
(i) Where clear finishes are required, tint tiller to match wood. Work fillers into the grain before set. Wipe excess from surface.
(j) Back prime concealed surfaces of interior and exterior woodwork with primer paint.
(k) Apply block fillers unthinned to concrete and concrete block at a rate of 50-75 sf/gal (1.2-1.8 m^2/L). Ensure complete coverage with pores filled and no pinholes.
(l) Wherever using spray application, apply each coat at the recommended film thickness. Do not double-back with spray equipment or paint roller building-up film thickness of two coats in one pass.
(m) Seal, prime and finish top coat and bottom edges of wood and metal doors the same as door face.
(n) Seal, prime and finish coat tops of sashes and bottoms of lower sashes the same as adjacent surfaces.

(2) Finishing Mechanical and Electrical Equipment:

(a) Refer to Division 15 and 16 for schedule of color coding and identification or banding of equipment, ductwork, piping and conduit. Paint in accordance with requirements.
(b) Finish paint shop primed equipment.
(c) Remove and paint separately unfinished lovers, grilles and access panels for mechanical and electrical systems.
(d) Prime and paint insulated and exposed ducts and pipes, covers, conduit, boxes, hangers, brackets and collars, except where items are plated or prefinished.
(e) Replace identification markings on mechanical or electrical equipment when painted or spattered.
(f) Paint interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint. Paint dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels.
(g) Paint exposed conduit and electrical equipment in finished areas to match adjacent surfaces.
(h) Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
(i) Replace electrical plates, hardware, light fixture trim and fittings removed prior to finishing.

(3) Wood Door Finish:

(a) Sand doors with 120 grit paper to scuff surface.
(b) Apply Minwax Pre-Stain Wood Conditioner. Let surface dry per manufacturer's recommendations.
(c) Stain door with Minwax Water-Based Wood Stain. Let surface dry per manufacturer's recommendations.
(d) Apply one coat of Sherwin Williams Wood Classics Waterbourne Polyurethane.
(e) After polyurethane dries per manufacturer's recommendation lightly sand with 180 or 200 grit paper.
(f) Apply a final coat of Sherwin Williams Wood Classics Waterbourne Polyurethane.
(g) Allow final coat to dry per manufacturer's recommendations before handling.

G. Field Quality Requirements:

(1) Manufacturer’s Field Services: Upon Architect’s request, provide manufacturer’s field service consisting of product use recommendations and period site visits for inspection of product installation in accordance with manufacturer’s instructions.

H. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer’s instructions prior to Owner’s acceptance. Remove construction debris from project site and legally dispose of debris.

(1) As work proceeds and upon completion of areas, remove paint where spilled, splashed or splattered.
(2) During progress of work keep premise free from accumulation of tools, equipment and surplus materials.
(3) Upon completion of work, leave premises neat and clean, to the satisfaction of Architect.

G. Completion of Work:

(1) Deliver to the Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with 017000: Contract Completion Requirements.
(2) Furnish quantify of full-size units equal to 5% of amount installed.
(3) Comply with Owner’s requirements for delivery, storage and protection of extra materials.
(4) Label each container with color type, texture and room locations in addition to manufacturer’s label.

101650: TOILET PARTITIONS

1. GENERAL

A. Scope: Includes all materials and labor required to install toilet partitions as shown on drawings and described herein.

B. Codes and Standards Compliance: ADA, ASTM A240, ASTM A666, ASTM A743, ASTM B86, ASTM E84, ASTM B221, IBC, ICC/ANSI A117.1

C. Quality Assurance:

(1) Qualifications of Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed in its performance. A firm with a minimum of five (5) years successful experience in the application of materials similar to those specified herein shall be used.
(2) Qualifications of Manufacturer: Employ only manufacturers making the specified materials as a regular production item.
(3) Source Limitations: Obtain toilet compartment components and accessories from single manufacturer.

D. Submittals:

(1) Manufacturer's Product Data sheets shall be required for each item specified.
(2) Shop Drawings:

(a) Provide fabrication and installation drawings of toilet compartments and screen assemblies.
(b) Include plans, elevations, details and details of attachments to other work including locations of required blocking.
(c) Show locations of reinforcement and cutouts for compartments-mounted toilet accessories. Provide template layouts and installation instructions for anchorage devices built into other work.

(3) 3 x 3 color samples from the manufacturer's standard colors.

E. Warranties and Guarantees:

(1) Provide manufacturer's standard warranty in which the manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion:

(a) Plastic Toilet Partitions: Against corrosion, breakage and delamination: 15 years

F. Cross Reference: 018000: Cleaning
042200: Concrete Masonry Units
090001: Color Scheme
099100: Painting
108000: Accessories

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standard: ASI Global. Other companies may be acceptable if they meet or exceed the Quality Standard. Alternate must be submitted to the Architect before bidding for approval.

B. Product Characteristics: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent and graffiti-resistant textured surface.

C. Materials: Doors, panels and pilasters shall be 1" thick constructed from high density polyethylene (HDPE) resins. Partitions shall be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pans, pencils, markers and other writing instruments. All plastic components shall be covered with a protective plastic masking.

D. Construction:

(1) Doors, panels, and pilasters shall be 1" thick with all edges rounded to a ¼" radius.
(2) Doors and dividing panels shall be 55" high and mounted at 14" above the finished floor.
(3) Pilasters shall be 82" high (standard) and fastened into a 3" high stainless steel pilaster shoe with a stainless steel, tamper resistant torx head sex bolt.

E. Hardware:

(1) Hinges shall be 8" and fabricated from heavy-duty extruded aluminum (6463-t5 alloy) with a bright dip anodized finish with wrap-around flanges, surface mounted and through bolted to doors and pilasters with stainless steel, tamper resistant torx head sex bolts. Hinges operate and field with adjustable nylon cams. Cams can be field set in 30° increments.
(2) Door strike/keeper shall be 6" long and made of heavy-duty extruded aluminum (6436-T5 alloy) with a bright dip anodized finish, with wrap around flanges that are at least 5/32" wall thickness, and secured to the pilasters with stainless steel, tamper resistant torx head sex bolts. Bumper shall be made of extruded black vinyl.
(3) Latch and housing shall be made of heavy-duty extruded aluminum (6463-T5 alloy). The latch housing shall have a bright dip anodized finish, and the slide bolt and button shall have a black anodized finish.
(4) Each door shall be supplied with one coat bumper/hook made of chrome plated zamak. Outswing doors shall be supplied with one door pull and one door stop made of chrome plated zamak.
(5) Pilaster shoes shall be 3" high and made of stainless steel. Walls brackets shall be fastened to the pilaster with stainless steel tamper, resistant, torx screws and fastened to the panels with stainless steel, tamper resistant torx head sex bolts. Stirrup brackets shall be fastened to the pilasters and panels with stainless steel, tamper resistant torx head sex bolts.
(6) Headrail shall be made of heavy duty extruded aluminum (6463-T5 alloy) with anti-grip design and a curtain track integrated into its design. The headrail shall have a bright dip anodized finish and shall be fastened to the top of pilasters and to the headrail brackets with stainless steel, tamper resistant torx head sex bolts.
(7) Headrail brackets shall be 16-gauge stainless steel with a stain finish and secured to the wall with #14 stainless steel screws.
(8) Partition Finish: Pebble Grain
(9) Partition Colors: See 090001: Color Scheme

3. EXECUTION

A. Storage and Handling of Materials: Deliver materials in manufacturer's original, unopened containers with labels indicating brand names, colors, and patterns, and quality designations legible and intact.

B. Preparation/Field Verification:

(1) Prior to installation of wall finishes, verify required blocking has been installed in proper locations.
(2) Verify installation of finishes and required anchoring devices are complete.
(3) Take dimensions with field measurements prior to component fabrication to ensure proper fitting of work.
(4) Proceed with installation of items only after unsatisfactory conditions have been corrected. Installation of items indicates all conditions are satisfactory.

C. Installation:

(1) Install partitions rigid, straight, plumb, and level manor, with plastic laid out as shown on shop drawings and manufacturer's installation instructions.
(2) All doors and panels to be mounted 14" above finish floor.
(3) Clearance at vertical edges of doors shall be uniform top and bottom and shall not exceed ¼".
(4) No evidence of cutting, drilling, and/or patching shall be visible on the finished work.
(5) Finished surfaces shall be cleaned after installation and be left free of all imperfections.

D. Manufacturer's Instructions and/or Literature: Strictly comply with the manufacturer's written or published recommendations and/or instructions.

E. Cleaning and Protecting Finished Work:

(1) Just prior to date of Substantial Completion, remove any protecting coverings.

(2) General Cleaning: See 01800: Cleaning

102226: OPERABLE PARTITIONS

1. GENERAL

A. Scope: Includes all materials, labor, tools and equipment necessary for the complete installation of two (2) sets of manually operated, paired panel operable partitions.

B. Codes and Standards Compliance: ADA, ASTM E557, ASTM E90, ASTM C1036, ASTM C1048, ASTM E84, ASTM E413, NEMA LD3, State and Local Codes.

C. Quality Assurance:

(1) Installer Qualification: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design and extent to that indicated for this project.
(2) Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
(3) Preparation of the opening shall conform to the criteria set forth per ASTM E557.

D. Submittals:

(1) Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
(2) Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
(3) Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
(4) Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.
(5) Reports: Provide a complete and unedited written sound test report indicating test specimen matches product as submitted.
(6) Operations and Maintenance Manual

E. Warranties and Guarantees: Provide manufacturer's standard written warranty agreeing to repair or replace any components with manufacturing defects.

F. Cross Reference: 018000: Cleaning
051200: Structural Steel
052100: Steel Joist Framing
090001: Color Scheme
095100: Acoustical Ceiling Systems
096820: Carpet
Structural Drawings

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standard: Modernfold, Inc. Acousti-Seal Legacy Paired Panel System. Other manufacturers may be acceptable if they meet or exceed the quality standard herein. Alternates must be submitted to the Architect for approval before bid date.

B. Product Characteristics:

(1) Product: Acousti-Seal Legacy Paired Panel 932
(2) Operation: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.
(3) Final Closure: Expandable panel with jamb.

C. Panel Construction:

(1) Nominal 3-inch-thick panels in manufacturer's standard 48" widths.
(2) All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity.
(3) Top channel reinforced to support suspension system components.
(4) Frame designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
(5) Panel Skin: 21 gage steel wrapped around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction.

(a) Acoustical Rating: 50 STC

(6) Hinges for Closure Panels, Pass Doors and Pocket Doors: Full length butt hinges, attached directly to panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
(7) Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appears at panel joints.
(8) Panel Weight (for 50 STC): 8 lbs./square foot
(9) Panel Finishes:

(a) Panel Face Finish: Reinforced heavy-duty vinyl with woven backing weighing not less than 30 ounces per lineal yard. Color: Serenity 572H
(b) Panel Seals and Hardware: Modernfold Smoke Gray

(10) Sound Seals:

(a) Vertical Interlocking Sound Seals Between Panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.
(b) Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
(c) Horizontal Bottom Seals: Automatic operable seals providing nominal 2-inch operating clearance with an operating range of +1/2" to +1 1/2" which automatically drop as panels are positioned, without the need for tools or cranks.

(11) Suspension System: Modernfold #14 Suspension System

(a) Suspension Tracks: Minimum 7-gage, 0.18 roll formed steel. Track shall be supported by adjustable steel hanger brackets connected to structural support pairs of 1/2" diameter threaded rods. Brackets must support the load bearing surface of the track.

(b) Exposed Track Soffit: Steel, removable for service and maintenance, attached to track bracket without exposed fasteners, and pre-painted white.
(c) Carriers: One all steel trolley with steel-tired ball bearing wheels. Non-steel ties are not acceptable.
(d) Warranty Period: Twenty (20) years

(12) Options:

(a) Work Surfaces:

1. Markerboard: White enamel on steel, bonded to the face of the panel with horizontal trim without exposed fasteners. Trim is not acceptable on vertical edges to provide uninterrupted work surface.

a. Provide 4 markerboards. One board to be located on each side of both sets of operable partitions.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels
(2) Protect panels during delivery, storage and handling to comply with manufacturer's direction and as required to prevent damage.

B. Preparation of Area:

(1) Ensure all work required before partitions are installed has been done and work has been accepted.
(2) Verify exact location of partition before anchors are installed for the partitions.
(3) Beginning work in this section assumes acceptance of the existing conditions.

C. Protection of Adjacent Work:

(1) Protect finished floors, walls, etc. from staining, marking, or other physical damage.
(2) Cover or mask finish surfaces adjacent as required to prevent damage.

D. Installation:

(1) General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, drawings and approved shop drawings.
(2) Match operable partitions by installing panels from marked packages in numbered sequence indicated on shop drawings.
(3) Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

E. Cleaning and Protecting Finished Work:

(1) Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
(2) Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that ensure operable partitions are without damage or deterioration at time of substantial completion.

F. Adjusting: Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

G. Examination: Examine flooring, structural support and opening with installer present for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

H. Demonstration: Demonstrate proper operation and maintenance procedures with Owner's representative.

102600: WALL PROTECTION

1. GENERAL

   A. Scope: Includes all material, labor, tools and equipment to furnish and install handrails in locations shown on drawings.

   B. Code and Standards Compliance: ADA, ANSI, ASTM E-84, ASTM D-256-90b, ASTM D-543, ASTM D-635-74, ASTM, ASTM F 476-84, ASTM G-21, ASTM G-22, IBC, Life Safety. NFPA, OSHPD, SAE J-1545, UL, UBC, Greenguard Certified, State and Local Codes.

   C. Quality Assurance:

      (1) Single Source Responsibility: Provide all wall protection components by the same company to ensure compatibility of color, texture and other properties.
      (2) Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed to perform the work.

   D. Submittals:

      (1) Product Data: Manufacturer's printed product data.
      (2) Shop Drawings:

         (a) Mounting details with the appropriate fasteners for specific project substrates.
         (b) Elevation drawings showing all supports, returns, lengths and installation height from floor.

      (3) Samples: Verification samples of each type.
      (4) Maintenance data for corner guard components for inclusion in the operating and maintenance manuals.

   E. Warranties and Guarantees: Provide manufacturer's standard limited lifetime warranty against material and manufacturing defects.

   F. Cross References: 018000: Cleaning
      079000: Caulking and Sealants
      090001: Color Scheme
      092500: Gypsum Board

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standards: InPro Architectural Products Stainless Steel Corner and Custom Endwall Protectors:

      (1) Product Characteristics:

         (a) Corner Guards: SAS-1824C-304
         (b) End Wall Protection: Custom to meet specifications below
         (c) Wing Size: 2” x 2”
         (d) Height: 48"
         (d) Material: 16-gauge type 304 stainless steel with #4 satin finish
         (e) Outside Corner: 1/8" radius
         (f) Deburred and return bend edges
         (f) Adhesive: Low VOC polyurethane-based construction adhesive. No screws.

(2) Fabrication: Corner and end wall guards shall be factory formed from stainless steel sheet.

(a) Lengthwise perimeter edges to include nominal 10° return bend.
(b) Edge burrs shall be removed.
(c) Satin finish grain oriented parallel with length.
(d) Single piece fabrication to 144" length.
(e) To be installed without exposed fasteners

(3) Locations: See 090001: Color Scheme for locations

3. EXECUTION

A. Storage and Handling of Materials:

(1) Deliver materials in unopened factory packaging to the jobsite.
(2) Inspect materials at delivery to assure that specified products have been received.
(3) Store in original packaging in a climate controlled location away from direct sunlight.

B. Environmental Conditions:

(1) Installation areas must be enclosed and weatherproof before installation commences.

C. Examination:

(1) Examine areas and conditions in which the corner guards will be installed.
(2) Complete all finishing operations, including painting, before beginning installation.
(3) Wall surface shall be dry and free from dirt, grease and loose paint.

D. Preparation: Prior to installation, clean substrate to remove dust, debris and loose particles.

E. Installation: Strictly comply with manufacturer's written installation instructions.

F. Cleaning: At completion of the installation, clean surfaces in accordance with the manufacturer's clean-up and maintenance instructions.

104116: EMERGENCY KEY CABINET

1. GENERAL

A. Scope: Includes all materials and labor required to install recessed data and key cabinet for emergency personnel rapid entry.

B. Codes and Standards Compliance: NFPA, IBC, IFC, UL 1037, UL 1610, UL 1332, UL 437, Local Codes

C. Quality Assurance:

(1) Qualifications of Installer: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed in its performance. A firm with a minimum of five (5) years successful experience in the application of materials similar to those specified herein shall be used.
(2) Qualifications of Manufacturer: Employ only manufacturers making the specified materials as a regular production item.

D. Submittals:

(1) Manufacturer's product data and installation methods and details.
(2) Shop Drawings:

(a) Provide fabrication and installation drawings of emergency key cabinet assembly.
(b) Drawing showing location specific to installation including adjacent materials. Indicate dimensions, clearances and depth of recess.
(c) Include methods of installation differing from manufacturer's standard details, if necessary.

E. Warranties and Guarantees: Provide manufacturer's standard warranty.

F. Cross Reference: 018000: Cleaning
041000: Mortar
042100: Brick Masonry Units
051200: Structural Steel Framing
079000: Caulking and Sealants

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality or Performance Standard: Knox, KnoxBox 3200. Other companies may be acceptable if they meet or exceed the Quality Standard. Alternates must be submitted to the Architect before bidding for approval.

B. Product Characteristics:

(1) Manufacturer/Model No: Knox, KnoxBox 3200 with Recessed Mounting Kit (RMK)
(2) Installation: Recessed
(3) Size: 4"H x 5"W x 3 7/8"D
(4) Flange Size for Recess Mount: 7"H x 7"W

(5) Storage Capacity: 10 keys
(6) Fabrication:

(a) UL Listed Knox Tamper Alert
(b) Housing: 1/4" plate steel
(c) Door: 1/2" steel door with interior gasket seal and stainless-steel door hinge
(d) Lock: 1/8” stainless steel dust cover with tamper seal mounting capability. Lock to be UL listed. Double-action rotating tumblers and hardened steel pins access ed by biased cut key.

(7) Color: Aluminum
(8) Recessed Mounting Kit (RMK)

(a) Size: 6 1/2"H x 6 1/2"W x 5”D
(b) Includes shell housing and mounting hardware

3. EXECUTION

A. Storage and Handling of Materials: Deliver materials in manufacturer's original, unopened containers with labels indicating brand names, colors, and patterns, and quality designations legible and intact.

B. Preparation of Area: Ensure area is ready to receive work; starting work in section is evidence that the installer is satisfied with the surrounding work. Verify that rough opening is the correct size before installation.

C. Protection of Adjacent Work: Ensure no damage is done to adjacent work in the course of installation required in this section.

D. Installation: Install key cabinet in strict compliance with manufacturer’s installation instructions and shop drawing directions.

E. Cleaning and Protecting Finished Work:

(1) Just prior to date of Substantial Completion, remove any protecting coverings.
(2) General Cleaning: See 01800: Cleaning

104260: SIGNAGE

1. GENERAL

   A. Scope: Includes all material, labor, tools and equipment necessary to install signage indicated hereinafter and shown on drawings.

   B. Code and Standards Compliance: IBC, DOJ ADA, ANSI A117.1, 2010 Standards for Accessible Design, State and Local Codes

   C. Quality Assurance:

      (1) Manufacturer: Work required under this section from manufacturer regularly engaged in work of this type and scope for a minimum of 5 years.
      (2) Qualifications of Installer: Only craftsmen with a demonstrable skill in installing signage shall be used to install work under this specification.

   D. Submittals:

      (1) Submit Manufacturer's literature and shop drawing showing installation and location on building.
      (2) Submit each signage style required including materials, sizes, configurations, thickness, color, design shape, edges, corners, text, Braille and pictograms, layout, components and applicable substrate mountings.
      (3) Signage schedule complete with location of each sign and required copy; include floor plans, if required.
      (4) Full size sample including material, thickness, color, design, shape, size edge, corner, text, Braille and pictogram. Sample will not be returned.
      (5) Sign Program Maintenance Plan: Manufacturer shall provide details of an online reordering and maintenance application whereby the client can submit sign reorders online and store/view relevant project information such as sign type, drawings, message schedules and product instructions.

   E. Warranties and Guarantees: Provide a one (1) year guarantee against all defects and faulty workmanship.

   F. Cross References: 041500: Brick Masonry Units
      042100: Brick Masonry Units
      042200: Concrete Masonry Units
      074400: Cementitious Panels and Trim
      088100: Glass and Glazing
      090001: Color Scheme
      092500: Gypsum Board
      093100: Tiling
      099100: Painting

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Exterior Signage:

      (1) Handicap Parking Signage: See Civil Drawings

      (2) Building Entrance Signs: 1” thick brushed aluminum, Futura Book Font, Size as shown on elevations

         (a) Recreation Building: “JOHN DAVIS RECREATION CENTER”
         (b) Pool Access Building: “POOL ACCESS BUILDING”

(3) Building Number Signage: 8" Pressure Sensitive Vinyl, Futura Book Font, Color: Silver

(a) Recreation Building: 904
(b) Pool Access Building: 906
(c) Installation: Interior glass above entrance. See elevations.

(4) Mens and Womens Locker Room Entrances from Pool Deck: Brushed aluminum with black lettering. Stud mounted. See elevations

(a) Door D02 (21"H x 10"W – to course with brick):

Text: "WOMEN"
Text: "MUJERES"
Symbols: Shower, Locker, Woman, Handicap, Adult/Baby Changing
ADA Compliant Braille

(b) Door D05 (21"H x 10"W – to course with brick):

Text: "MEN"
Text: "HOMBRES"
Symbols: Shower, Locker, Man, Handicap, Adult/Baby Changing
ADA Compliant Braille

B. Interior Signage:

(1) Wall Signage: 1" thick brushed aluminum, Futura Book Font, Size as shown on elevations. Stud mounted.

(a) Recreation Building:

1. "RECEPTION" installed on canopy fascia above reception counter at Reception 103

(2) Interior Building Plaque:

(a) Cast aluminum ¾" thick
(b) No border
(c) Satin aluminum finish with black letters
(d) See drawings for details, size and installation location.
(e) Installation requires blocking

(3) Room Signage:

(a) Quality Standard: Inpro Signscape Aspen Collection, APCO ADA Signage, ASE Manufacturing. Other manufacturers may be acceptable if they meet or exceed the Quality Standard. Any alternates must be submitted to the Architect for approval before the bid date.

(b) Product Characteristics:

1. Panel/Plaque Construction: PETG plaque featuring chemically fused layer of UV hardened, 1/32" thick raised photopolymer characters and Braille chemically fused, not applied, to the PETG surface resulting in a single-piece construction. Laminated photopolymers, adhesive-applied characters and applied Braille dots are not acceptable.
2. Typography: Futura Book, all uppercase letters
3. Colors and Finishes: As selected from manufacturer's standards during construction.
4. Size: 6" x 6", 6" x 8" to accommodate text and symbols. 4" x 4" (at Reception)
5. Thickness: .125"

6. Corners: Radius
7. Furnish grade 2 Braille characters for tactile signs; same text as letter designation and symbol translation.
8. For offices, provide insert window for name insert by Owner.

(c) Mounting: Wall mounted/surface. Mounting location are to be determined during construction with Owner and Architect. Generally, signage to be installed on the wall on the latch side of the entrance door to the spaces listed below. Signage SHALL NOT be installed on doors.

(d) Interior Signage Schedule:

1. Recreation Building:

Quantity	Location		Text/Symbols
1	100	Stair 1	Text: “STAIR 1” Text: “ESCALERA 1” Symbol: Stair ADA Complaint Braille
1	103	Reception	Symbol: Handicap ADA Compliant Braille Signage Size: 4” x 4” Location: Reception Counter
1	104	Community Room 1	Text: “COMMUNITY ROOM 1” Text: “SALA DE LA COMUNIDAD 1” ADA Complaint Braille
1	106	Stair 2	Text: “STAIR 2” Text: “ESCALERA 2” Symbol: Stair ADA Compliant Braille
1	112	Men Restroom	Text: “MEN” Text: “HOMBRES” Symbols: Man, Handicap, Baby Changing ADA Compliant Braille
1	113	Plumbing Service	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	114	Family Restroom	Text: “FAMILY RESTROOM” Text: “BAÑO FAMILIAR” Symbols: Man, Woman, Child, Baby Changing, Adult Changing, Handicap ADA Compliant Braille
1	115	Women	Text: “WOMEN” Text: “MUJERES” Symbols: Woman, Handicap, Baby Changing ADA Compliant Braille
1	118	Exit Corridor	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille

1	119C	Sprinkler Riser Room	Text: “SPRINKLER RISER ROOM” ADA Compliant Braille
1	119B	Main Electrical	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	122	Exit Corridor	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	126	Storage	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	127	Utility Workroom	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	128	Janitor’s Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	131	Concessions	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	135	Workroom	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	136	Staff Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	137	Staff Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	139	Director	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	140	Staff Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	141	Staff Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	142	Director	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	143	Staff Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name

1	144 Staff Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	145 Staff Office	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	Director of DRD	Text: Office Name TBD in English/Spanish ADA Compliant Braille Insert Window for Occupant Name
1	151 Men	Text: “MEN” Text: “HOMBRES” Symbols: Man, Handicap ADA Compliant Braille
1	152 Women	Text: “WOMEN” Text: “MUJERES” Symbols: Woman, Handicap ADA Compliant Braille
1	154 Stair 3	Text: “STAIR 3” Text: “ESCALERA 3” Symbol: Stair ADA Compliant Braille
1	200 Stair 1	Text: “EXIT” Text: “SALIDA” Text: “STAIR 1” Text: “ESCALERA 1” Symbol: Stair ADA Compliant Braille
1	201 Activity Room 1	Text: “ACTIVITY ROOM 1” Text: “SALA DE ACTIVIDADES 1” ADA Compliant Braille
1	202 Activity Room 2	Text: “ACTIVITY ROOM 2” Text: “SALA DE ACTIVIDADES 2” ADA Compliant Braille
1	203 Activity Room 3	Text: “ACTIVITY ROOM 3” Text: “SALA DE ACTIVIDADES 3” ADA Compliant Braille
1	207 Stair 2	Text: “EXIT” Text: “SALIDA” Text: “STAIR 2” Text: “ESCALERA 2” Symbol: Stair ADA Compliant Braille
1	211B Mechanical	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille

1	211A	IT Closet	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	213	Women	Text: “WOMEN” Text” “MUJERES” Symbols: Woman, Handicap, Baby Changing ADA Compliant Braille
1	214A	Men	Text: “MEN” Text: “HOMBRES” Symbols: Man, Handicap, Baby Changing ADA Compliant Braille
1	214B	Elevator Disconnect Rm	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
2	215	Activity Room 4	Text: “ACTIVITY ROOM 4” Text: “SALA DE ACTIVIDADES 4” ADA Compliant Braille Note: One sign at each entrance door
1	219	Vestibule	Text: “COMMUNITY ROOM 2” Text: “SALA DE LA COMUNIDAD 2” ADA Compliant Braille
1	220	Furniture & Equip. Storage	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	222	Pantry Storage	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	225	IT Closet	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille
1	226	Stair 3	Text: “EXIT” Text: “SALIDA” Text: “STAIR 3” Text: “ESCALERA 3” Symbol: Stair ADA Compliant Braille

2. Pool Access Building:

Quantity	Location		Text/Symbols
1	102	Reception	Symbol: Handicap ADA Compliant Braille Signage Size: 4” x 4” Location: Reception Counter
1	103	Life Guard Office	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille

1	104 Hall	Text: “MEN” Text: “HOMBRES” Symbols: Shower, Locker, Man, Handicap, Adult/Baby Changing ADA Compliant Braille
1	108 Storage	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Complaint Braille
1	109 Hall	Text: “WOMEN” Text: “MUJERES” Symbols: Shower, Locker, Woman, Handicap, Adult/Baby Changing ADA Compliant Braille
1	113 Utilities	Text: “STAFF ONLY” Text: “SÓLO PERSONAL” ADA Compliant Braille

(4) Interior room signage must comply with all applicable provisions of the 2010 Standard for Accessible Design. Requirements include, but are not limited to the following:

(a) Tactile copy must be all upper case and raised at least 1/32”. Tactile characters must be san serif, not italic, not oblique, script or highly decorative.
(b) The stroke width of the upper case “I” has to be 15% of the letter height or less. The character width of the uppercase “O” must be between 55% and 110% of the height of the corresponding uppercase “I”.
(c) The copy height for tactile information must be between 5/8” and 2”. If separate visual characters are provided, raised characters can be ½” and need not contrast with the background.
(d) The distance between characters on tactile copy must be a minimum of 1/8” and a maximum of 4 times the character stroke width. These distances are measured between the closest points of adjacent characters.
(e) Spacing between lines of tactile copy needs to be a minimum of 135% and a maximum of 170% of the corresponding uppercase “I” height (measured from baseline to baseline).
(f) Braille must be Grade II and positioned directly below the corresponding raised characters. If text is multi-lined, Braille is placed below the entire body of text and separated 3/8” from any other tactile characters and 3/8” minimum from raised borders and decorative elements.
(g) Visual characters and symbols, and their background, are to have a non-glare finish. The color of raised characters must contrast as much as possible with their background to make sure signs are more legible for persons with low vision.
(h) Pictograms, selected from International Standards, are to be located within a 6” vertical void and accompanying text descriptions are to be located directly below the pictogram.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Package signs to prevent damage during shipment, handling, storage and installation. Products are to remain in their original packaging (unless otherwise specified), until removal is necessary for installation.
(2) If installation site is not ready for signage upon delivery, store signs in a dry, air-conditioned environment.

(3) Handle signage in accordance with manufacturer's instructions.

B. Preparation of Area: Ensure wall and/or doors area is totally installed and completed prior to installation of letters. Do not install lettering until one week before final review by Architect.

C. Protection of Adjacent Area: Do not damage walls or doors while installing lettering.

D. Manufacturer's Instructions and/or Literature: Strictly comply with manufacturer's written instructions.

E. Completion of Work: Remove protected film on letters the day of substantial completion.

F. Cleaning: Consult Manufacturer before any cleaning of lettering. Do not clean without proper instructions.

105000: LOCKERS

1. GENERAL

A. Scope: Includes material and installation of lockers shown or indicated on drawings in the Pool Access Building.

B. Code and Standard Compliance: ADA, ANSI, ASTM, State and Local Codes

C. Quality Assurance:

(1) Uniformity: Provide each type of locker as produced by a single manufacturer, including necessary accessories, fittings and fasteners.
(2) Provide lockers from a manufacturer with a minimum of 10 years experience with a similar product.
(3) Installer must have a minimum of three (3) years experience installing similar products.

D. Submittals:

(1) Product Data: Submit manufacturer's product literature and installation instructions for each type of unit required. Include data substantiating that products to be furnished comply with requirements of the contract documents.
(2) Shop Drawings:

(a) Submit shop drawings showing locker types, sizes and quantities, including all necessary details relating to anchoring, trim installation and relationship to adjacent surfaces. Include notations and descriptions of all installation items and components.
(b) Show installation details at non-standard conditions, if any.
(c) Provide layout, dimensions, and identification of each unit corresponding to sequence of installation procedures.
(d) Provide installation schedule and procedures to ensure proper installation.

(4) Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors and textures available.
(5) Numbering: The locker numbering sequence shall be provided by the approving authority and noted on approved drawings returned to the locker contractor.

E. Warranties and Guarantees: Provide manufacturer's standard warranty for each type of unit specified herein.

F. Cross Reference: 042200: Concrete Masonry Units
090001: Color Scheme
092500: Gypsum Board
099100: Painting

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Pool Access Building Locker Room Lockers:

(1) Quality Standard: ASI Storage HDPE Solutions Traditional Plus Collection, Triple Tier. Alternates must be submitted to the Architect for approval before bid date.

(2) Product Characteristics:

(a) Material: Made from high impact high-density polyethylene (HDPE).
(b) Finish: Commercial grade texture on all flat surfaces.
(c) Construction: All lockers to be built on a unit principle with common intermediate uprights separating units.
(d) Door Frames: Made of 1/2" thick HDPE material that is water resistant and non-absorbing.
(e) Doors: Made of 1/2" thick HDPE material that is water resistant, non-absorbing with ventilation.
(f) Body: Made of 1/2" thick HDPE material that is water resistant and non-absorbing.
(g) Hinges: Continuous stainless steel, full, length, black and shall be securely fastened.
(h) Handles: Stainless steel, solidly mounted to internal latch mechanism with stainless steel fasteners.
(i) Latching: Securely attached to the door, continuous in design and capable of accepting various locking mechanisms. Stainless steel components.
(j) Interior Hooks: Stainless steel, ball ends.
(k) Number Plates: One per opening, supplied in polished aluminum with black numerals ½" high.
1. Locker Room 105: 1-30
2. Locker Room 110: 31-60
(l) Bases: Fabricated from HDPE polymer to form components with 1" nominal thickness. No legs.
(m) Color: Interior and exterior of lockers to be homogeneous in color. Color to be selected from the manufacturers standard color options. See also 090001: Color Scheme.
(n) Assembly: Shall be assembled by means of machined joints, pins, and tamper resistant mechanical fasteners. Locker components to be square, rigid and free of scratches.
(o) Sizes: See drawings.

3. EXECUTION:

A. Storage and Handling of Material:

(1) Do not deliver lockers until building is enclosed and ready for installation. Protect from damage during delivery, handling, storage and installation.
(2) Deliver materials packaged for protection.
(3) Inspect materials upon delivery for damage. Reject damaged items.
(4) Store materials under cover, on raised platforms, in vertical position. Protect from moisture and remove from wet containers if wetting occurs.

B. Preparation of Area: Ensure area is ready to receive work; starting work in section is evidence that the installer is satisfied with the surrounding work.

C. Protection of Adjacent Work: Ensure no damage is done to adjacent work in the course of doing the work required of this section.

D. Manufacturer's Instruction: Comply strictly to Manufacturer's written instruction on the installation of the work required of this section. Lockers shall be level and plumb with flush surfaces and rigid attachment to anchoring surfaces.

E. Workmanship and Installation: Install the items of this section in strict accordance with the original design, approved shop drawings, and requirements of agencies having jurisdiction, as approved by the Architect, anchoring all components firmly into position.

F. Cleaning: See 018000: Cleaning

105200: FIRE PROTECTION SPECIALTIES

1. GENERAL

   A. Scope: Includes material and installation of Portable Fire Extinguishers as specified below in locations shown on drawings.

   B. Code and Standard Compliance: IBC, NFPA 10, ADA, ASTM E-814, State and Local Codes

   C. Qualifications of Installer: Only a firm having at least three (3) years experience in installation of fire protection equipment shall be used.

   D. Submittals: Submit manufacturer's literature and installation written information for review. The close out documents shall include a fire extinguisher instruction manual that details condensed instructions and cautions necessary to the operation, inspection, and maintenance of the fire extinguisher(s).

   E. Warranties and Guarantees: 1 year against defects.

   F. Cross Reference: 042200: Concrete Masonry Units
   090001: Color Scheme
   092500: Gypsum Board

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard: JL Industries (Activar, Inc.). Alternates must be submitted to the Architect for approval before bid date.

   B. Product Characteristics:

      (1) Rated Fire Extinguisher Cabinets for Recreation Center Locations:

         (a) Model Number: Cosmopolitan Stainless-Steel Fire-FX2 Fire Extinguisher Cabinets #2036
         (b) Trim: 1 ¼” Square
         (c) Tub: 12"W x 27"H x 7 3/4"D
         (d) Frame Overall Dimensions: 15 3/8” x 30 3/8"
         (e) Wall Opening: 14 5/16” x 29 5/16" x 7 11/16"
         (f) Door and Trim Construction: No. 4 stainless steel (standard finish)
         (g) Door: S21 Solid Door with pull handle
         (h) Hinge: Continuous
         (i) Letters: #LDCVARFE - Diecut red ascending FIRE EXTINGUISHER (3/4" x 18")
         (j) Locations: Entrance Lobby 102, Corridor 111, Corridor 117, Exit Corridor 118, Exit Corridor 122, Corridor 129, Corridor 153, Corridor 212, Corridor 218, Exit Corridor 224

      (2) Non-Rated Extinguisher Cabinet for Pool Access Building Location:

         (e) Model Number: Cosmopolitan Stainless-Steel Fire Extinguisher Cabinet #2036
         (f) Trim: 1 ¼” Square
         (g) Tub: 12"W x 27"H x 7 3/4"D
         (h) Frame Overall Dimensions: 15 3/8” x 30 3/8"
         (e) Wall Opening: 13” x 28" x 6 5/8"
         (f) Door and Trim Construction: No. 4 stainless steel (standard finish)
         (g) Door: S21 Solid Door with pull handle
         (h) Hinge: Continuous
         (i) Letters: #LDCVARFE - Diecut red ascending FIRE EXTINGUISHER (3/4" x 18")
         (j) Location: Lobby 101 at Door D04 exit.

(2) 3-D Plastic Tent Sign: #24S. Each location to receive a tent sign.
(3) Fire Extinguisher: Cosmic 10E, (UL 4A-80 BC rating), Class: ABC Fires. One per fire extinguisher cabinet.

C. Mounting: See details on drawings and as directed by manufacturer.

3. EXECUTION

A. Storage and Handling of Material:

(1) Deliver fire extinguishers and cabinets packaged for protection.
(2) Inspect materials upon delivery for damage. Reject damaged items.
(3) Store materials under cover, on raised platforms, in vertical position. Protect from moisture and remove from wet containers if wetting occurs.

B. Preparation of Area: Ensure area is ready to receive work; starting work in section is evidence that the installer is satisfied with the surrounding work. Verify that rough openings for cabinets are correctly sized and located.

C. Protection of Adjacent Work: Ensure no damage is done to adjacent work in the course of doing the work required of this section.

D. Manufacturer's Instruction: Comply strictly to Manufacturer's written instruction on the installation of the work required of this section.

E. Workmanship and Installation: Install the items of this section in strict accordance with the original design, approved shop drawings, and requirements of agencies having jurisdiction, as approved by the Architect, anchoring all components firmly into position.

F. Cleaning: See 018000: Cleaning

105300: HANGER SUPPORTED ALUMINUM CANOPY

1. GENERAL

A. Scope: Includes furnishing material and installation of an extruded aluminum overhead hanger rod style canopy as detailed on drawings.

B. Codes and Standards Compliance: ASTM B221, ASTM B429, AA DAF, AAMA 2603, AAMA 2605, ASCE-7, IBC, State and Local Codes.

C. Quality Assurance: Only craftsmen who have a demonstrable skill in the work covered under this specification shall be employed in its performance. A firm with a minimum of three (3) years successful experience in the application of materials similar to those specified herein shall be used. Canopy must conform to all codes listed on drawings.

D. Submittals:

(1) Supply Manufacturer's standard literature and specifications for canopies.
(2) Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly. Drawings are to include plans, elevations, and sections showing all connections.
(3) Engineering: Provide shop drawings with engineering calculations sealed by a registered Georgia Professional Engineer.
(4) This application is on an existing building and field verified dimensions are to be indicated on the shop drawings.

E. Warranties and Guarantees: Provide Manufacturer's standard warranty

F. Cross Reference: 018000: Cleaning
042100: Brick Masonry Units
042200: Concrete Masonry Units
055800: Miscellaneous Metal
074400: Cementitious Panels and Trim

G. Jobsite Safety: Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standards:

(1) Super Lumideck Hanger Rod Supported Canopy by Mapes Canopies; Lincoln, Nebraska (1-888-273-1132). This specification is based on the Super Lumideck product by Mapes.
(2) Tennessee Valley Metals, Inc. (800-551-2579)
(3) Note: Any alternates must be submitted to the Architect for approval before the bid date. No substitutions will be approved after bid date.

B. Components:

(1) Materials:

(a) Decking and fascia shall be extruded aluminum, alloy 6063-T6 in profile and thickness shown on drawings.
(b) Intermediate framing members shall be extruded aluminum, alloy 6063-T6.

(c) Hanger Rods:

1. Hanger rods and attachment hardware shall be powder coated to match aluminum finish.
2. Size: 1" diameter
3. Configuration: As shown on drawings.
4. Hanger Rod Escutcheon Plate: Round disc

(2) Finishes: Clear anodized aluminum

C. Fabrication:

(1) All canopies to be shipped in preassembled sections for ease of installation.
(2) All connections shall be mechanically assembled utilizing 3/16 fasteners with a minimum shear stress of 350 lbs. Pre-welded or factory welded connections are not acceptable.
(3) Decking shall be designed with interlocking roll-formed aluminum members.
(4) Concealed drainage. Water shall drain from covered surfaces into intermediate trough and be direct to front scupper.

3. EXECUTION

A. Delivery, Storage and Handling:

(1) Deliver canopies packaged for protection.
(2) Inspect materials upon delivery for damage. Damaged items shall be rejected.
(3) Store materials under cover, on raised platforms. Protect from moisture and remove from wet containers if wetting occurs.

B. Inspection:

(1) Confirm that surrounding area is ready for the canopy installation.
(2) Installer shall confirm dimensions and elevations to be as shown on approved submittals.
(3) Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed.

C. Installation: Installation shall be in strict compliance with manufacturer’s shop drawings. Particular attention should be given to protecting the finish during handling and erection. Any damage to the canopy will be rejected.

D. Completion of Work:

(1) Clean-up canopies and adjacent surfaces upon completion. Do not use abrasive cleaners that will harm canopy finishes.
(2) Repair any damage to adjacent painted finishes.
(3) Protect canopies from damage from other trades

107500: FLAGPOLES

1. GENERAL

   A. Scope: Includes material and installation of flagpoles located on Site Plan.

   B. Code and Standard Compliance: SBCCI, NAAMM, AAMA, AASHTO

   C. Qualifications of Installer: Only an erection crew skilled in setting flagpoles shall be used.

   D. Submittals: Submit manufacturer's literature and installation written information for review.

   E. Warranties and Guarantees: 1 year against defects.

   F. Cross Reference: 033000: Cast-In-Place Concrete
      Civil Drawings

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard: Vanguard Series Internal Halyard Flagpoles. Alternates must be submitted to the Architect for approval before bid date.

   B. Product Characteristic: Vanguard Series Internal Halyard Flagpoles

      (1) Model: ECV35
      (2) Type: Satin Anodized Aluminum
      (3) Pole Length: 35’-0”
      (4) Overall Length: 38 ½”
      (5) Butt: 7”
      (6) Top: 3.5”
      (7) Wall: 0.188
      (8) Ball: Gold Anodized
      (9) Flag Size: 6 x 10

   C. Compliance: Flagpoles, bases, and anchorage devices shall be designed to withstand a flagged wind speed of 120 MPH and 200 MPH unflagged speed.

   D. Mounting: Ground set. See detail on drawings.

   E. Lighting Protection: Provide and install manufacturer’s standard lightning protection device.

3. EXECUTION

   A. Packaging: Flagpoles to be packed in recommended fashion to assure protection during transit.

   B. Handling and Storage: Aluminum flagpoles, if stored in original for extended periods, can become stained due to adverse chemical reactions between aluminum and certain packaging materials. When poles are to be stored on site for extended periods, all wrappings material should be removed and the poles stored bare in a dry place off the ground. Be sure to provide protection against damage.

   C. Installation: Flagpole to be installed by an accredited erection crew experienced in the handling, assembly and placement of poles, and in strict compliance with manufacturer's instructions.

108000: ACCESSORIES

1. GENERAL

   A. Scope: Includes all materials and labor to install accessories listed below and shown or implied on the drawings.

   B. Code and Standard Compliance: ADA

   C. Quality Assurance:

      (1) Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
      (2) Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
      (3) Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA requirements as applicable.

   D. Submittals:

      (1) Product Data: Submit manufacturer's data sheets for each product specified, including the following:

         (a) Installation instructions and recommendations
         (b) Storage and handling requirements and recommendations
         (c) Cleaning and maintenance instructions
         (d) Replacement parts information

      (2) Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom and where blocking is required. Use room numbers as indicated on the drawings.

   E. Warranties and Guarantees: One (1) year guaranteed to be free of defects in workmanship and material from the date of substantial completion of project.

   F. Cross Reference: 042200: Concrete Masonry Units
      054000: Cold Formed Framing
      061000: Rough Carpentry
      090001: Color Scheme
      092500: Gypsum Board
      093100: Tiling
      099100: Painting
      101650: Toilet Partitions

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standards: Quality Standard provided for each accessory herein. Alternates may be acceptable if they meet or exceed the Quality Standard. All alternates must be approved by the Architect before bid date.

      (1) Surface Mounted Twin Mini Jumbo Bath Tissue Roll Dispenser: Tork / System T2

         (a) Size: 5.7”L x 17”W x 10.1”H
         (b) Material: Black Plastic
         (c) Locations:

            1. RC: Men Restroom 112 (2), Family Restroom 114 (1), Women Restroom 115 (5), Men 151 (1), Women 152 (1), Women 213 (3), Men 214A (2)
            2. PAB: WC and Lavatories 106 (2), WC and Lavatories 111 (4)

(2) Grab Bars: ASI 3800 1 1/2" Diameter Concealed Mounting

(a) Quantities, sizes and mounting heights as detailed on drawings for ADA restrooms and showers.
(b) Mounting Anchors: Install with manufacturers anchors for each grab bar style
(c) Fabrication: 18-gauge type 304 stainless steel tubing, satin finish
(d) Locations:

1. RC: Men Restroom 112, Family Restroom 114, Women Restroom 115, Men 151, Women 152, Women 213, Men 214
2. PAB: WC and Lavatories 106 (ADA restroom), Showers 107 (2 shower locations), WC and Lavatories 111 (ADA restroom), Showers 112 (2 shower locations)

(3) Surface Mount Hand Towel Roll Dispenser: Tork / Tork Matic System H1

(a) Size: 8.1”L x 13.2”W x 14.6”H
(b) Material: Black Plastic
(c) Locations:

1. RC: Catering Kitchen 107 (1), Men Restroom 117 (2), Family Restroom 114 (1), Women Restroom 115 (2), Concessions 131 (1), Men 151 (1), Women 152 (1), Women 213 (1), Men 214A (1), Catering Kitchen 223 (1)
2. PAB: WC and Lavatories 106 (1), WC and Lavatories 111 (1)

(4) Surface Mounted Wall Mounted Mirrors: ASI Roval 20650-B

(a) Size: 24" x 36"
(b) Frame: 18-gauge type 304 18-8 satin finish stainless steel with radius edges and polished seamless mitered corners.
(c) Glass: ¼” thick tempered glass mirror.
(d) Locations:

1. RC: Men Restroom 112 (3), Family Restroom 114 (1), Women Restroom 115 (3), Men 151 (1), Women 152 (1), Women 213 (2), Men 214A (2)
2. PAB: WC and Lavatories 106 (3), WC and Lavatories 111 (3)

(5) Surface Mounted Hand Dryers: Xlerator Hand Dryer XL-SB-ECO

(a) Size: 11 ¾”W x 12 11/16”H x 6 11/16”D
(b) Construction: Stainless Steel
(c) Options:

1. HEPA Filtration System
2. 1.1” Noise Reduction Nozzle

(d) Power: See electrical drawings
(e) Locations: PAB: WC and Lavatories 106 (1), WC and Lavatories 111 (1)

(6) Extra Heavy Duty Shower Curtain Rods: Bobrick B-6047

(a) Size: As required for shower openings.
(b) Material: 18-8, Type 304, 18-gauge stainless steel with satin finish. One-piece.
(c) Locations: PAB: Showers 107 (2), Showers 112 (2)

(7) Shower Curtain Hooks: Bobrick 204-1

(a) Size: 1 3/8”W x 2 9/16”H
(b) Material: 18-8, Type 304, 0.09” diameter stainless steel
(c) Locations: PAB: Showers 107, Showers 112
(d) Quantity: Number required for specified shower curtains. Note: Two showers per locker room.

(8) Shower Curtains: ASI 1200-V

(a) Size: 84”W x 72”H
(b) Material: Flame-resistant, anti-bacterial 10-gague white vinyl fabric.
(c) Locations: PAB: Showers 107 (2), Showers 112 (2)

(9) Surface Mounted Shower Seats: ASI 8208 (R or L as required)

(a) Size (folded down): 33”W x 17” to 19”H x 23”D
Size (folded up): 33”W x 35” to 37”H x 23”D
(b) Material: Seat and body made of satin finish type 304 stainless steel
(c) Concealed mounted plates, anchors and hardware required to support 500 lb.
(d) Locations: PAB: Showers 107 (2), Showers 112 (2)

(10) Special Needs Stainless Steel Diaper Changing Station: Foundations Model 100SSE-SM

(a) Size (folded down): 64 1/4”W x 21 3/8” D x 23 1/8”H
Size (folded up): 64 1/4”W x 4”D x 23 1/8”H
(b) Material: Full body 16-gauge, 304 brushed stainless steel. ABS replaceable tray liner.
(c) Option: 200-SSLD stainless steel liner dispenser
(d) Mounting Flange: 100SSE-SM
(e) Installation: Per manufacturers installation instructions using. Provide blocking as required.
(f) Locations: PAB: Showers 107 (1), Showers 112 (1)

(11) Adjustable Height Changing Station: Koala Kare KB3000-AHL

(a) Size (folded down): 75 5/16”W x 40 9/32”D x 60 15/32”H
Size (folded up): 75 5/16”W x 9 23/32”D x 60 15/32”H
(b) Power: See electrical drawings
(c) Wall Sign: Mounted required wall sign provided by manufacturer.
(d) Installation: See architectural drawings and manual following this specification.
(e) Location: RC Family Restroom 114 (1)

(12) Surface Mount Baby Changing Station: Koala Kare KB310-SSWM Stainless Steel Station

(a) Size (folded down): 43 ¾”W x 21 5/6”D x 28 5/8”H
Size (folded up): 43 ¾”W x 6 5/8”D x 28 5/8”H
(b) Material: Type 304 satin stainless steel outer shell and recessed pan, with injection-molded polypropylene interior.
(c) Unit to include a dual cavity liner dispenser with bed liners.
(d) Installation: Per manufacturers installation instructions using included mounting hardware. Providing blocking as required.
(e) Locations: RC Men Restroom 112 (1), Family Restroom 114 (1), Women Restroom 115 (1), Women 213 (1), Men 214 (1)

(13) Coat/Clothing Hooks: ASI 7308

(a) Size: 1 15/16" round x 2 5/16”D
(b) Material: Type 304 Satin Stainless Steel
(c) Locations:

1. RC (one in each location): Women Restroom 115 (1), Men Restroom 112, Janitor Office 128, Workroom 135, Staff Office 136, Staff Office 137, Staff Office 139, Staff Office 140, Staff Office 141, Director 142, Staff Office 143, Staff Office 144, Staff Office 145, Director of DRD 147, Men 151, Women 152, Women 213, Men 214A,
2. PAB: Showers 107 (4), Showers 112 (4). Provide blocking for these units.

3. EXECUTION

A. Delivery, Storage and Handling of Materials: Deliver, store and handles materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

B. Preparation of Area: Products shall not be installed until area in which they are to be installed is ready.

C. Protection of Adjacent Work: Care shall be exercised to avoid damage to finishes adjacent to where these products are installed.

D. Installation: Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:

(1) Verify blocking has been installed properly.
(2) Verify location does not interfere with door swings or use of fixtures.
(3) Comply with manufacturer's recommendations for backing and proper support.
(4) Use fasteners and anchors suitable for substrate and project conditions.
(5) Install units rigid, straight, plumb and level in accordance with manufacturer's installation instructions and approved shop drawings.
(6) Conceal evidence of drilling, cutting and fitting to room finish.
(7) Test for proper operation.

E. Completion of Work:

(1) Clean exposed surfaces of all accessories using methods acceptable to the manufacturer.
(2) Touch-up, repair or replace damaged products until Substantial Completion.

KB3000-AHL

Adjustable Height Changing Station

Koala Kare™

Installation and User Guide

50.157.08.0004 (Rev2)

Contents

Section 1

The KB3000 is a robust height adjustable changing station, delivering uncompromised user comfort and simple hygienic upkeep. Its patented stretcher is made from a highly cut-resistant material that is easy to clean and disinfect, yet offers a comfortable bed to lie on. It has been designed to be tamper proof with integrated controls and security fittings, and contains no removable parts. The guard gives versatility of use to suit your care task and situation, giving better access while maintaining safety.

Intended Use

No formal training is required to use the KB3000, but users must read and understand the user guide. To aid usage, a quick user guide should be clearly displayed on the wall at all installations.

CAUTION: The product must not be used for any purpose that is not specified within these operating instructions

The product is intended to be used by people trained or experienced in healthcare for a family member or client that:

- needs to be changed or cleaned in a lying position
- is older and/or larger than a child able to use a standard baby changing station

Other than the weight of the patient using the changing table, there are no known contraindications associated with this device.

The maximum working load for the KB3000 is 500 lbs (227 kg).
The recommended position for use of this equipment is shown in Fig 1.

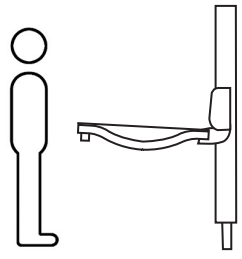


Fig 1

Operating Environment

The KB3000 is a product designed for use in public changing facilities. However, it could be used in any indoor facility at room temperature.

Section 2

See Section 5 for where the label is positioned on the product.
See Section 4 for a full explanation of symbols, cautions and warnings.

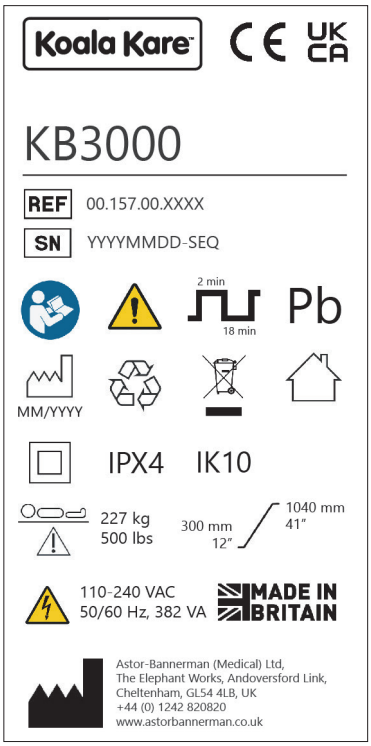


Fig 2a Product label

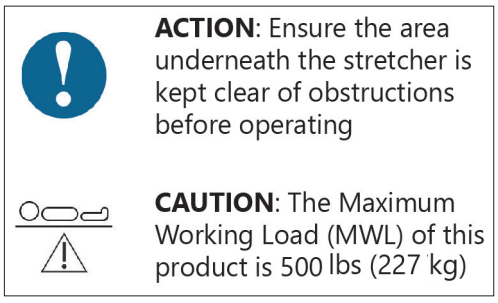


Fig 2b Front cover label

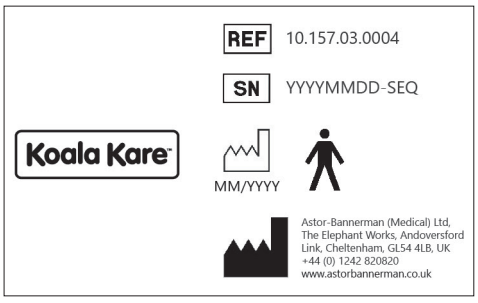


Fig 2c Stretcher label

Section 3

Once registered, this product has a **3 year warranty** against all defects in manufacture of the product. This does not affect your statutory rights.

To validate your warranty and for full terms and conditions, please register your product and your details immediately:

on-line at: koalabear.com

email our support team: customerservice@koalabear.com
or call us on Main: 303.539.8300 | **Toll Free:** 888.733.3456

This warranty is provided by Koala Kare to the registered customer.

Equipment requiring commissioning must be commissioned by a competent, trained technician for this warranty to be valid.

To maintain the warranty, the equipment must be serviced at least on an annual basis by a competent, trained technician. Service or repairs undertaken by persons other than competent qualified technicians will invalidate this warranty.

This product has been designed using quality components and tested under standard usage conditions to give a 10 year service life based on regular servicing and average usage patterns and conditions. This does not alter the warranty offered.

Section 4.1 Standard symbols

Below are some common symbols used throughout this document and on the product labelling.

This product is UKCA Marked and is certified to BS EN 60601-1:2006+A12:2014 Medical electrical Equipment General Requirements for Basic Safety and Essential Performance, and to BS EN 60601-1-2:2015 for EMC. It also complies with Supply of Machinery (Safety) Regulations 2008, Electrical Equipment (Safety) Regulations 2016, BS EN 349:1993+A1:2008 Minimum gaps to avoid crushing parts of the human body, ISO 10535 Hoists for the transfer of disabled persons, ISO 17966 Assistive products for personal hygiene that support users and BS EN 62262. A declaration of conformity can be found on our website.

This product is CE-marked and is certified to BS EN 60601-1:2006+A12:2014 Medical electrical Equipment General Requirements for Basic Safety and Essential Performance, and to BS EN 60601-1-2:2015 for EMC. It also complies with Supply of Machinery (Safety) Regulations 2008, Electrical Equipment (Safety) Regulations 2016, BS EN 349:1993+A1:2008 Minimum gaps to avoid crushing parts of the human body, ISO 10535 Hoists for the transfer of disabled persons, ISO 17966 Assistive products for personal hygiene that support users and BS EN 62262. A declaration of conformity can be found on our website.

Koala Kare product reference number.

Koala Kare product serial number.

FOLLOW INSTRUCTIONS FOR USE: Before installing or using this equipment you must read and fully understand these instructions. Failure to comply with these instructions may result in accidents resulting in serious personal injury or the product being damaged.

CAUTION: To indicate that caution is necessary when operating the device or control close to where the symbol is placed, or to indicate that the current situation needs operator awareness or operator action in order to avoid undesirable consequences.

WARNING: This symbol indicates a hazardous situation which could result in serious injury or even death if not avoided.

WARNING: This symbol indicated a hazard relating to electricity/voltage.

Type B applied parts. Parts of this product in normal use necessarily comes into physical contact with the patient to perform its function. The product complies with requirements of IEC 60601-1 to provide protection against electric shock. The applied part for this equipment is the changing table stretcher

This product has a duty cycle of 2 minutes ON and 18 minutes OFF.

This product is for indoor use only.

ACTION: This sign is used to highlight a mandatory action that must be followed by the user.

Identify any terminal which is intended for correction to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.

Used to identify that a component is suitable for direct current only.

Class II power supply.

Caution, safety information & checks

Parts of this product can be recycled.

Parts of this product must be separated when being disposed of.

Pb

The battery used in this product contains Lead.

Details of product manufacturer.

Symbol indicated the date of manufacture.

IPX4

This product has been tested for water ingress in accordance with IPX4.

IK10

This product has been tested for external mechanical impacts in accordance with IK10.

The maximum working load for this product is 500 lbs (227Kg).

The lifting range of this product is 12" (300 mm) to 41in" (1040mm).

WARNING: This symbol indicates a hazard associated with EMC (Electromagnetic Compatibility).

Power supply is equipped with safety isolation and short-circuit protection.

MADE IN BRITAIN

Astor Bannerman products are proudly made in Britain.

Control button to raise the stretcher.

Control button to lower the stretcher.

To indicate connection to the mains power supply.

To identify the battery condition indicator.

To signify a prohibited action.

Section 4.2 General safety information

WARNING: These instructions must be read and understood before installing or using this equipment. Failure to comply with these instructions may result in accidents resulting in serious personal injury or the product being damaged.

WARNING: No modification of this equipment is allowed without express authorization from Koala Kare. If you suspect that any individual parts may be damaged contact for Koala Kare dealer or service provider. Do not remove, attempt to repair or install parts yourself, unless directed to do so by Koala Kare or its agents.

CAUTION: The product must be installed professionally by a qualified trained individual.

Koala Kare and Astor Bannerman cannot be held liable for injury to persons or damage to property caused by faulty installation.

WARNING: This electrical equipment needs special precautions regarding electromagnetic compatibility (EMC) and needs to be installed and put into service in accordance with the EMC information. It is unlikely that the user will encounter problems with the product because of inadequate electromagnetic compatibility. However, portable and mobile RF communications equipment can affect medical electrical equipment. When the product is connected to the local mains power supply, we recommend the use of electromagnetic shielding and similar preventative measures to avoid conducted emissions. Prior to installation please ensure that there are no existing equipment in the environment that could be adversely affected by electromagnetic interference.

Use of the device should be discontinued if it is suspected that the equipment is being affected by electromagnetic interference.

WARNING: Risk of electric shock if equipment is not used correctly.

WARNING: To avoid the risk of electric shock, this equipment must only be connected to a mains electrical supply with protective earth. The installer must verify that the protective earth terminal of the control box is connected to the external protective earthing system.

WARNING: The product must be connected to the mains supply and a protective earth connection by a qualified electrician in accordance with IEC 60601-1, as well as any locally applicable standards.

WARNING: To ensure protection by electrical separation, the product must be supplied by a mains sup-ply circuit that does not supply power to any other equipment, unless it incorporates a residual current protective device (RCD) with a rated residual operating current not exceeding 30 mA. The circuit must be grounded using a protective earth connection and able to be isolated from mains supply by means of a switch installed in a wall or cabinet. Ensure that location of the mains isolation switch or coupling is easy to access and use.

WARNING: The height adjustable changing table is powered by a 32VDC control system with battery backup. The battery enables the use of the changing table in the event of mains electrical supply failure. It is essential that mains electrical power is switched on at all times to maintain the charge of the backup batteries. Ensure that the device is connected to the internal battery at all times.

Section 4.3 EMC declaration

<table>
<tr><td colspan="4">The KB3000 changing station has been tested for compliance to EN 60601-1-2:2015 and is intended for use in the electromagnetic environments specified below. The responsible organisation should assure that it is used in such an environment.</td></tr>
<tr><td colspan="4">Guidance and Manufacturer's Declaration - RF Emissions</td></tr>
<tr><td>Test</td><td>Compliance Standard</td><td colspan="2">Electromagnetic Environment - Guidance</td></tr>
<tr><td>Radiated Emissions
Conducted Emissions</td><td>CISPR 11:2015 +A1:2016
Group 1, Class A</td><td colspan="2" rowspan="3">The KB3000 changing station is suitable for use in all public changing facilities. Its RF emissions are low and are not likely to cause any interference in nearby electronic equipment.</td></tr>
<tr><td>Mains Harmonics</td><td>EN 61000-3-2:2014 Class A</td></tr>
<tr><td>Mains Voltage Flicker</td><td>EN 61000-3-3:2013</td></tr>
<tr><td colspan="4">Guidance and Manufacturer's Declaration - Electromagnetic Immunity</td></tr>
<tr><td>Immunity Test</td><td>Compliance Standard</td><td>Compliance Level</td><td>Electromagnetic Environment - Guidance</td></tr>
<tr><td>Electrostatic Discharge</td><td>EN 61000-4-2:2009</td><td>3 8kV contact

315kV air</td><td>Floors should be wood, concrete or ceramic tile.
If floors are covered with non-conductive synthetic material the relative humidity should be at least 30%.</td></tr>
<tr><td>Magnetic Field Immunity</td><td>EN61000-4-8:2010</td><td>30A/m</td><td rowspan="5">Mains power quality should be that of a typical commercial environment.

If problems are encountered then use of the equipment should be discontinued until the source of interference is identified and corrected.</td></tr>
<tr><td>Radiated RF Immunity</td><td>EN61000-4-3:2006
+A1:2008 + A2:2010</td><td>3V/metre
(28V/m spot frequencies)</td></tr>
<tr><td>Conducted Immunity</td><td>EN 61000-4-6:2014</td><td>3V rms (6V in ISM Bands)</td></tr>
<tr><td>Fast Transient Burst</td><td>EN 61000-4-4:2012</td><td>32kV for power supply lines;
31kV for input / output lines</td></tr>
<tr><td>Surge Immunity</td><td>EN 61000-4-5:2014</td><td>31kV differential mode;
32kV common mode</td></tr>
<tr><td>Voltage Dips and Interruptions</td><td>EN 61000-4-11:2011 +A1:2017</td><td>-100% ½cycle
-100% full cycle
-30% 500mS
-100% 5000mS</td><td>The KB3000 changing station is equipped with a battery backup to permit continued use in the event of a power failure.</td></tr>
</table>

Section 4.4 Regular checks

Please note that the cover must be removed to complete servicing tasks (this includes all annual tasks) which must only be done by a qualified person.

DO NOT: carry out these checks or service this changing station when a person is lying on the stretcher.

Tasks to be completed:	Start-up	Monthly	Every 6 months	Annually
Disinfect unit	✓			
Clean stretcher	✓			
Check stretcher is undamaged	✓			
Check stretcher is secure with no play (check it does not wobble side to side)	✓			
Check mains power & battery status indicator lights are both green	✓			
Rise and fall: full function test of the equipment; smooth; no unusual noise		✓		
Check front guard locks securely / unlock smoothly		✓		
Check front guard rotates freely once unlocked		✓		
Corrosion: inspect the unit for any signs of corrosion		✓		
Cables: Check that all cables from the power supply/control unit are securely fitted and show no sign of damage		✓		
Fixings: Inspect all visible nuts, bolts etc. to see that they are secure		✓		
Check the stretcher angle has not changed when the stretcher is deployed. Stretcher should not be leaning towards the floor. If so arrange a service.		✓		
LOLER test* (to be completed by service engineer)			✓	
Service** (to be completed by service engineer)				✓

*LOLER testing applicable to products used within the UK. Please follow all applicable local regulations.

**To maintain your warranty, and for your safety, this product should be fully serviced annually by a competent, trained technician.

Koala Kare will make available on request circuit diagrams, component part lists, descriptions, calibration instructions, or other information that will assist service personnel to repair those parts of the equipment that are designated by the manufacturer as repairable by service personnel.

If the equipment is likely to not be used for over 1 month then the battery should be disconnected. This can be done by following the reverse of section 12.2.

For further information on servicing offered by Koala Kare, contact: customerservice@koalabear.com

Section 5

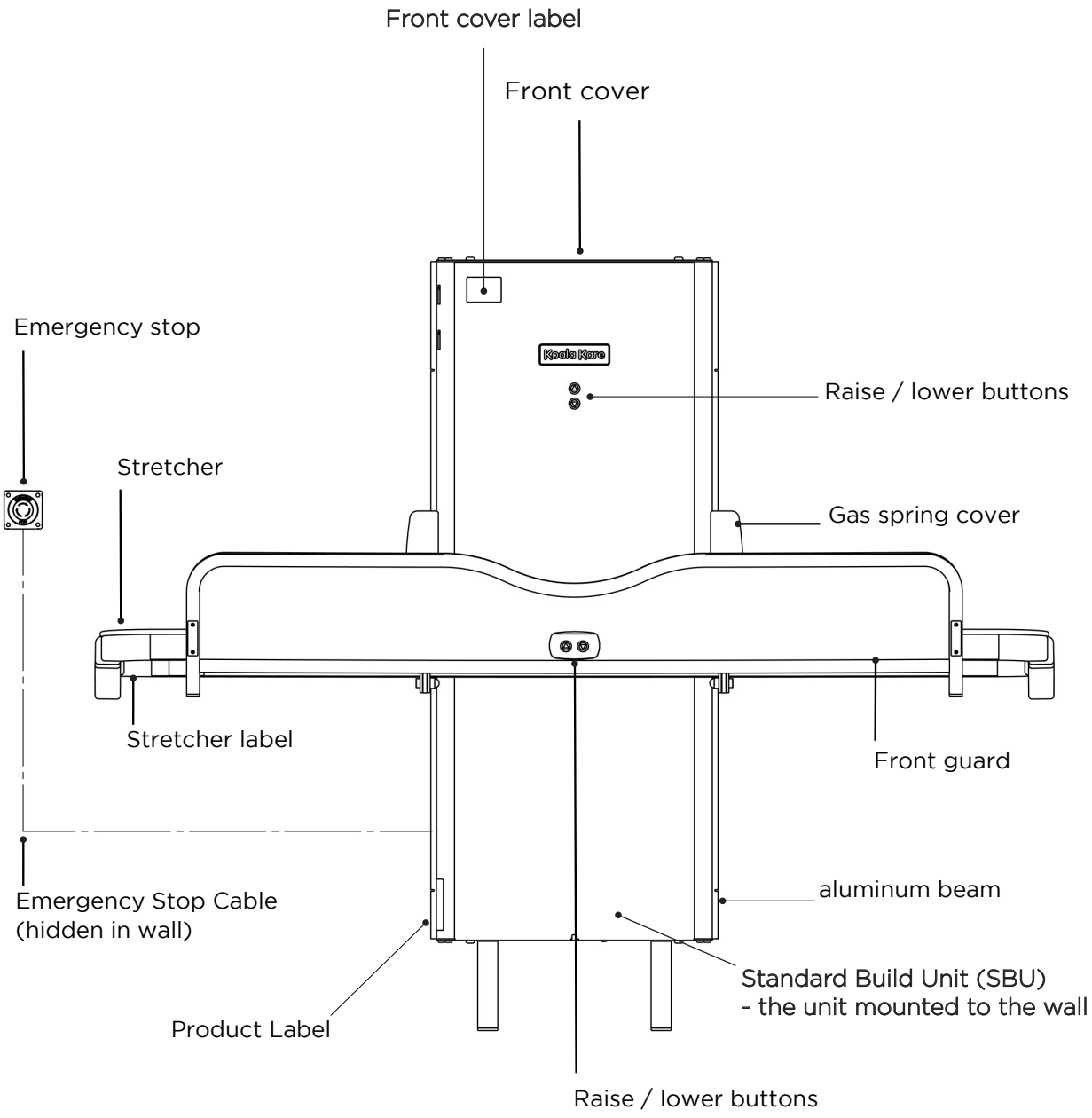


Fig 5

Section 6.1 Daily checks

Carry out the following checks daily before using the changing station:

- Check the weight of the user and ensure the equipment is rated for the weight to be lifted.
- Check the mains electrical supply is connected and turned on, see indicator light information Section 6.4. If mains supply is not turned on inform your facility manager.
- If the device is running on battery power ensure that there is sufficient battery charge, see indicator light Section 6.4.
- Check there are no obstructions or items that may be trapped when the changing station is operated.
- Check that the changing station will raise and lower using the buttons on the front cover or stretcher frame (see Section 6.5).
- In the event of an emergency where the mains power should need to be disconnected your device should have a mains isolation switch installed in a separate room or cabinet. (see Section 11 pre-install requirements)

Section 6.2 Preparing for use

The changing station is securely held in the stowed position by gas springs. There is no release mechanism to operate before deploying the stretcher. To move the bed from the stowed position:

- Place your hand on the top edge of the stretcher.
- Pull gently forward and the stretcher will begin to rotate down.
- During the rotation, the bed will gain a little momentum, so position your hand underneath to aid it lowering slowly down.

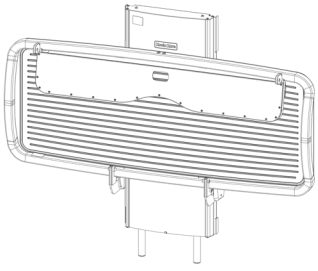


Fig 6.2a

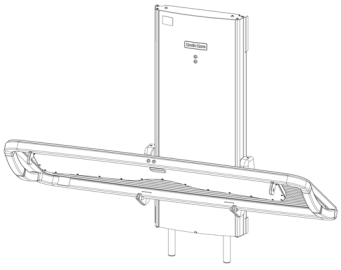


Fig 6.2b

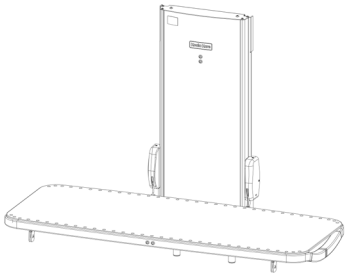


Fig 6.2c

ACTION: Ensure the area underneath the stretcher is kept clear of obstructions before operating to prevent risk of injury.

CAUTION: Keep clear of moving parts when stretcher is being raised or lowered.

Section 6.3 How to stow the stretcher

The changing station is securely held in the stowed position by gas springs. There is no release mechanism to operate before deploying the stretcher. To move the bed from the stowed position:

- Stow the guards as shown in Section 6.6.
- Place your hand on the underside of the stretcher.
- Pull gently upwards and the stretcher will begin to rotate up.
- During the rotation, the bed will gain a little momentum, so position your other hand on the end of the stretcher to control the movement safely.

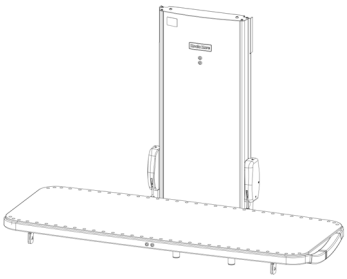


Fig 6.3a

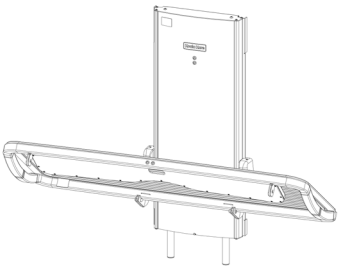


Fig 6.3b

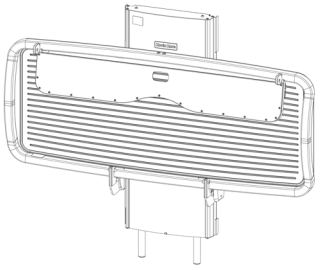


Fig 6.3c

ACTION: Ensure the area around the stretcher is kept clear of obstructions before operating to prevent risk of injury.

CAUTION: Keep clear of moving parts when stretcher is being raised or lowered.

Section 6.4 Check the status of the changing station

The changing station has two indicator lights at the side of the main unit. (Fig 6.4a)
The top indicator light will illuminate green when there is power to the device.
The light on the bottom will show the status of the battery. Use the equipment only if both lights are green.

DO NOT: use the equipment if the both power indicator lights are not green except in emergencies.

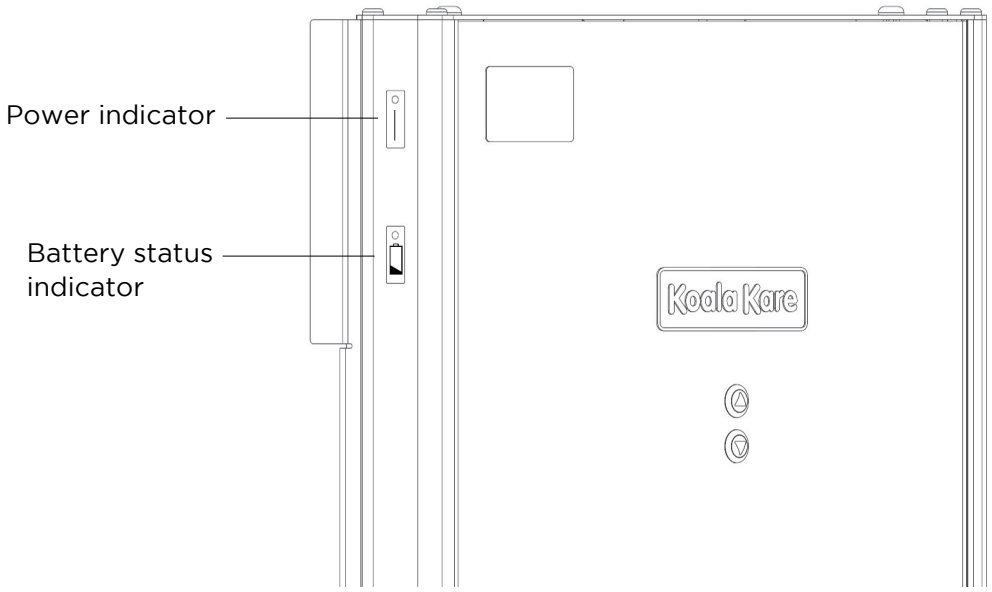


Fig 6.4a

Mains power indicator

- **Green =** Power on - Device in normal condition and ready to use if battery status indicator light is also green.
- **No light =** There is no mains electrical supply to the device. See troubleshooting section of this manual.

Battery status indicator

- **Green =** Battery level between 50% and 100%.
- **Green - flashing =** Battery is charging and above 50% charge. The device is safe to use if mains power indicator light is also green.
- **Orange =** Battery is between 20% and 50%. Only use device for emergency release of the patient.
- **Orange - flashing =** Battery is charging and between 20 and 50%. Only use device for emergency release of the patient.
- **Red =** Battery has less than 20% battery and is not in a ready to use state. Please see troubleshooting section.
- **Red - flashing =** Battery is charging and has less than 20% battery and is not in a ready to use state. Please see troubleshooting section.
- **No light =** There is no battery power to the device. See troubleshooting section of this manual.

Section 6.5 Adjusting the height of your changing station

- The changing station is operated using buttons on the front cover or moving stretcher frame.
- In each location, the buttons will either raise or lower the changing station to the desired height.
- Use the raise/lower buttons to position the station at the most convenient height to transfer the person being cared for.
- Once the person has been transferred, raise the front guard (see 6.6)
- The stretcher height can then be adjusted to suit a height most comfortable for the care-giver.
- If there is any unexpected movement of the stretcher use the emergency stop.

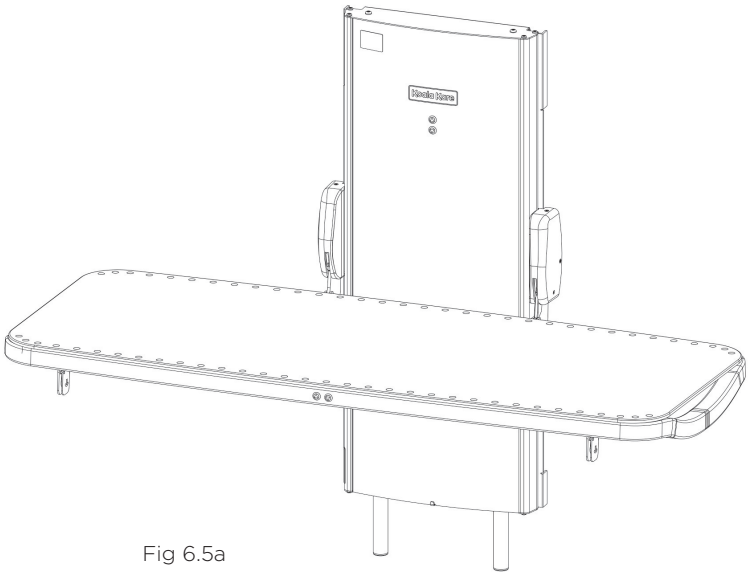


Fig 6.5a

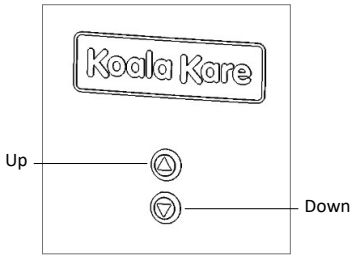


Fig 6.5b

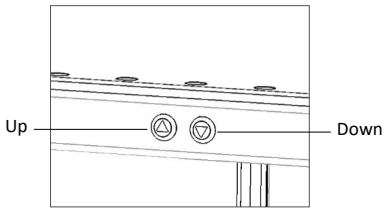


Fig 6.5c

WARNING: Risk of injury by crushing. Ensure the area underneath the stretcher is kept clear of obstructions before operating. Keep clear of the area above the stretcher when stowing.

CAUTION: Keep clear of moving parts when operating. Ensure there are no obstructions when moving the guards into position.

ACTION: Always deploy the guards before moving the changing table with a person on the stretcher.

ACTION: Ensure the area underneath the stretcher is clear of obstructions before operating.

Section 6.6 Using the guard

The KB3000 changing station has a front guard which can be stowed under the stretcher.

ACTION: Always deploy the guard before moving the changing table with a person on the stretcher.

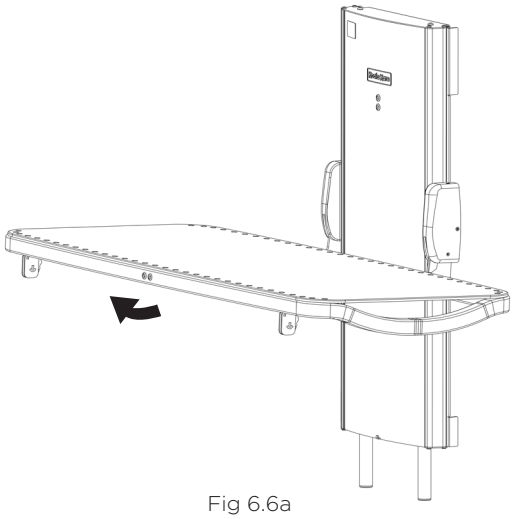


Fig 6.6a

To move the guard into place:

- Reach underneath the stretcher and take hold of the guard. The guard is stowed with magnets, see Fig 6.6a.
- Pull down on the front edge of the guard so it rotates down. Take care not to let go as it may swing around on its own, see Fig 6.6b.
- Rotate the guard forward and up into position.
- Once upright, the guard will be able to drop down into its location and lock into place, see Fig 6.6c.

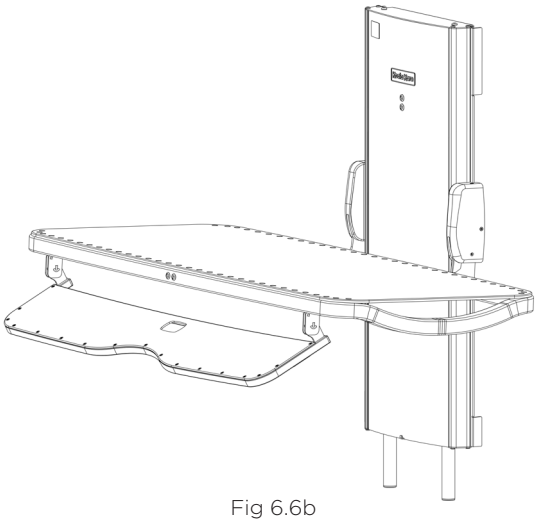


Fig 6.6b

To stow the guard:

- Lift the guard up until it can be rotated back towards you.
- Rotate the guard down and back underneath the stretcher.
- Push the guard up underneath the stretcher until the magnets hold it.

CAUTION: Ensure there are no obstructions while moving the guard into position.

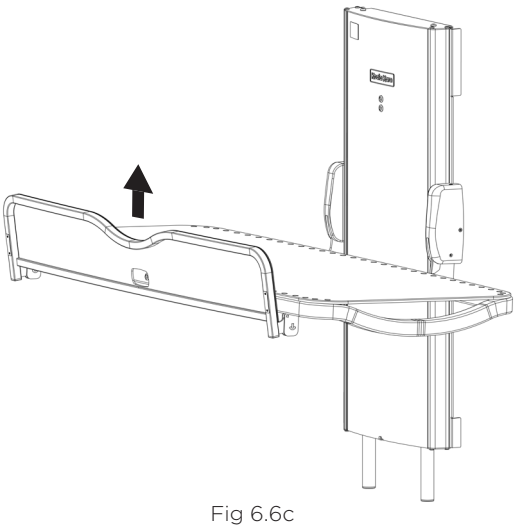


Fig 6.6c

Section 7

The KB3000 changing station should be regularly cleaned and must be cleaned between users to prevent the risk of cross contamination of infection.

CAUTION: The heavy use of oil based products may adversely affect the stretcher material. Oils and other petrochemical products should be avoided and any residue removed immediately. These products include, amongst others: baby oil and emollient creams.

Cleaning:

- Before cleaning, try a small test first in an inconspicuous area with the cleaning agent you are proposing to use.
- The changing station may be cleaned using mild cleaning agents, Isopropyl alcohol (maximum 70% alcohol) or with a warm soapy water solution. The changing station should be rinsed off after cleaning and dried off with a soft cloth.
- Chemical agents, abrasive compounds and solvents must not be used, i.e. drain cleaners, acetone, oven cleaners or acids.
- Attention should always be paid to instruction labels for the cleaning agent.
- Do not use an autoclave or other type of steam cleaner to clean any part of the product.
- The main unit of the device may be cleaned with the same solution used on the stretcher, a stainless steel cleaner may be used on the front cover to remove any marks.

ACTION: Ensure any cleaning product spillages are cleaned up correctly.

CAUTION: Always follow the instructions and comply with the safe use of the cleaning/disinfecting agent. Do not mix cleaning products.

CAUTION: Do not use flammable cleaning agents.

CAUTION: Do not use abrasive cloths or cleaners.

CAUTION: A dampened, non-wet cloth should be used for cleaning.

CAUTION: Do not pour or spray cleaning liquids directly onto the equipment.

Section 8

Problem: The stretcher won't move up or down
Suggestion: Check if the emergency stop has been activated, to release turn the emergency stop button clockwise. Check that the mains power supply is switched on. Check that you are using the correct button for the direction of your choice. Check battery status of the device. If the stretcher still won't move, use the other set of buttons. If you discover one or both sets of buttons are not working correctly, please contact Koala Kare at customerservice@koalabear.com

Problem: I cannot release the front guard
Suggestion: The guard is held in place by magnets, so with a strong tug, it should easily release.

Problem: I cannot put the guard down to stow it
Suggestion: The guard is held in place by a auto-lock mechanism. To release this you need to lift the guard before you try to rotate it down.

Problem: My guard does not stow correctly
Suggestion: The guard is held in place with magnets fixed to the underside of the stretcher. Ensure you have rotated the guard to meet the underside of the stretcher so that the magnets can engage.

Problem: My power indicator lights are not illuminated
Suggestion: If the mains power light is not on check that your mains power supply is switched on and live. If the battery power light is flashing please wait for it to turn green before using the product. If the mains light is on and the battery light is red or orange, but not flashing, please contact Koala Kare.

Problem: My battery status indicator light has been continually flashing for over 24 hours.
Suggestion: There maybe a problem with your recharging circuit. Please contact Koala Kare.

Problem: I have an idea for improving my product; some feedback, or there's something that doesn't work as expected
Suggestion: Koala Kare are committed to continuous improvement. Please contact our service department with suggestions, improvements, feedback or to let us know of any problems with your product at customerservice@koalabear.com

Section 9

AC input	110VAC-240VAC, 50/60Hz, 382VA
Power supply	Class I power supply
Applied part	Stretcher of device is an applied part type 'B'
Battery specification	Lead acid battery / "non-spillable" Input 30V - Output 24V Supplier reference - TiMotion (TBB2-4307-001)
Battery model	TiMotion TBB2 1.2A
Fuses	5Amp fuses (External to the device, part of the mains supply system)
Duty cycle	10% maximum: 2min use & 18mins rest
Maximum working load	500 lbs (227 kg)
Sound emission	LAeq 56dB at maximum working load
Width	75 1/4" (1911 mm)
Height	60 1/2" (1536 mm)
Depth	40 3/4" (1026 mm) - Stretcher and guard deployed
Weight of product	308 lbs (140 kg)
Materials	Mild steel, Stainless Steel, Polyethylene
Operating ambient temperature range	50°F to 104°F / 10°C to 40°C
Operating relative humidity range	10 - 80% not condensed at 68°F / 20°C
Operating atmospheric pressure	50kPa to 106kPa
IP class	IPX4
Transport & storage conditions	10°C to 40°C / 50°F to 104°F 10 - 80% not condensed at 20°C / 68°F

CAUTION: Battery must only be replaced by qualified service personnel. Replacement battery must be the same model as the original battery supplied with the device.

Overall dimensions

Section 10

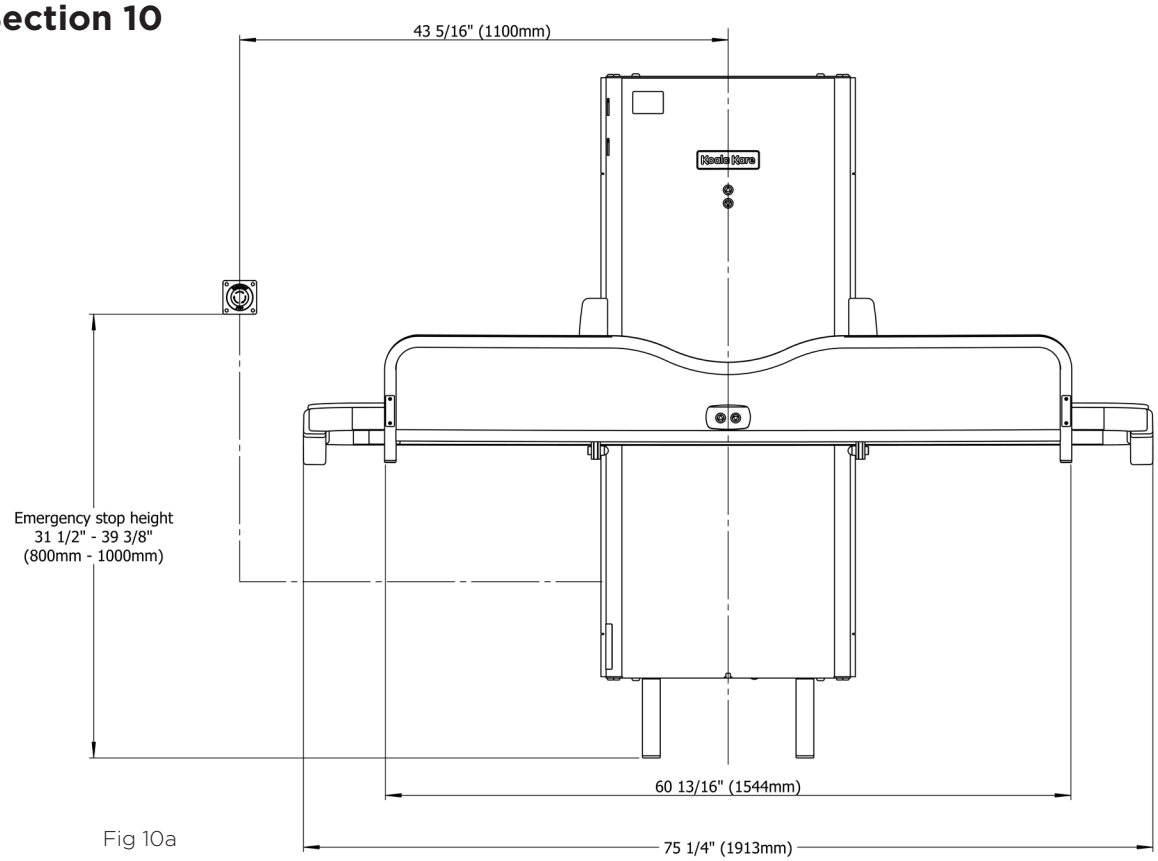


Fig 10a

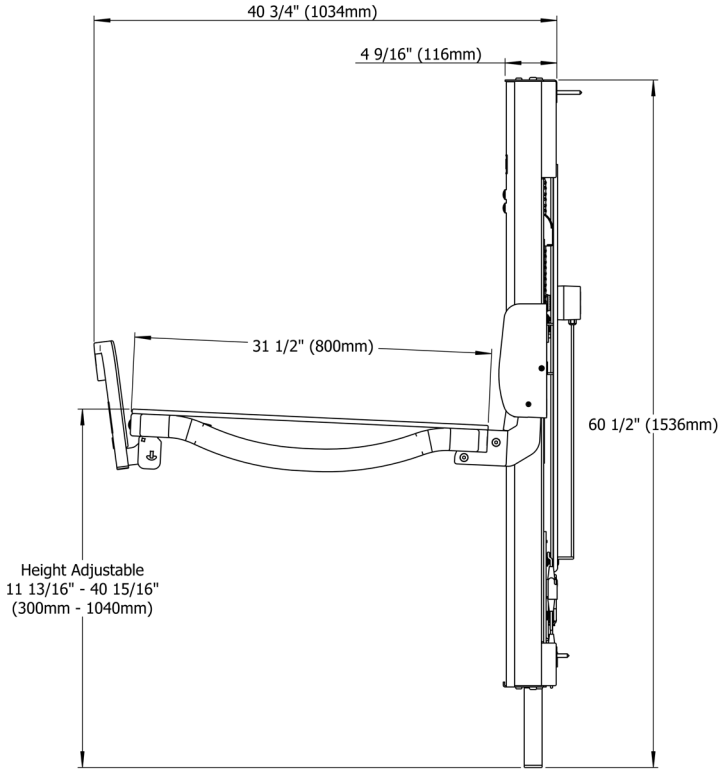


Fig 10b

Section 11

Before the changing station can be installed, the wall and mains electrical supply must have been prepared as set out below. Pre-Installation works should be carried out by a competent and qualified professional in compliance with local and national building code standards.

- Electrical requirement: Ensure electrical hazards are fully understood before commencing pre-installation, See section 4.2 page 8 for detail. This device is powered by a Class II power supply. A mains supply to suit the technical specification is required through a switched, waterproof, flex outlet. This must be fitted as described below.
- There must be an easily accessible mains isolation switch fitted for this device. It is recommended to be located in a separate room or in a cabinet. If the mains isolation switch is out of sight the switch should have a lock. To conform to IEC60601 clause 8.11.1 both poles of the electrical supply must be isolated. If the isolator is out of the view of personnel servicing the equipment then it shall be capable of being locked in the off position.
- The KB3000 is a wall-mounted, floor standing product.
- This product must be connected to a suitable mains earth

WARNING: Ensure the electrical mains supply is isolated from power while connecting the product to the mains supply.

Section 11.1 Preparing the wall

WARNING: Ensure supporting wall and fixings are suitable and correctly installed by a competent and qualified professional. risk of collapse of equipment if the strength of the supporting wall structure is inadequate.

- A 108 5/16” (2751 mm) width area is recommended for fitting this product, to allow adequate clear space at both ends of the unit. If this is not available please defer to local/national building code for minimum clearance required around the unit.
- For solid masonry construction, it is expected that a wooden frame of 2” (50 mm) x 2” (50 mm) sections will be securely fixed to a solid load bearing concrete, brick or equivalent construction wall which is flat and able to bear a load of 1250 lbs (566 kg).
- This construction or equivalent must be faced with minimum 23 5/8” (600 mm) wide, 1 in. (25 mm) thick marine plywood which continuously extends from floor to ceiling.

- The marine plywood must be from floor to ceiling and secured every 7 7/8” (200 mm). around the perimeter and to at least 2 supporting horizontal cross members as shown in Fig 11.1.
- Ensure the horizontal cross members are not located at the same height as the changing station’s fittings as shown in Fig 11.3 in order to avoid a future installation problem.
- For wooded stud walls additional framing will not be required as long as framing behind the installed unit matches that shown in Fig 11.1.
- Koala Kare cannot be held responsible for the reinforcements made in a faulty manner.
- These recommendations are to be considered as guidelines only.

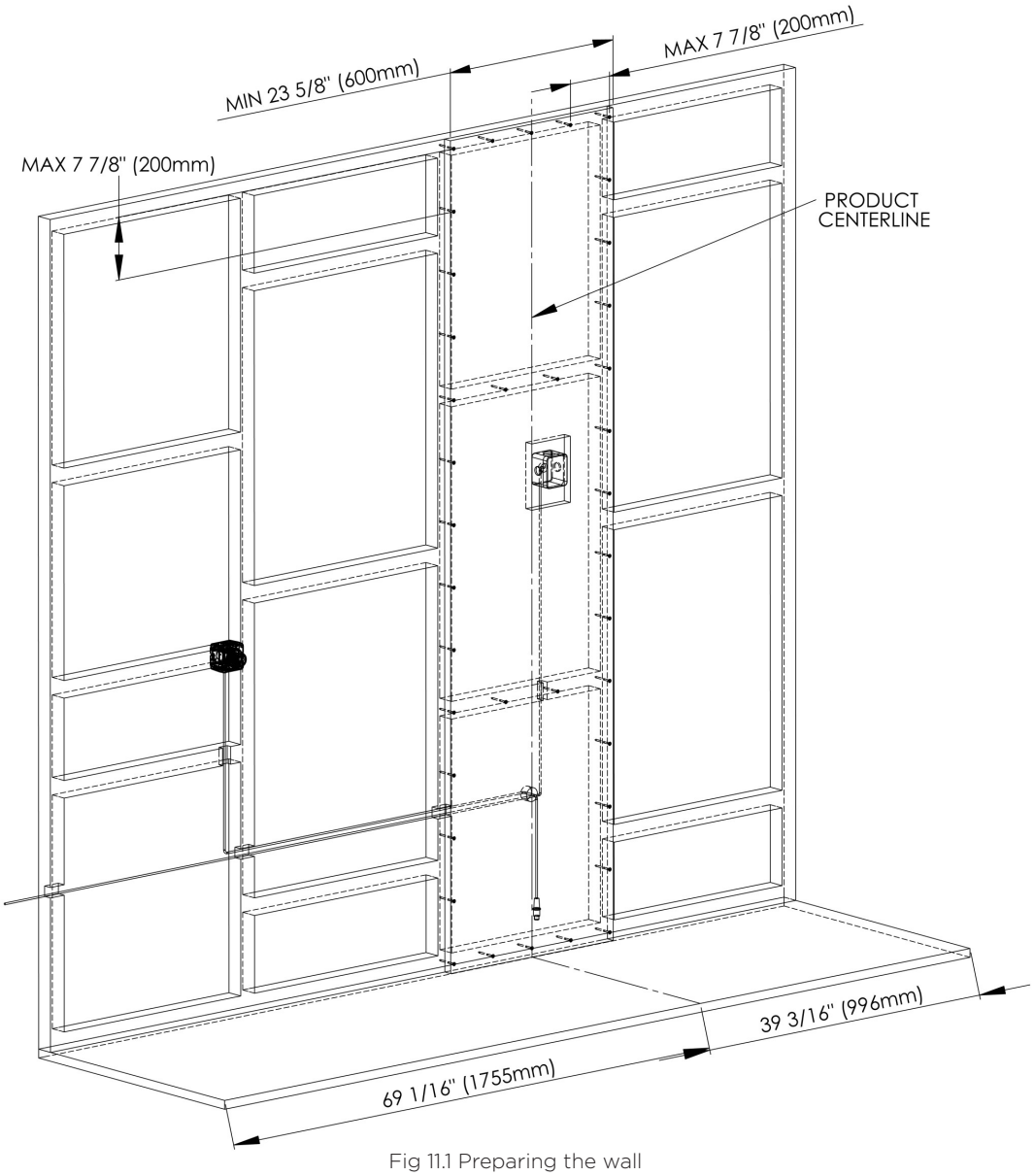


Fig 11.1 Preparing the wall

Section 11.2 Fitting the emergency stop & switched, waterproof, flex outlet

- The provided emergency stop must be fitted at the position shown in Fig 11.2.
- The emergency stop can be fitted either side of the product depending on your room layout. There must be at least 1 9/16" (40 mm) clearance at one end and 31 1/2" (800 mm) at the other end of the product for the emergency stop. This is to ensure it is 'easily accessible' in accordance with ISO 13850.
- Provision needs to be made to allow the cable to be traced in through the wooden frame and remain hidden behind the dry wall/plasterboard. At least 11 13/16" (300 mm) of cable should come through the marine plywood at the position shown in Fig 11.2.
- Take care not to damage the connector at the end of the cable. This will be attached to the SBU later during installation.
- A switched, waterproof flex outlet is required for hard wiring the product. This outlet must be located in the position shown in Fig 11.2. The outlet cannot be any larger than 7 1/2" (191 mm) tall or 5 5/8" (142 mm) wide and must be flush or subflush to the level of the marine plywood once fitted.
- Examples of suitable outlet types are K56410GRY from MK Electronics or WPB50 from British General.

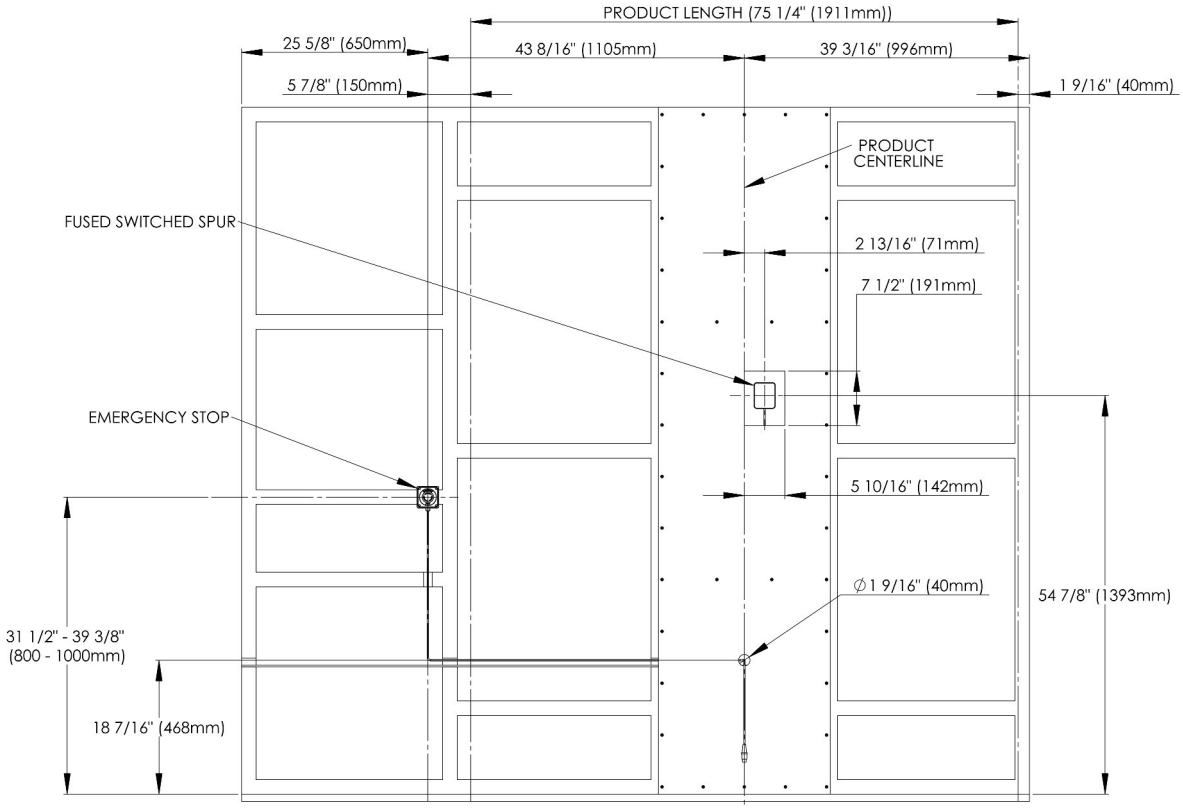


Fig 11.2 Emergency stop & switch, waterproof, flex outlet

11.3 Finished pre-installation & checks

- The finished pre-installation should appear like Fig 11.3.
- Drywall/plasterboard is fitted to appear flush with the marine plywood. This wall can then be blended/painted so to appear as a finished wall.

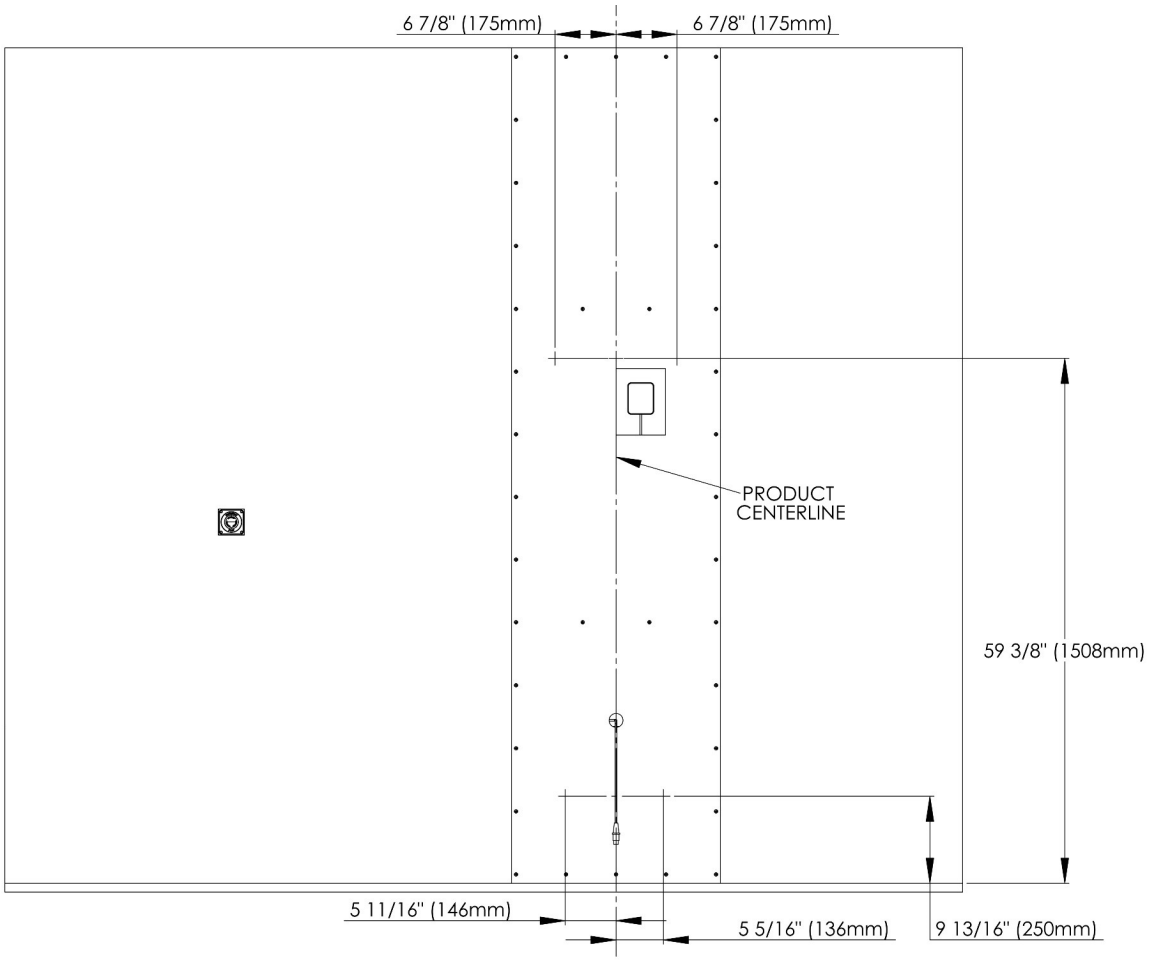


Fig 11.3 Fixing points of KB3000 SBU

Checks:

- A sheet of 1" (25 mm) marine plywood which is at least 23 5/8" (600 mm) wide has been securely fitted in accordance with section 11.1.
- The Emergency Stop has been fitted at the position shown in Fig 11.2. The cable has been hidden in the wall and at least 11 13/16" (300 mm) of cable is coming out of the wall.
- The switched, waterproof flex outlet has been fitted in the position shown in Fig 11.2, is no larger than the stated dimensions and flush or sub-flush with the wall.
- The entire wall has been painted and finished ready for product fitting.

Section 12

The KB3000 must be installed by a competent and qualified technician in compliance with local and national building code standards.

Ensure that all pre-installation works have been carried out & checked in accordance to Section 11.

Section 12.1 Preparing the standard build unit for installation (SBU)

The SBU will be provided with the front & gas spring covers already fitted.
These will need to be removed before starting the installation.

Externally accessed security fixings require specific tools which are provided.
Please keep them safe after completing installation for future servicing.

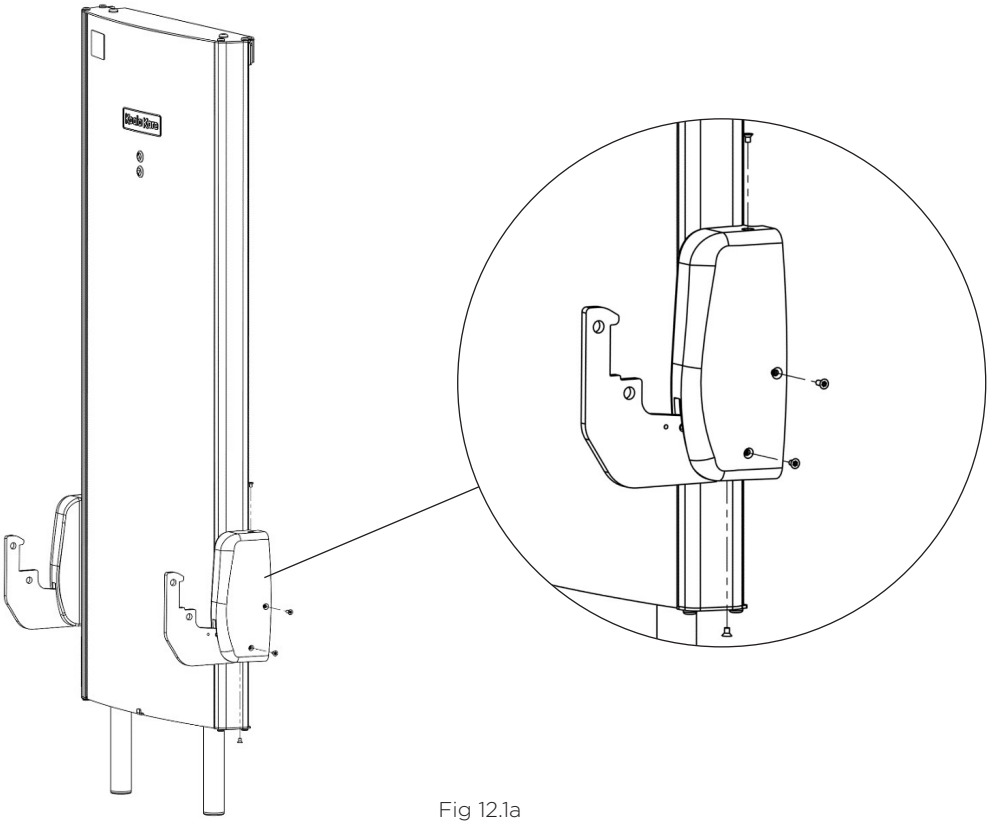


Fig 12.1a

- Remove the four security fixings from each of the gas spring covers, as shown in Fig 12.1a. Take note the upper most horizontal screw is a different size and has a hidden spacer inside the cover.

Section 12.1 Preparing the standard build unit for installation (SBU)

- Each gas spring cover can then be removed by rotating up and away, as shown in Fig 12.1b. Keep in safe place as they will be refitted at the end of the installation.

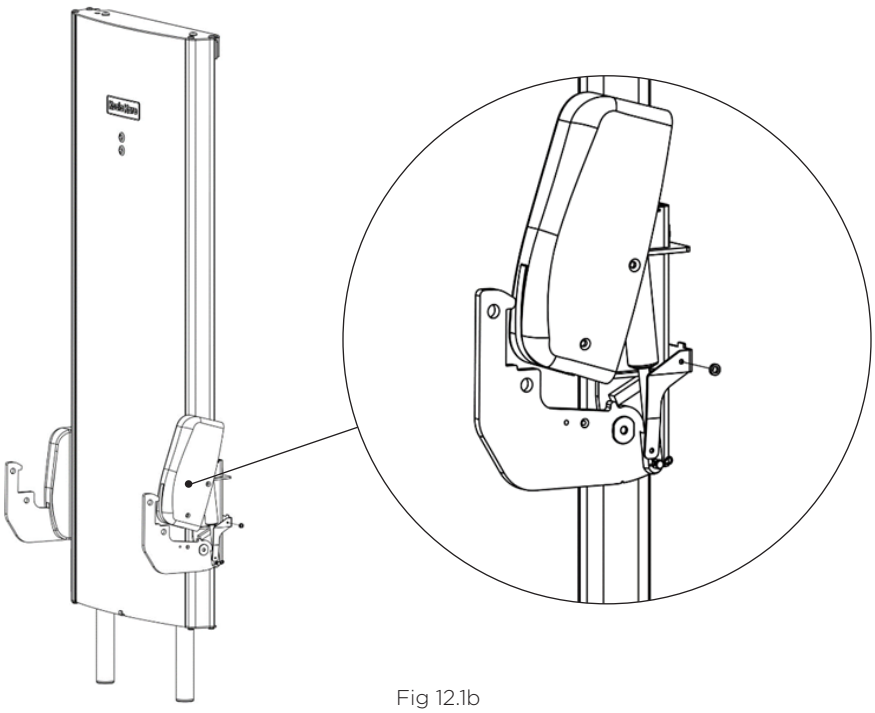


Fig 12.1b

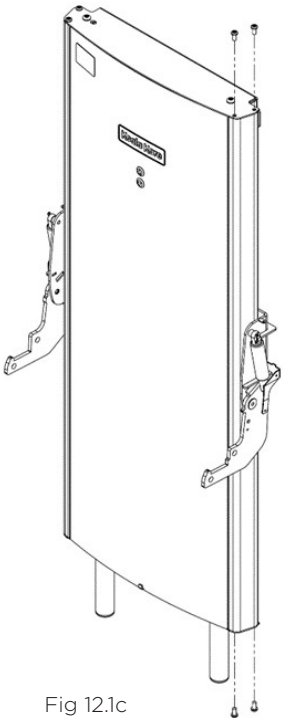


Fig 12.1c

- The front cover can now be removed.
- Start by removing the four screws which retain the aluminum beam as shown on one side only, as shown in Fig 12.1c. Two security screws on the top and two security screws on the bottom.

Section 12.1 Preparing the standard build unit for installation (SBU)

- Looking from the top (Fig 12.1d) the aluminum beam can now freely rotate in order to release the front cover.

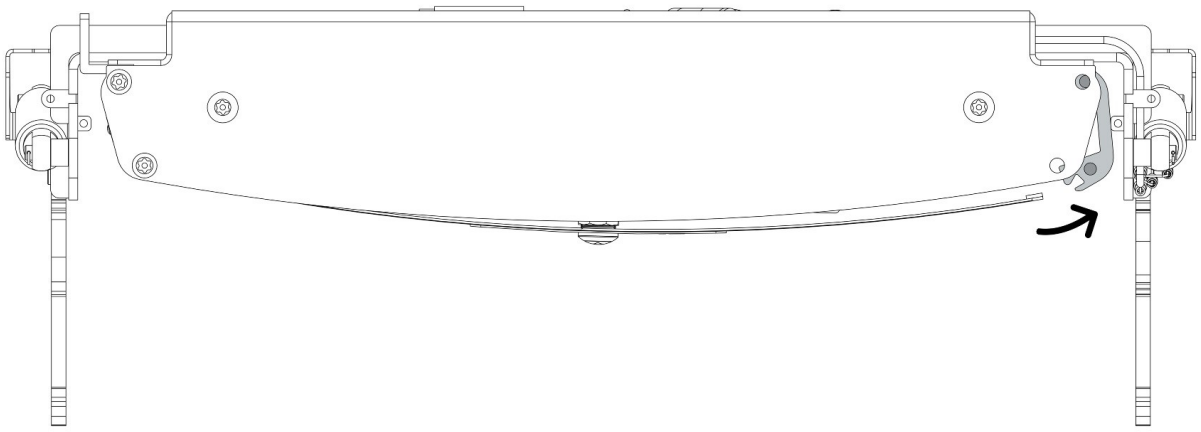


Fig 12.1d

- The front cover can now be lifted out vertically in the direction shown in Fig 12.1e, and retain. This will be refitted at the end of the installation.
- Take care not to scratch or damage the front cover or aluminum beam.
- Temporarily refit the screws into the aluminum beam to prevent any scratches during the next steps.

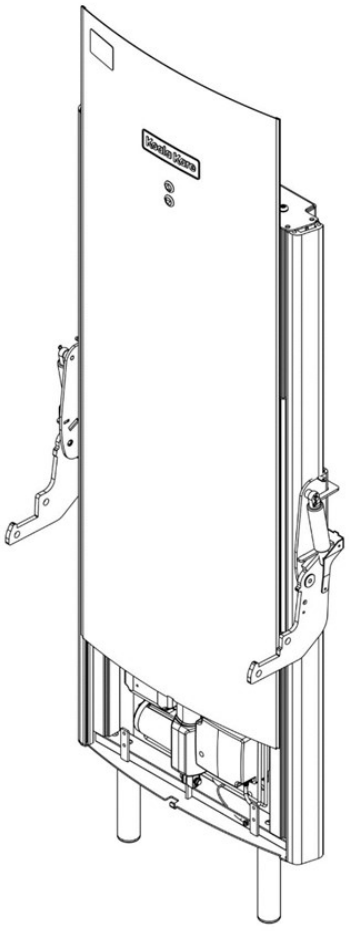


Fig 12.1e

Section 12.2 Connecting the emergency stop

Provision for the emergency stop should have been previously completed in accordance with Section 11. The cable should be been hidden in the wall and at least 11 13/16" (300 mm) of cable is coming out of the wall.

- Looking at the rear of the product, locate the female connector.
- Locate the male connector of the emergency stop which should be coming from the wall.

- Make the connection by rotating the female connector clip cover and fully insert the male connector. The female clip cover should then easy rotate back over to secure the connection.

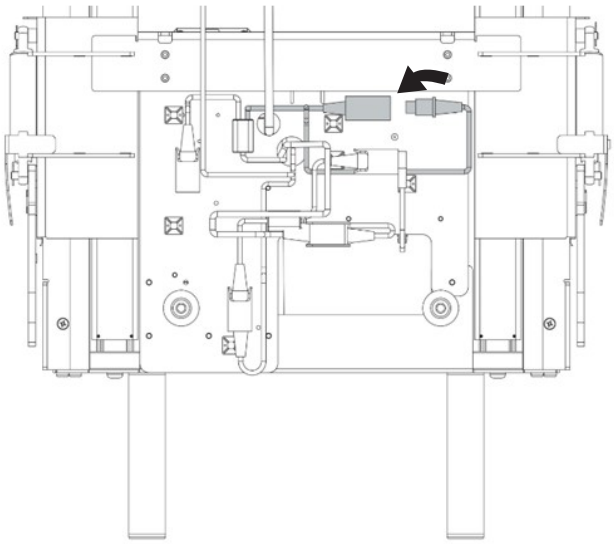


Fig 12.2a

- Tidy the cable behind the product so that it is not visible once the SBU is against the wall. Ensure it does not protrude further than any of the other cables.

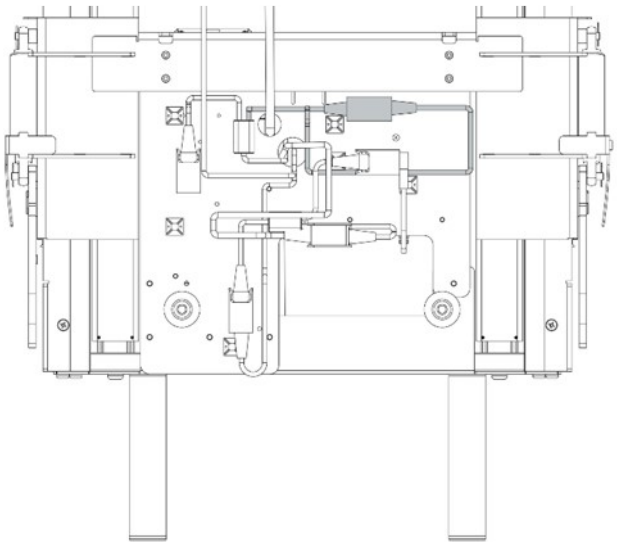


Fig 12.2b

Section 12.3 Connecting the battery

The product has been provided without the battery connected.

- Looking at the rear of the product, locate the female connector, as shown in Fig 12.3a.
- Locate the male connector of the emergency stop which should be coming from the SBU.

- Make the connection by rotating the female connector clip cover and fully insert the male connector. The female clip cover should then easy rotate back over to secure the connection.

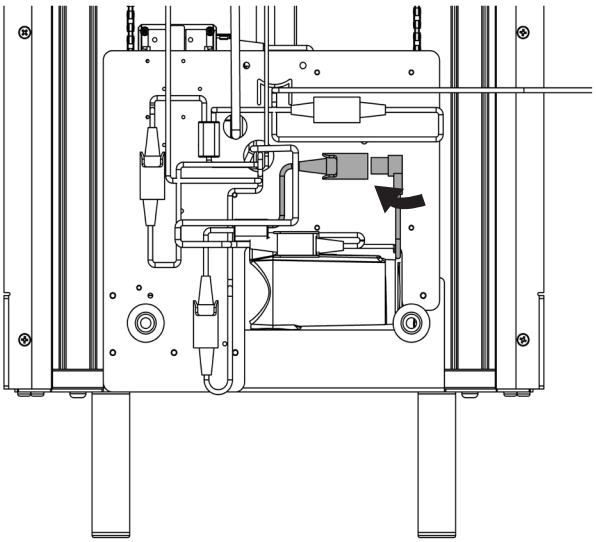


Fig 12.3a

- Tidy the cable behind the product so that it is not visible once the SBU is against the wall. Ensure it does not protrude further than any of the other cables.

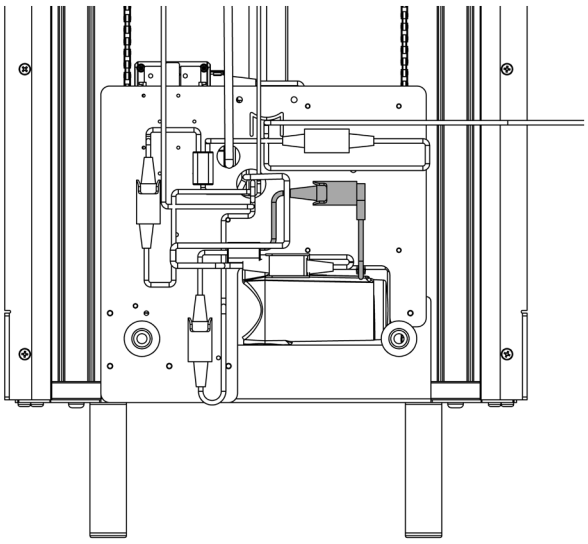


Fig 12.3b

Section 12.4 Connecting the power outlet

WARNING: Ensure the electrical mains supply is isolated from power while connecting the product to the mains supply.

A switched, waterproof flex outlet should have been previously fitted in accordance with Section 11. The outlet cannot be any larger than 7 1/2" (191 mm) tall or 5 5/8" (142 mm) wide and must be flush or sub-flush to the level of the marine plywood once fitted.

- Position the SBU against the wall in the approximate mounting position which will allow the mains power cable to reach the outlet.
- Hardwire the product to the outlet in accordance with local and national regulations.
- The mains cable from the unit must be protected from moving parts by trunking. At minimum this should extend from the top of the plastic board which retains the fixed electrical components to the outlet. It should be no deeper than 5/8" (16 mm) from the wall and ideally should be positioned 1 1/2" (40 mm) to 3" (100 mm) from the centreline of the product.

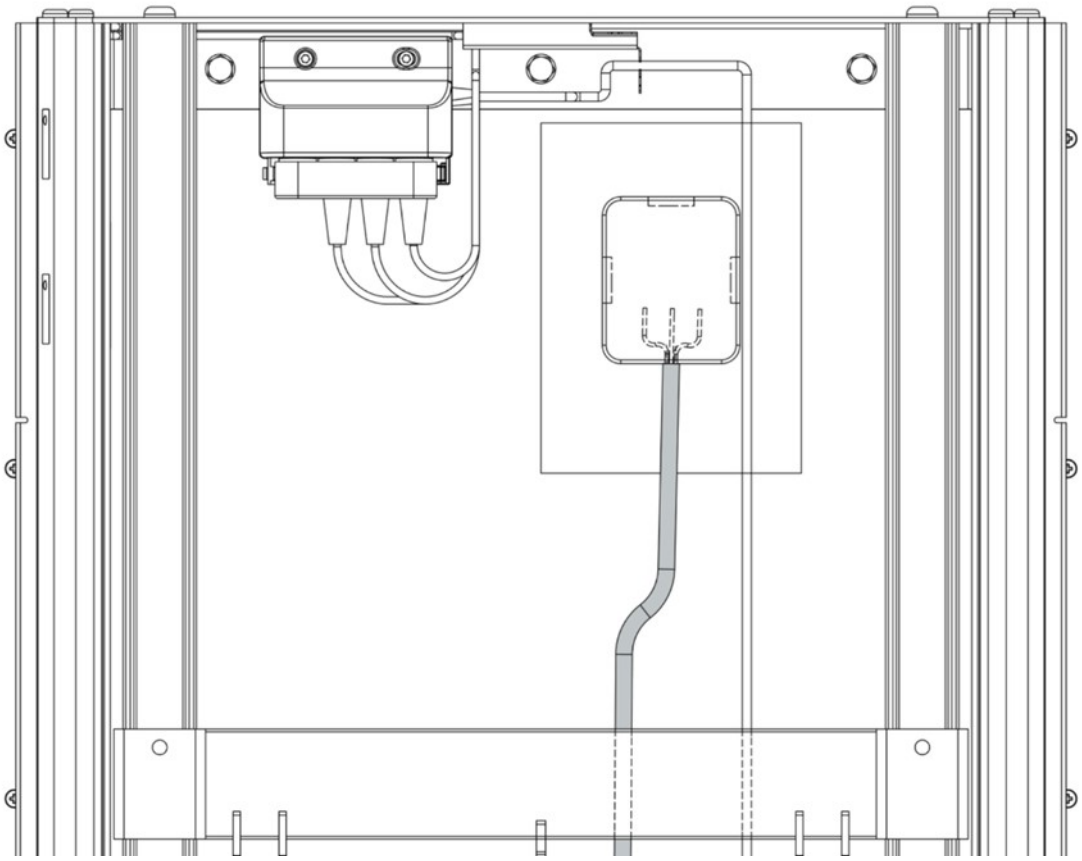


Fig 12.4

Section 12.5 Attaching the standard build unit to the wall

- The wall must have been suitably prepared and reinforced as explained in Section 11 during the pre-installation phase.
- Align the SBU to the wall about the centerline ensuring it is level. If the floor is uneven the feet can be manually adjusted.
- If the floor is uneven, the feet can be adjusted by rotating the black plastic screw head on the bottom of the foot up to 20 mm / (inch equivalent).

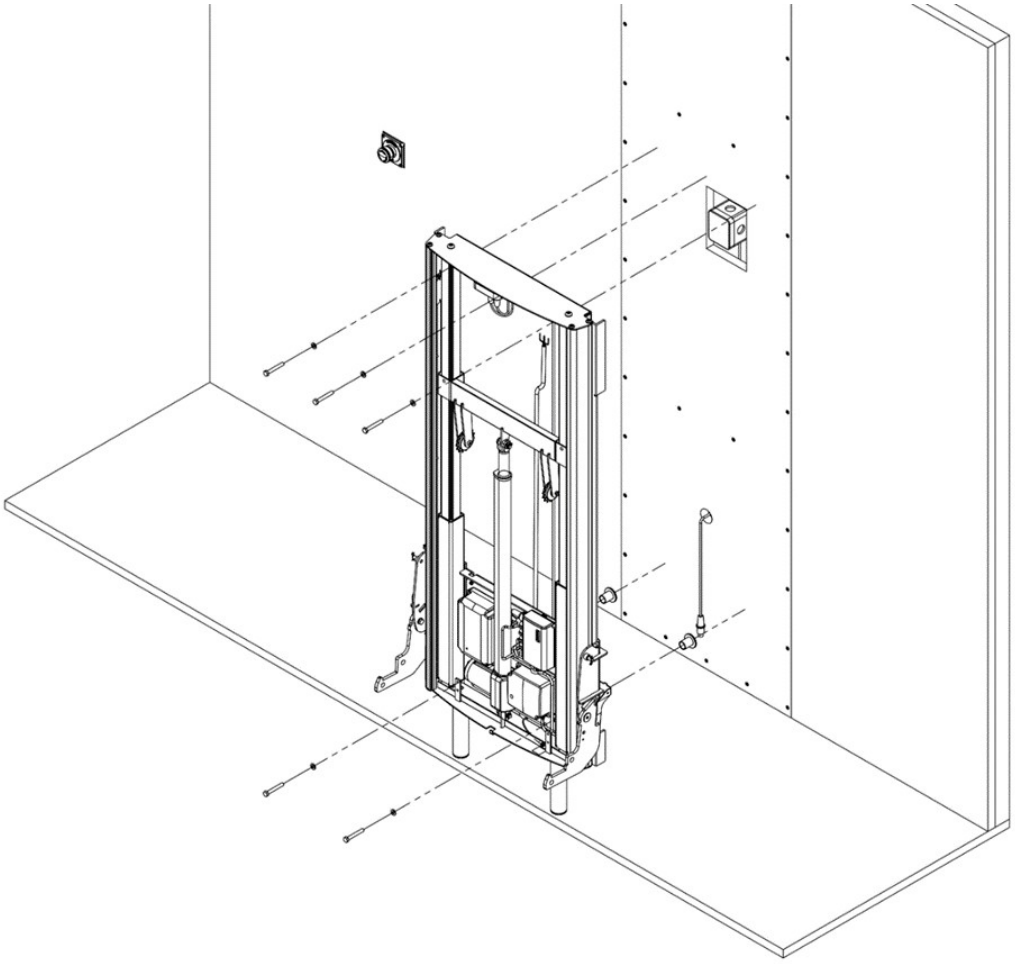


Fig 12.5a

Section 12.5 Attaching the standard build unit to the wall

- With the product in place, mark out the five fixing holes, set the SBU aside and then pilot drill with a 1/8" (3.5 mm) diameter bit.
- Using the screws provided No. 8 x 2 23/64" (60 mm) coach screws fit the top three first and then the lower two, as shown in Fig 12.5b. Ensure you have used the spacers provided on the bottom two fixings.

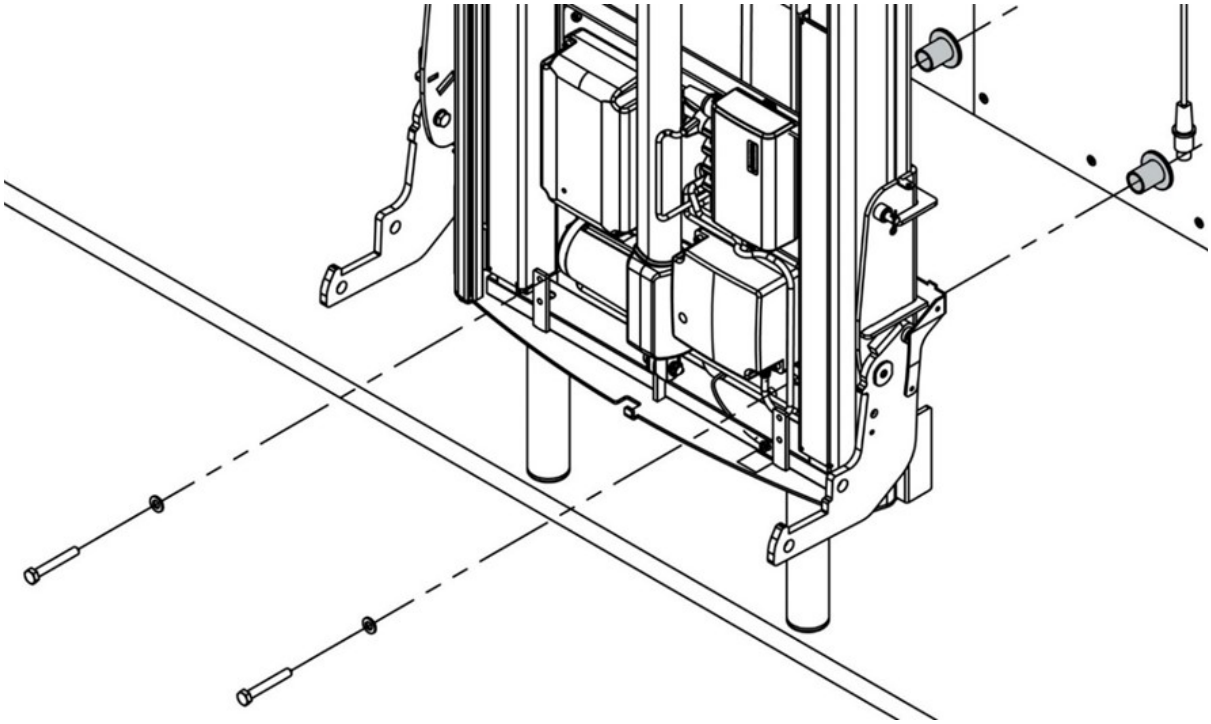


Fig 12.5b

- Tighten all five screws until they are flush.

Section 12.6 Connect the front cover

The front cover has two buttons which need to be connected to the cables from the SBU.

- Locate the metal front cover which was previously removed from the SBU.
- Connect the four matching-colored cables from the front cover to the corresponding centrally hanging cables coming from the SBU as shown in Fig 12.6a.

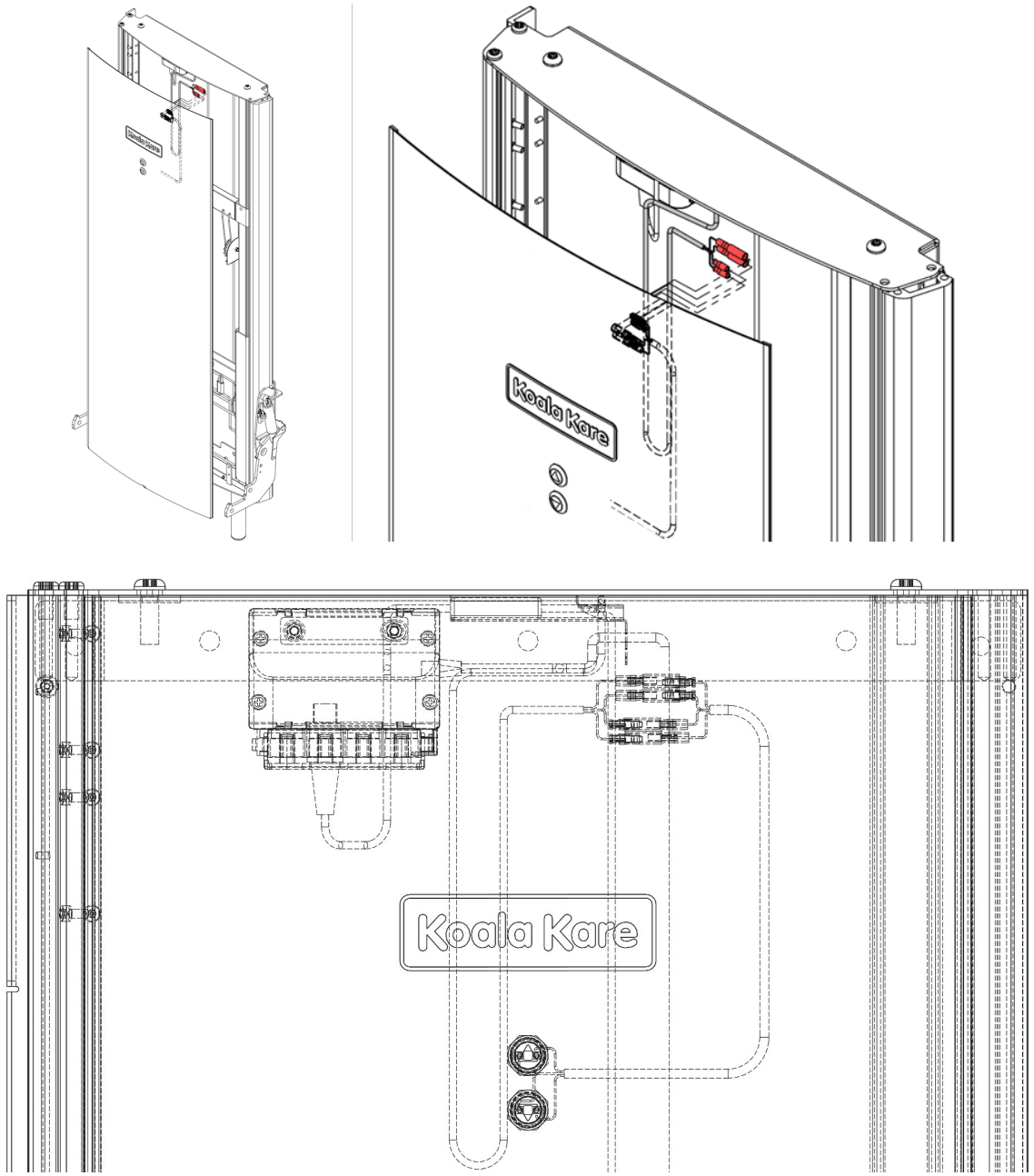


Fig 12.6a

Section 12.7 Refit the front cover

The front cover can now be refitted, fitting is the reverse of removal. Care should be taken not scratch the front cover or damage the cables.

- Remove the four screws which retain the aluminum beam as shown on one side only. Two security screws on the top and two socket screws on the bottom.
- Looking from the top, the aluminum beam, as shown in Fig 12.7a, can now freely rotate in order to receive the front cover.

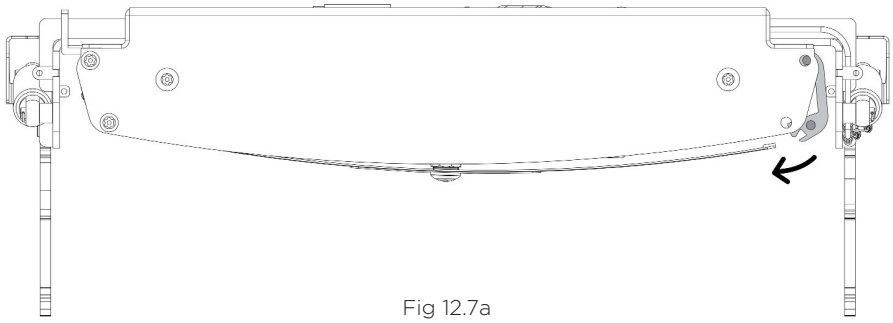


Fig 12.7a

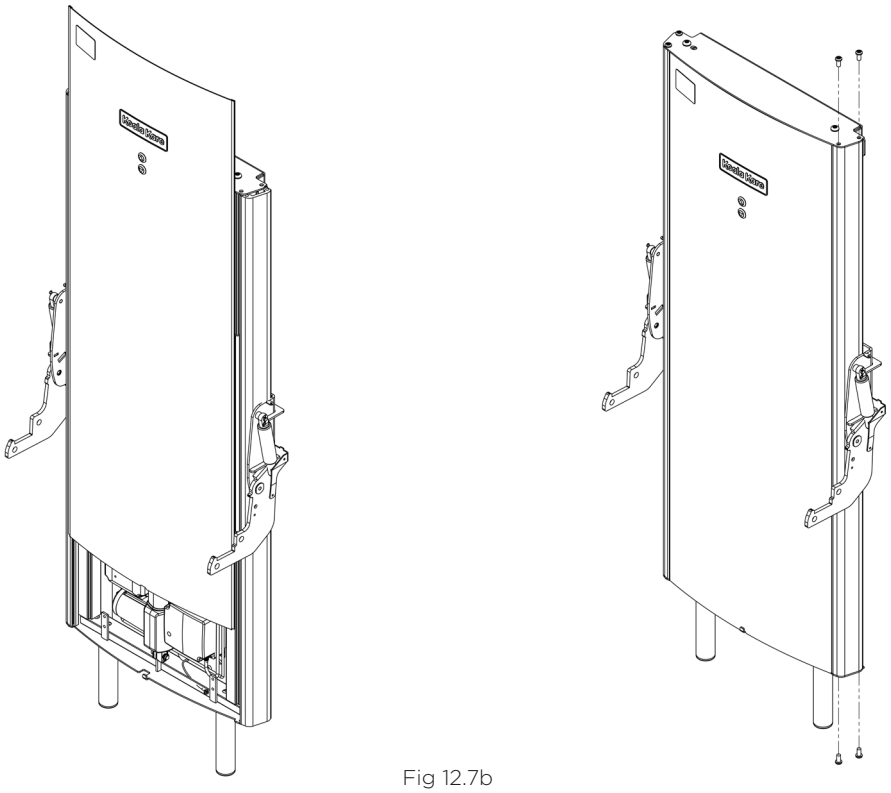


Fig 12.7b

- Refit the four security screws which retain the aluminum beam. Ensure they are fully tightened back up.

Section 12.8 Fit the stretcher.

CAUTION: Take care when fitting the stretcher to the product. This is a heavy item and we recommend two people install the stretcher.

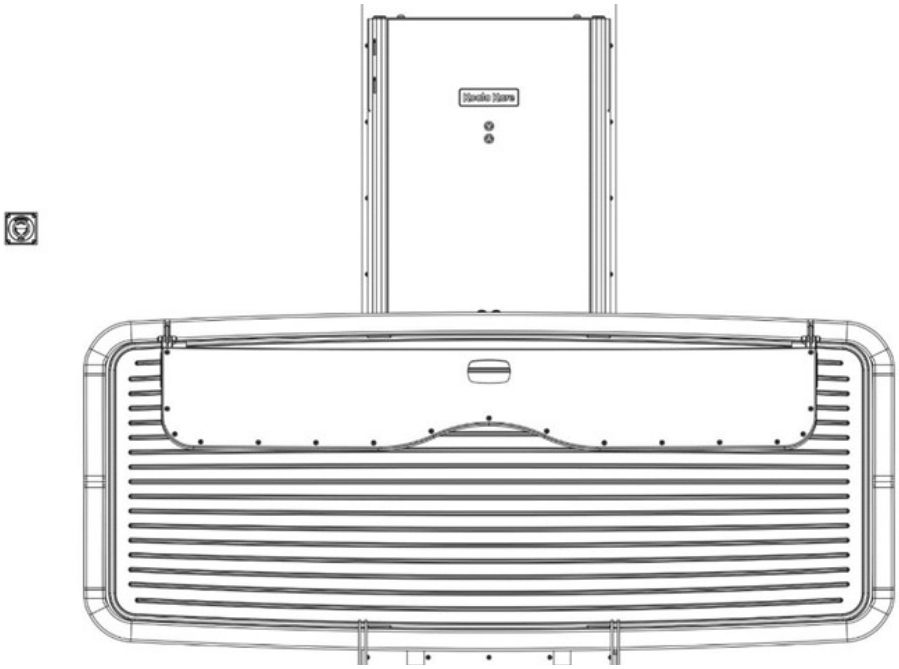


Fig 12.8a

- Bring the stretcher towards the product and rest as shown in Fig 12.8a.
- Take note of the cable/wires coming out of the stretcher bracket and take care not to damage them during the next steps. They are taped to the stretcher with a label.

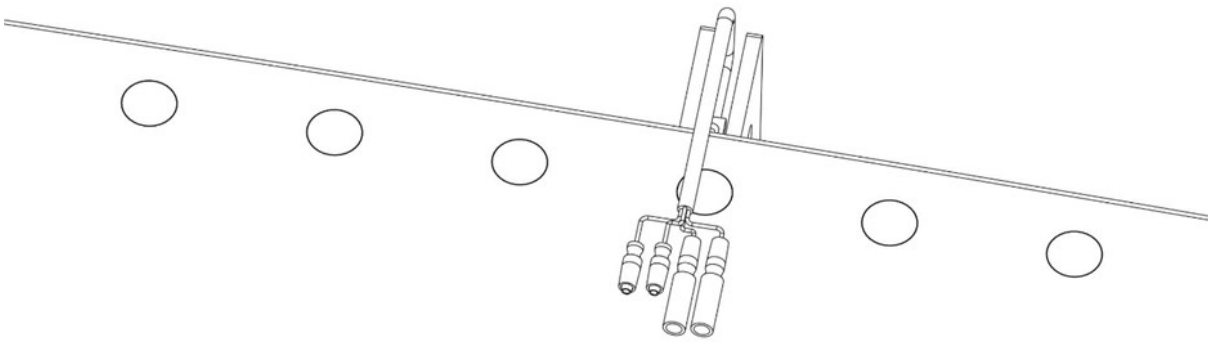


Fig 12.8b

Section 12.8 Fit the stretcher

- With two people, lift the stretcher and slot the SBU arms into the middle of each pair of stretcher brackets, see Fig 12.8c.

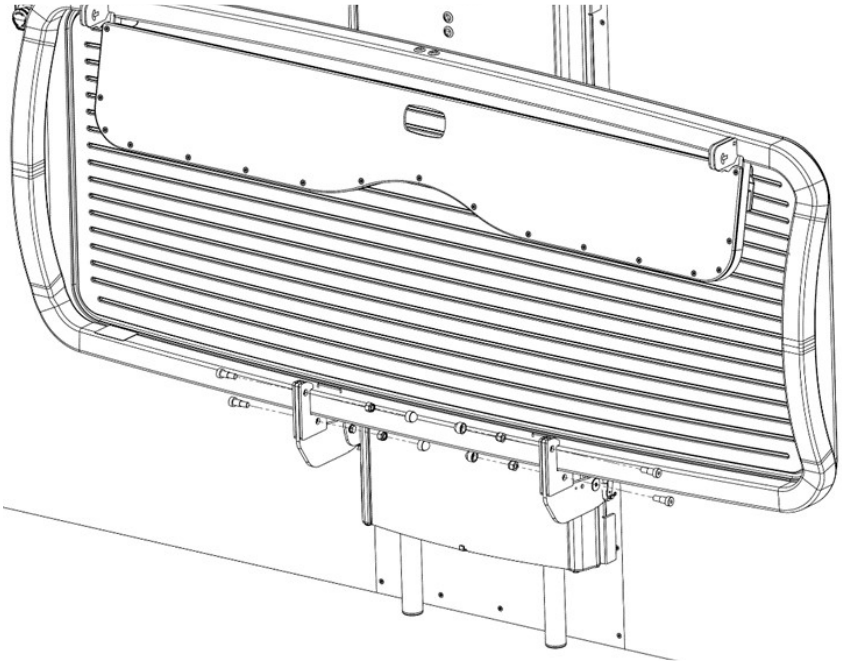


Fig 12.8c

- Once in position secure the M10 x 16 mm bolts and M10 nuts provided. Finish by covering the nut with the caps provided as shown in Fig 12.8d.
- Once all the fasteners are secured fold and stow to check the stretcher is moving freely and without restriction.

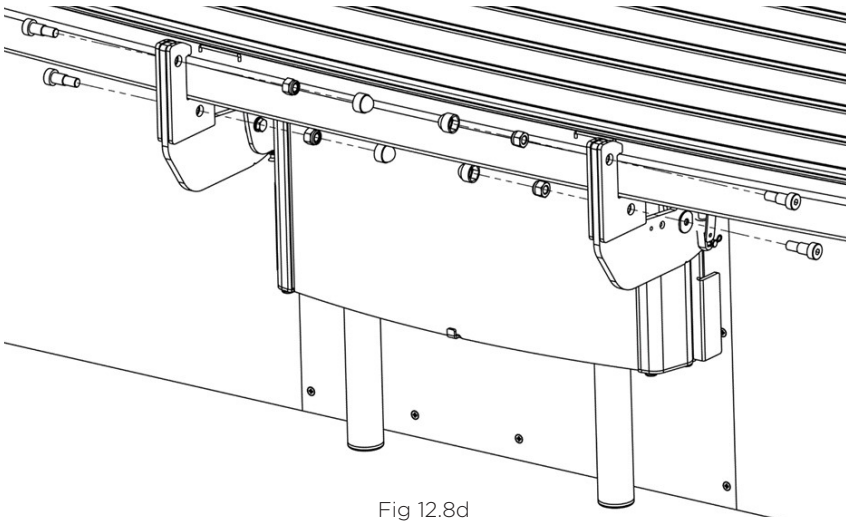


Fig 12.8d

Section 12.9 Connect the stretcher

The cable coming from the stretcher now needs to be connected to the SBU so that the stretcher buttons will function correctly.

- Remove the label securing the cables to the stretcher.

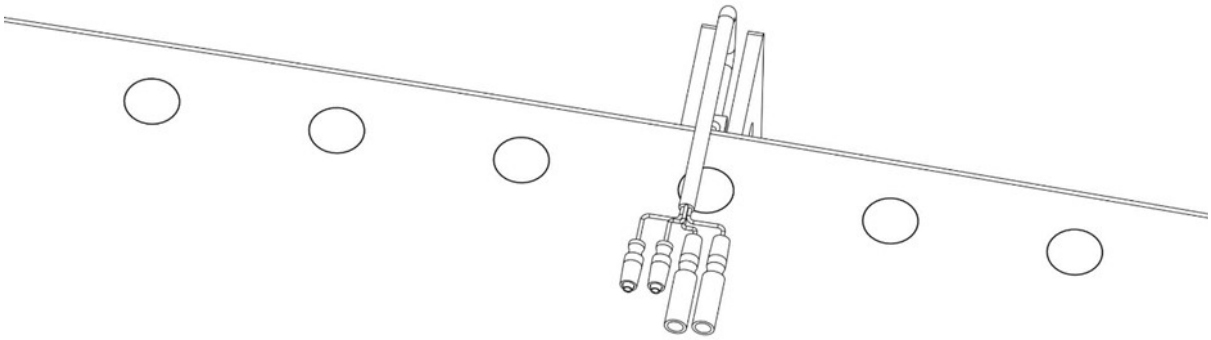


Fig 12.9a

- Deploy the stretcher and locate the cables coming from SBU and the stretcher, shown in red in Fig 12.9b.

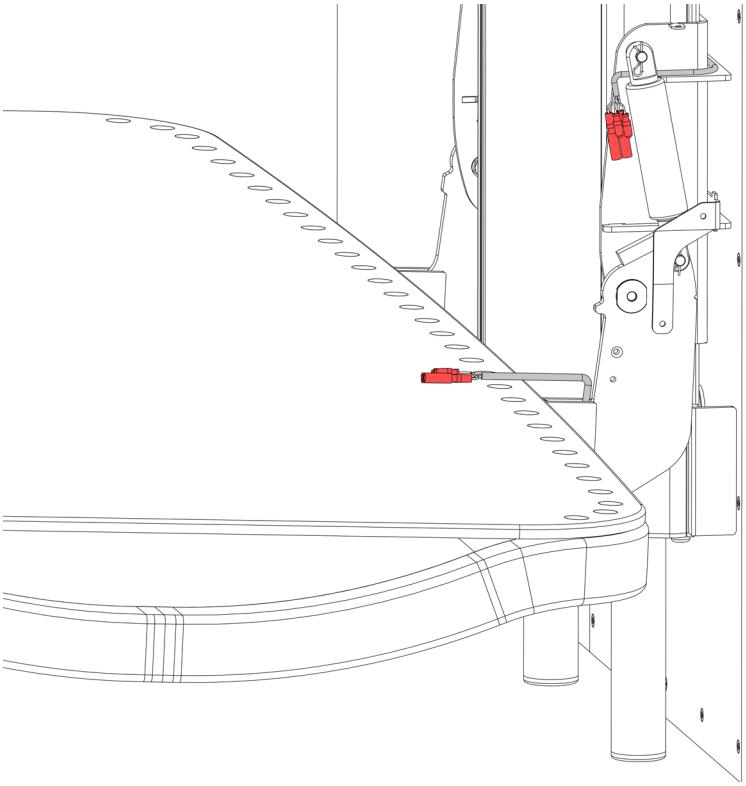


Fig 12.9b

Section 12.9 Connect the stretcher

- Connect the four matching-colored cables coming from the SBU and stretcher to each other.

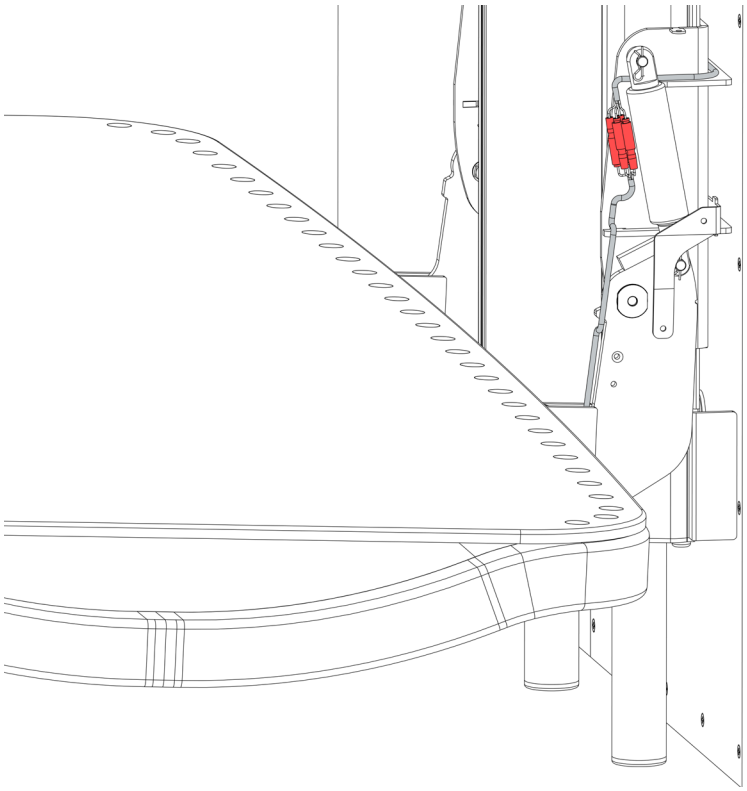


Fig 12.9c

- The mains electrical supply can now be safely turned on.
- Check that the buttons at the front of the stretcher now raise and lower the product.

Section 12.10 Fit the cable cover

- To ensure the cable is not accessible a cable cover must now be installed to protect the connection.

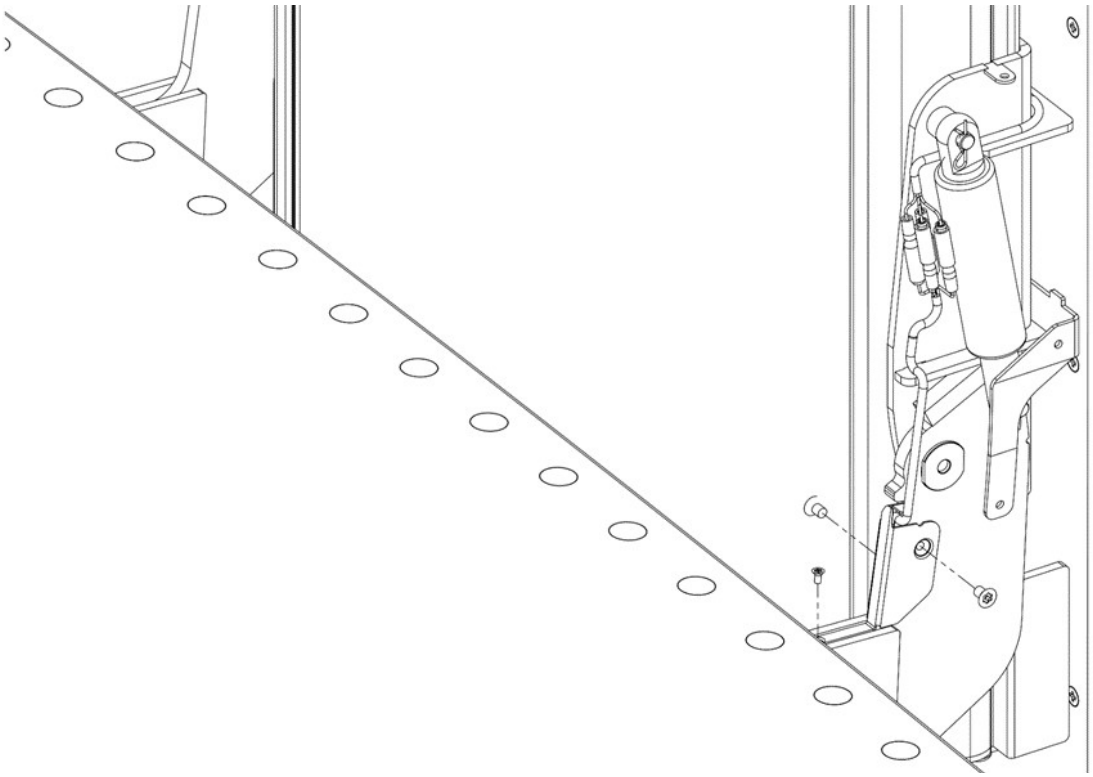


Fig 12.10

- Using the tools and security fasteners provided, install the cable cover. The two horizontal screws are M5 x 8 mm and one vertical is M3 x 6 mm as shown in Fig 12.10.

Section 12.11 Refit the gas spring covers

The gas spring covers can now be refitted, fitting is the reverse of removal

- Locate the gas spring covers and rotate into position, as shown in Fig 12.11a - 12.11b.
- Refit the hidden spacer that was removed from the position shown in Fig 12.11c The spacer will sit behind the M5 x 12 mm screw.

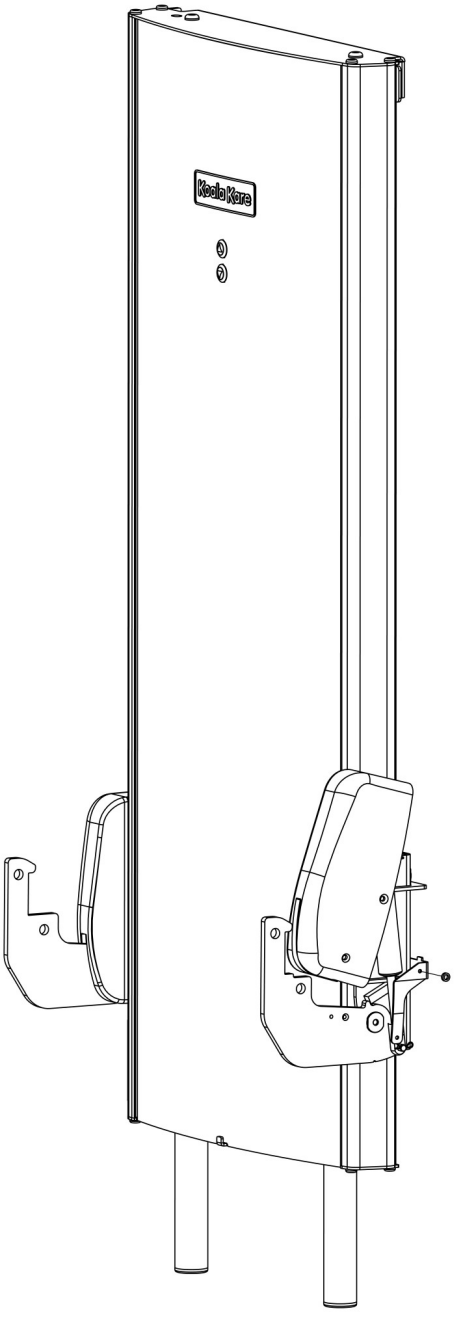


Fig 12.11a

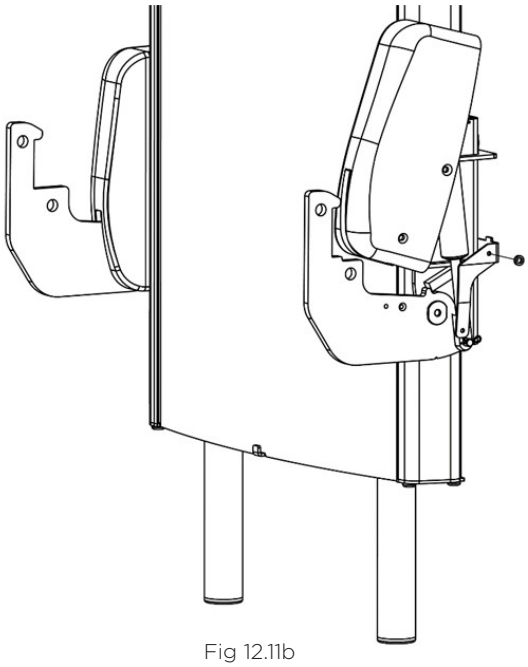


Fig 12.11b

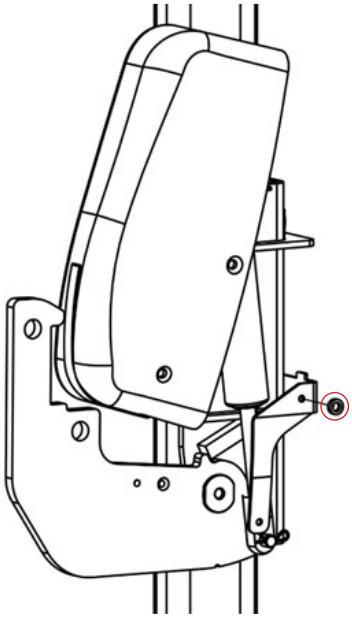


Fig 12.11c

Section 12.11 Refit the gas spring covers

- Align the four screw holes and refit with the previously removed screws and internal spacer, see Fig 12.11d.
- The uppermost horizontal screw is M5 x 12 mm with the remaining screws being M5 x 8 mm.
- The M5 x 12 mm screw provided requires the spacer provided to be refitted between the inside of the gas spring cover and metal bracket. Location for the spacer can be seen in Fig 12.11f.

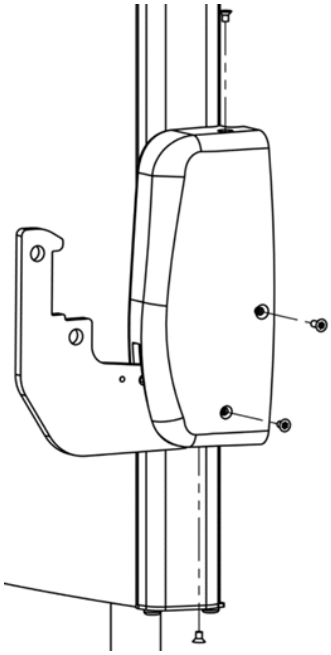


Fig 12.11d

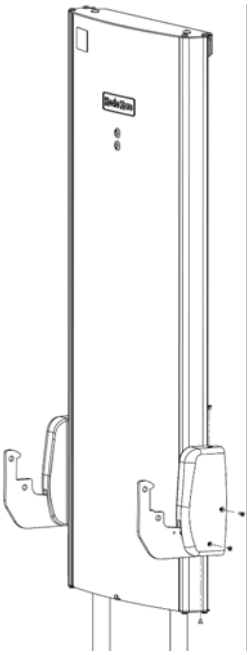


Fig 12.11e

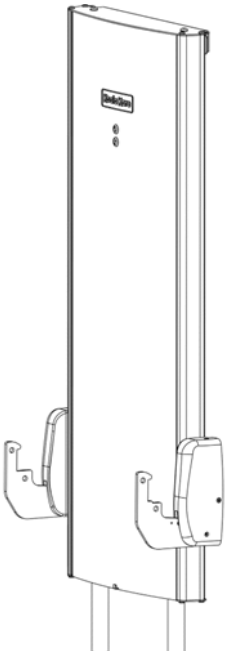


Fig 12.11f

Section 12.12 Testing

Once complete, a full function test of the product is required, ensuring:

- The stretcher stows vertically and deploys correctly.
- That the stretcher rises and falls with no obstructions through the full height range.
- Apply safe working load to stretcher and complete at least 3 cycles of the full height range checking for any excess noise or incorrect movement.
- Both sets of buttons move the stretcher up and down.
- The guard stows securely and is retained by the magnets.
- The guard locks into position when deployed.
- The emergency stop immediately stops the stretcher moving when pressed and re-starts after the emergency stop has been dis-engaged.

Section 12.13 Mounting the wall sign

The wall sign provided must be securely fixed to the wall in a clear and visible position near to the changing station.

- It is recommended that the wall sign be mounted next to and at a similar height as the emergency stop.
- If your changing table is in the corner of a room the wall sign can also be mounted on the perpendicular wall at a similar height.
- The wall sign must be clearly visible at all time. Ensure that the wall sign is not covered when the stretcher is stowed or by any other object in the room.
- Permanently fix the wall sign to your wall using appropriate fixings.

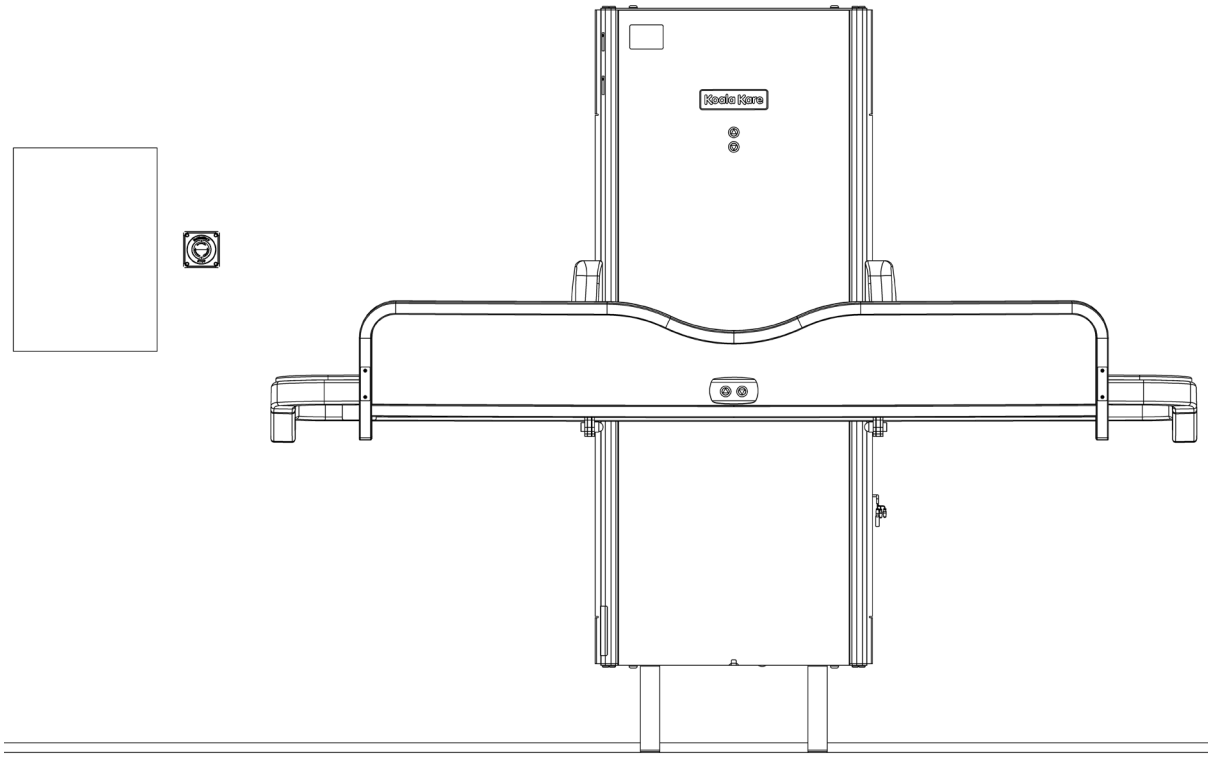


Fig 12.13

Section 13 Moving & transporting the equipment

- It is anticipated that once installed, the equipment will not be transported. If you need to transport this equipment after unpacking it, please contact Koala Kare customer services team for advice (see contact details at the end of this booklet).

Section 14 Product disposal

- The steel frame is widely recycled.
- Polyethylene material from the stretcher and guard can be recycled in some local authorities - please check and dispose of in accordance with state, federal and local regulations.
- The electronic components should be recycled in accordance with local WEEE regulations. For further advice, please contact Koala Kare:

email our support team: customerservice@koalabear.com
or call us on Main: 303.539.8300 | **Toll Free:** 888.733.3456

Section 15 Replaceable parts

The KB3000 is supplied for use with the following parts and accessories;

- SBU (main unit) - 10.157.00.0001
- Stretcher including front guard - 10.157.03.0004

There are no detachable items as part of this product.

There are various parts of the product that may be replaced in the event of any failure or damage. In the event of any component failures or damage please contact us for advice;

email our support team: customerservice@koalabear.com
or call us on Main: 303.539.8300 | **Toll Free:** 888.733.3456

In the event of any component failures or damage please contact us for advice;

email our support team: customerservice@koalabear.com
or call us on Main: 303.539.8300 | **Toll Free:** 888.733.3456

Section 16

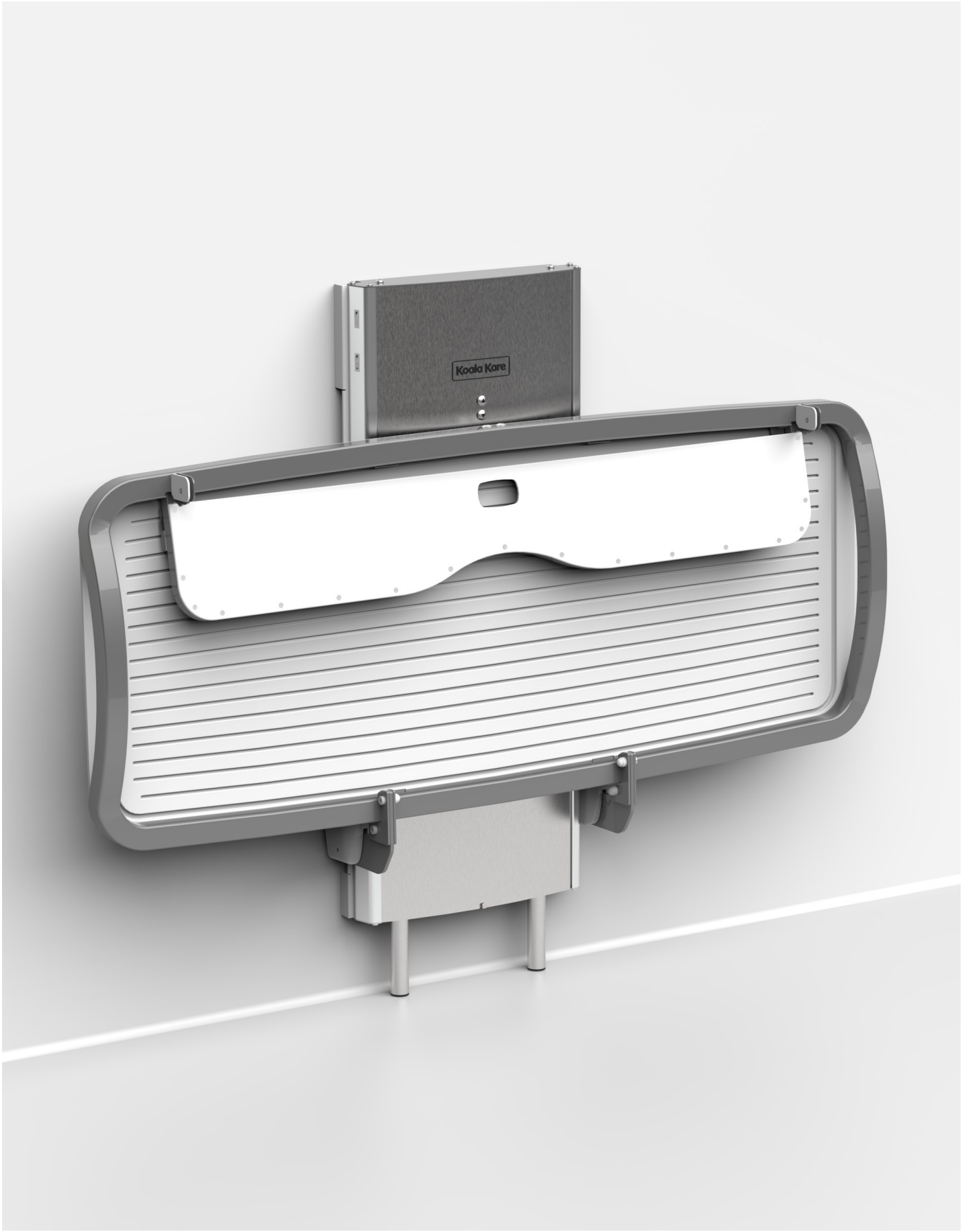
Service engineer's name	Date of service	Actions undertaken	Signature

Section 17

Trainee's name	Date of training	Type of training	Trainee's signature	Trainer's signature

Notes

Notes



Koala Kare Products
A Division of Bobrick

6982 South Quentin Street, Centennial, CO 80112-3945
Main: 303.539.8300 | **Toll Free:** 888.733.3456 | **Fax:** 303.539.8399
Website: koalabear.com | **Email:** customerservice@koalabear.com

50.157.08.0004 (Rev2)

112213: WALK-UP DEPOSITORIES

1. GENERAL

A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete installation of walk-up depositories.

B. Codes and Standards Compliance: ADA, ANSI, ASTM, IBC, NEC, UL, State and Local Codes

C. Qualifications of Installer: Only craftsmen who have a demonstrable skill to perform the work specified herein shall be employed. A firm with a minimum of three (3) years successful experience shall be used.

D. Submittals:

(1) Submit manufacturer's product data sheets on each product being used including:

(a) Manufacturer's printed installation instructions, showing required preparation and installation procedures.
(b) Storage and handling requirements and recommendations.
(c) Installation methods.
(d) Cleaning and maintenance instructions.

(2) Shop drawings specific to project showing dimensions, location of installation and relationship to other materials including exterior and interior walls and cabinetry.
(3) Manufacturer's warranty.

E. Warranties and Guarantees: Provide manufacturer's standard warranty.

F. Cross Reference: 018000: Cleaning
033000: Cast-In-Place Concrete
042100: Brick Masonry Units

061000: Rough Carpentry
064100: Cabinetry
076000: Flashing and Venting
079000: Caulking and Sealants
090001: Color Scheme

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Covenant Safe. Depositories by other manufacturers may be acceptable if they meet or exceed the quality standard. All alternates must be submitted to the Architect for approval before bid date.

(1) Product Characteristics:

(a) Manufacturer/Model Number: Covenant Safe CSE-VSI-TL15-5820 Night Depository Safe Walk-Up Combination
(b) Dimensions w/o Trim: 58"H x 22"W x 34"D
(c) Overall Dimensions: 61 ¼"H x 23 3/8"W x 36"D

(d)	Base Depth:	20”D
(e)	Interior Fabrication:	Half inch steel body and door painted black
(f)	Exterior Fabrication:	Stainless Steel with “DEPOSITORY” in black
(g)	Interior Safe Configuration:	ER-7435M. Arrangement to be selected by Owner.
(h)	ADA Compliant	
(i)	Accessories:	Thermostat alarm kit Night Depository Head Vibration detector

3. EXECUTION

A. Storage and Handling of Materials:

(1) Deliver materials in manufacturer’s original, unopened, undamaged rolls/pallets with identification labels intact.
(2) Storage and Protection: Store materials protected from exposures to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

B. Project Conditions: Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer’s absolute limits.

C. Preparation of Area:

(1) Do not proceed with installation until substrates have been properly prepared and deviations from manufacturer’s recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
(2) Commencement of installation constitutes acceptance of conditions.

D. Installation: Install in accordance with manufacturer’s written instructions and recommendations as applicable to specified application.

E. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

F. Completion of Work: General Contractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

G. Cleaning and Protection of Work:

(1) Remove all labels, warranties, instruction manuals, etc. and give to Owner.
(2) Clean in accordance with manufacturer's recommendations.
(3) Prevent use of the safe by construction personnel during construction.

114520: APPLIANCES

1. GENERAL

A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete installation of the specified appliances. General Contractor will be required to provide plumbing and electrical locations for Owner supplied and installed appliances as shown on the drawings.

B. Codes and Standards Compliance: ADA, ANSI, ASTM, AWI, IBC, NEC, UL, State and Local Codes

C. Qualifications of Installer: Only craftsmen who have a demonstrable skill to perform the work specified herein shall be employed. A firm with a minimum of three (3) years successful experience shall be used.

A. Submittals: Submit cut sheets on all appliances to ensure compliance with drawings, cabinetry shop drawings and specifications.

B. Warranties and Guarantees: Provide manufacturer's standard warranties on all appliances.

F. Cross Reference: 018000: Cleaning
064100: Cabinetry
Division 22: Plumbing
Division 26: Electrical

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Alternates to Quality Standards provided herein must be submitted to Architect for approval before bid date.

B. Catering Kitchen 107:

(1) ADA Dishwasher:

(a) Manufacturer/Model Number: General Electric GDT226SSLSS
(b) Dimensions: 32 1/4"-34 5/8" max. H x 23 1/2"D x 23 3/4"W
(c) Power Outlet Location: As directed by manufacturer
(d) Plumbing Supply/Drain: As directed by manufacturer
(e) Color: Stainless Steel

C. Concessions 131:

(1) Garbage Disposal:

(a) Manufacturer/Model Number: InSinkErator Evolution Compact
(b) Dimensions: 12 1/4" H
(c) Power Outlet Location: As directed by manufacturer
(d) Power Switch Location: Switch above countertop
(e) Horsepower: ¾
(f) Drain Connection: 1 ½" Anti-Vibration (hose clamp
(g) Dishwasher Connection: Yes

(2) ADA Dishwasher:

(a) Manufacturer/Model Number:	General Electric GDT226SSLSS
(b) Dimensions:	32 1/4"-34 5/8" max. H x 23 1/2"D x 23 3/4"W
(c) Power Outlet Location:	As directed by manufacturer
(d) Plumbing Supply/Drain:	As directed by manufacturer
(e) Color:	Stainless Steel

(3) Ice Maker:

(a) Manufacturer/Model Number:	Scotsman Prodigy Elite MC0530MA-1
(b) Capacity:	500 lb.
(c) Ice Maker Size:	30" x 24" x 23"
(d) Storage Bin:	B842S with KLP8S Stainless Steel Legs
(e) Storge Bin Size:	42"W x 34"D x 44"H
(f) Accessories:	KHOLDER – stainless steel scoop holder

D. Break Room 149:

(1) ADA Dishwasher:

(a) Manufacturer/Model Number:	General Electric GDT226SSLSS
(b) Dimensions:	32 1/4"-34 5/8" max. H x 23 1/2"D x 23 3/4"W
(c) Power Outlet Location:	As directed by manufacturer
(d) Plumbing Supply/Drain:	As directed by manufacturer
(e) Color:	Stainless Steel

E. Catering Kitchen 223:

(1) ADA Dishwasher:

(a) Manufacturer/Model Number:	General Electric GDT226SSLSS
(b) Dimensions:	32 1/4"-34 5/8" max. H x 23 1/2"D x 23 3/4"W
(c) Power Outlet Location:	As directed by manufacturer
(d) Plumbing Supply/Drain:	As directed by manufacturer
(e) Color:	Stainless Steel

F. Contractor Note: Contractor to coordinate appliance sizes with cabinetry.

3. EXECUTION

A. Fabrication: Not Required.

B. Storage and Handling of Materials:

(1) Once Contractor receives equipment at the site he must sign for each piece. The builder is thereafter responsible for its condition, handling, and storage. The Contractor's Builder's Risk shall apply to this equipment after it has been signed for by the Contractor.
(2) Site Conditions: The equipment must be stored in a locked area when it is delivered to the site.

C. Preparation of Area: Area to receive appliance shall be clean of dust, debris, and foreign matter. Areas concealed after appliances are installed shall be washed.

D. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

E. Manufacturer's Instructions and/or Literature: Strictly comply with Manufacturer's written instructions. Place utilities as required on the manufacturer's written instructions.

F. Workmanship and Installation:

(1) Ensure all cabinetry and appliances align properly based on flush construction.
(2) Ensure all appliances are in working order prior to final setting.

G. Completion of Work: General Contractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

H. Cleaning and Protection of Work:

(1) Remove all labels, warranties, instruction manuals, etc. and give to Architect or Owner.
(2) Clean all appliances in accordance with manufacturer's recommendations.
(3) Prevent use of the appliances by construction personnel during construction.

116600: INTERIOR ATHLETIC EQUIPMENT

1. GENERAL

A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete installation of the athletic equipment specified herein and shown on the drawings.

B. Codes and Standards Compliance: A2LA, ANSI, AWS, CFR1201, CPSC, FIBA, NBA, NFHS, NFPA, NFSHSA, USVBA, WNBA

C. Quality Assurance:

(1) All components including suspension system, frame assembly, backboards, goals, electric winches, and controls for backstops shall be of a single manufacturer.
(2) All welding to be performed by personnel having passed Welder Qualification testing in accordance with American Welding Society code D1.1. or higher. Manufacturer to provide certification and test results upon request.

D. Submittals

(1) List of proposed products and product data.
(2) Shop drawings showing layout, elevations, dimensions, fabrication details, method of attachment, loads to be transmitted to building structural members, requirements for supplementary bracing or structural support members and electrical wiring diagrams.
(3) Manufacturer must provide calculations and reports for tests performed by and independent testing laboratory accredited by the American Association or Laboratory Accreditation (A2LA) that clearly demonstrate compliance with minimum safety factors included in product specifications.
(4) Samples of materials for selection by Architect.
(5) Manufacturer's installation and maintenance instructions.

E. Warranties and Guarantees: Provide manufacturer's standard warranty for all materials listed herein.

F. Cross Reference: 018000: Cleaning
042200: Concrete Masonry
051200: Structural Steel Framing
096466: Wood Athletic Flooring
Division 26: Electrical

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS:

C. Acceptable Manufacturers

(1) Jaypro Sports LLC
(2) Sportsfield Manufacturing
(3) Porter Athletic

C. Basketball Backstops

(1) Main Gym (**6 Required**) Overhead Folding Basketball Systems

(a) Types:

1. Type 1:

a. Manufacturer/ Model Number: Jaypro / Model J849-FFFB
b. Basketball backstop shall be a single drop, ceiling-suspended, forward folding, and forward braced with attachment up to 32'-0".
c. Four systems required (cross court)

2. Type 2:

a. Manufacturer / Model Number: Jaypro / Model J817-FFRB
b. Basketball backstop shall be single drop, ceiling suspended, forward folding and rear braced with attachment up to 32'-0".
c. Two of these systems are required (end court)

(b) Main Mast Stem: 6-5/8" O.D. 11-gauge structural steel tube.
(c) Anti-Sway Braces: 2-3/8" O.D. 10-gauge structural steel tube with precision cut ends for maximum weld area. Sway braces shall attach to the mast no higher than 36" above the backboard for maximum stability.
(d) Auxiliary Braces: 1.90" O.D. 13-gauge steel tube braves for increased stability for attachment elevation exceeding 28'.
(e) Mast Header: 5" heavy duty structural c-channel.
(f) Mast Construction: Fully welded construction in accordance with American Welding Society, D1.1 "structural Welding Code- Steel." Bolt-together masts are not acceptable.
(g) Rear Brace: Operates with 2 3/8" O.D. 12-guage structure steel tube with vertical galvanized slide pipe attached to the main mast stem.
(h) Front Brace: Operates with 2-3/8" O.D. 12-guage structure steel tube with heavy duty folding knuckle joint.
(i) Fittings and Support Structure: Backstop supported from existing structure with capped 2-1/2" O.D. 11-guage structural steel tube with heavy duty precision formed and/or welded steel support fittings.
(j) Swing Hinge Fittings: Backstop suspended from 3-1/2" O.D. support pipe by 7/8" forged eyebolts with press fit oil-impregnated bronzed bearings. 2" of adjustability provided for precise plumbing of backstop during installation.
(k) Weight Lock: Mast centerline offset 2" forward of swing hinge fittings to ensure backstop securely weight locks the unit into the playing position.
(l) Hoist Cable: ¼" Diameter galvanized aircraft cable with 7000 lbs. ultimate break strength with cable retractor system.
(m) Goals: Mounted directly through the backboard to a direct goal mount with is secured to the 6-5/8" main mast stem.
(n) Finish: All metal parts, pipes, and fittings to be powder coated. Color to be selected during construction
(o) Compliance: Backstop system meets all NCAA and NFSHSA regulations and requirements.

(2) Electric Folding Operation (**6 required)**:

(a) Type: Fully enclosed, direct drive winch designed to hold backstop at any position during raising or lowering. Winch is maintenance free with no oils, belts, or chains.
(b) Motor: 1 HP, instantly reversing, 110-volt, single phase electric torque motor utilizing 3-wire control system.
(c) Frame: Precision interlocking steel frame for high rigidity and precise alignment.
(d) Hoist Cable: ¼" 7 x 19 galvanized aircraft cable with 7,000 pounds ultimate break strength.
(e) Rope Pressure Roller: Torsoin spring tensioning roller to ensure cable tracks properly in grooves even under slack cable conditions.

(f) Cable Drum: Cast aluminum grooved for ¼ aircraft cable to facilitate smooth take-up of cable and proper spooling. Supported in large diameter ball bearings.
(g) Limit Switches: Integral adjustable upper and lower limit switches making the sett.
(h) Mounting: Universal type mounting bracket, mounted upside down or right side up, with cable pull from any one of three different directions
(i) Controls: Specify type of control in subsequent paragraph.
(j) Warranty: Limited 1 year warranty.

(3) Backboard (**6 required)**:

(a) Manufacturer / Model Number: JayPro / Model GBRUB-42
(b) Dimensions: 72” x 42”
(c) Backboard frame of a heavy, brushed aluminum extrusion.
(d) Extended frame section of high tensile aluminum
(e) Ends of the frame extrusions mitered and fitted with steel brackets on all four corners, with the upper brackets incorporating keyhole slots for mounting the backboard to the support structure at standard mounting centers.
(f) Goal Mounting structure of a heavy, formed steel assembly, secured to the lower horizontal frame member to minimize stress on the glass section. Special Steel sleeves at the goal mounting hole locations to secure rear structure to front mounting plate, forming a unitized assembly to minimize shock to the glass. Entire frame includes goal-mounting structure fitted with a shock absorbing neoprene material to cushion and protect the glass section.
(g) ½” thick, fully tempered glass section with uniform load and impact strength. Glass is tempered to meet ANSI Standard Z91. 1 Class A and CPSC Standard 16 CFR1201 Category II. Glass is tested to conform with requirement of FIBA Rule 2.8- Rigidity Test for Backboard Tempered Safety Glass. Official white border and target area is permanently fired into front side of glass section so that it cannot wear away.
(h) Goal mount structure provided with two holes (7/16”) and two studs (3/8”-16) to secure backboard and goal to a direct mount “goal brace” feature which relieves all stress and shock on the backboard conforming to NCAA (Rule 1.15.1) and NFHS (Rule 1.11.1). Goal mounting holes (4) to be standard 5” horizontal x 4” vertical mounting centers.
(i) Backboard covered by a Lifetime Limited Warranty when installed on a basketball backstop with Goal Brace or Direct Mount Height Adjuster.

(4) Backboard Safety Padding (**6 sets required)**:

(a) Model Number: MBBP-6 Safe-Pro Bolt-On Edge Padding
(b) Application: Pads meet all NCAA and NFSHSA rules.
(c) Type: Bolt-on, molded self-skinning urethane two-piece design.
(d) Protection: Padding shall cover entire bottom edge and extend 17-3/8” up the sides. Padding shall not be less than 2” thick.
(e) Construction: Steel reinforced plates facilitate attachment of padding with bolts. Interlocking steel pin connectors provided at match point between two halves to provide alignment and eliminate sagging underneath goal.
(f) Color: To be selected during construction.

(5) Goals (**6 required)**:

(a) Manufacturer/Model Number: JayPro Model GBA-18041, Competitor 180° Breakaway Goal, 42” Boards
(b) For use with specified backboard with 5” x 4” mounting pattern
(c) Rim: 5/8” diameter steel rod braced by 3/16” die cut steel braving welded to the underside of ring.
(d) Net Attachment: 12 hideaway net attachments on underside of goal ring for maximum player safety.

(e) Pressure Release Mechanism: Automatically releases rim in any direction when static force exceeding the release setting is applied to the top of the goal. Spring loaded to instantaneously release back to playing position.
(f) Settings: Factory pre-set to 180 lbs. – 230 lbs. with in-the-field adjustability to comply with NCAA recommendation rebound characteristics of non-moveable ring.
(g) Net: White anti-whip nylon net.
(h) Finish: Official durable orange powder coat.
(i) Warranty: Limited 5-year warranty.

(6) Height Adjuster for all goals (**6 sets required)**:

(a) Manufacturer/ Model Number: Jay Pro EHA-LA, Electric Aluminum Heigh Adjuster
(b) Adjustment Range: Goal position from 8' to 10' above finished floor. Height indicators located on side of aluminum frame to visually determine height settings.
(c) Limit Switches: Factory set integral limit switches automatically shut off motor when goal reaches desired 8' or 10' locations.
(d) Construction: Lightweight, interlocking aluminum alloy extrusions with UHMW-polyethylene jib strips. ½ aluminum alloy mounting plates allow universal mounting to any drop and/or bank.
(e) Operation: 1/10 HP, 115 VAC, Single phase linear actuator driven height adjuster capable of lifting 660 lbs. with a 24" stroke. Three-position momentary key switch and polished wall plate provided standard with heigh adjuster.
(f) Size and Weight: Height adjuster shall not exceed 14" in width or 77 pounds in weight. Slim profile has minimum impact on glass backboard clear view. Any height adjuster wider than 14" shall not be approved as equals.
(g) Cover: Height adjusted to come standard with a motor cover to protect the motor from damage.
(h) Safety Feature: Includes redundant integral hard stops to catch the board and goal in the event of a failure. Height adjusters without a redundant safety feature shall not be approved as equals.
(i) Finish: Durable black powder coat.
(j) Warranty: Limited 1 year warranty.

(7) Safety Strap for all goals (**6 required**):

(a) Model Number: PL-1000, Posilok Safety Strap
(b) Application: For use all Ceiling Suspended Folding Backstops
(c) Lock: Inertia sensitive to automatically lock basketball backstop in position at any time during raising, lowering, or being held in the storage position. Initiation of locking mechanism occurs when a sudden increase in either tension or speed shall occur.
(d) Reset: Fully automatic reset mechanism requiring no poles, ropes, levers, or buttons.
(e) Telltale Indicator: Breakaway loop sewn into strap containing bright colored warning label for notification when safety belt has been called into action.
(f) Warranty: Limited 1 year warranty.

(8) Gym Equipment Group Control Systems (6 **required**):

(a) Model Number: KS-13, Momentary Wall Mounted Key Switch
(b) Wall Mounted Key Switch: Operate equipment with 3 position, momentary contact wall mounted key switch.
(c) Momentary Switch: Spring loaded with automatic return to OFF position.
(d) Cover Plate: Independently flush mounted stainless steel cover plate.
(e) Equipment: Key switch identical for operation of basketball backstops, and electric height adjusters.
(f) Warranty: Limited 1 year warranty.

D. Wall Padding

(1) Main Gym (**20 pads required**)

(a) Approved Manufacturers:

1. Jaypro Sports, LLC. Class A Rated Fire-Resistant Padding
2. Sportsfield Specialties
3. Porter Athletics
4. Construction:

a. Vinyl: 14 oz. Per square yard with grip tensile strength 365 lbs. x 348 lbs. and tongue tear strength 92 lbs. x 83 lbs. Vinyl shall have embossed leather-like pattern. Vinyl meets or exceeds NFPA 101 Life Safety Code for Class A rating.
b. Foam: 2" thick ASTM F2440-04 high impact foam.
c. Backing: 7/16" oriented strand board (OSB) backing. Column pads may be supplied without solid backing material.
d. Wrapping: Pads with OSB backing shall have vinyl completely wrapped around back side of pad and secured with steel staples.
e. Size: 2' x 6'.
f. Color to be selected during construction.
g. Attachment: Z-Clips top and bottom.
h. Verify wall locations requiring cut-outs for power access before ordering.

E. Volleyball Equipment

(1) Main Gym

(a) Multipurpose Aluminum Volleyball System (**2 sets required**).
(b) Each system shall consist of:

1. One winch upright
2. One anchor upright
3. One High School Competition Net
   a. Manufacturer/ Model Number: Jaypro Model PVBN-1
4. Upright Padding
   a. Manufacturer/ Model Number: Jaypro Model PVB-60P
5. Two Antennae
   a. Manufacturer/Model Number: Jaypro Model VBA-80

(c) Uprights are intended to fit into a 3.57 in. I.D. x 10 in. deep rigid aluminum floor sleeves (Jaypro Models PVB-75S/PVB-75S-CP).
(d) The one-piece uprights with sliding collars shall provide infinitely adjustable net height settings to accommodate tennis, badminton, and volleyball net heights.
(e) Uprights (2): Entire upright shall be constructed of a 3-1/2" O.D. x 0.300 in. wall anodized aluminum tube and shall have a molded composite foot to protect the finished floor during transportation, storage, and installation of standards. Top of upright shall have an end plug for extra player safety.
(f) Winch: Tensioning winch to have an internal worm gear construction with an effective 10:1 turn ratio to eliminate snap-back and shall be completely enclosed with a welded steel cover. The winch shall be furnished with folding handle. Winch will have a 1-1/2" wide, high tensile strength (7700lb) nylon strap with sewn snap buckle for completed cable-less design. Winch is located on outside of post for added player safety. Anchor strap shall be adjustable and winch strap shall be long enough to readily adapt to varying sleeve installation widths.

(g) Net: High School Competition Net shall be 32' L x 36" h with a 2" white polyester reinforced vinyl top binding which surrounds the perimeter of the net body. Top cable shall be manufactured from 1/8" x 7 x 19 vinyl coated to 3/16" A/C cable x 33' 10". Cable is looped at each end for leader strap attachment. This net is designed to be used on most Jaypro volleyball units. Netting shall be manufactured from high quality, #21 black thread knotted nylon, 4 in. square mesh. Two net dowels at each end shall consist of ½ in. EMT steel tubing which are completely enclosed for safety in side pockets. Bottom of net shall have, on each end, a 2 in. Velcro tensioning strap and metal buckle to allow a very tight bottom net binding. Each end of net body shall have two quick-locking snap buckles sewn to 1 in. white nylon web straps for quick and easy net attachment. Bottom of net shall have one 1/4" x 38' nylon cord with net tension handle to adjust lower net tension.

(h) Upright Padding: Pad shall be manufactured of 2" thick virgin polyurethane foam covered by a heavy duty 14 ox. Polyester reinforced vinyl sewn into place. A 1-1/2" wide vinyl and Velcro flap, sewn onto one pad, securely fastens to the edge of the other in attaching the pad snugly around standard. All sewing shall be of a lock stitch type, running stitch style of sewing shall not be considered equal. Pad shall be a full 72" height. Velcro flap attachment shall be positioned to allow net cord or strap access to standards. Pad exceeds NFHS, NCAA and USVBA specifications for safety.

(i) Antennae: Official 72" red and white antennae quickly clamps directly to the top and bottom of the net. Attachment adjustments are made easily from the floor. Fits both 36" and 39" nets.

(j) System Finish:

1. Uprights: Shall have a durable, silver factory powder coat finish.
2. Padding: Color to be selected during construction.

F. Volley Ball Floor Sleeves (**4 required**):

(1) Brass Finished 3-1/2" diameter Floor Sleeves and Solid Brass Locking Cover
(2) Provide sleeves two volleyball net locations.

3. EXECUTION

A. Storage and Handling of Materials:

(1) Provide volleyball floor sleeves, covers and floor inserts in accordance with requirements of related trades that are responsible for installation.
(2) Do not deliver balance of athletic equipment until the building is enclosed and other construction within gymnasium is substantially complete.
(3) Site Conditions: The equipment must be stored in a locked area when it is delivered to the site.

B. Preparation of Area: Examine the areas and conditions where equipment and systems are to be installed and notify the contractor of conditions detrimental to the proper and timely installation of the work.

C. Installation

(1) All athletic equipment shall be installed as indicated on approved submittals as recommended and in strict accordance with manufacturer's written directions and as indicated on the drawings and specified herein.
(2) All sleeves required for athletic equipment installation shall be set plumb and true to line and grade in concrete as indicated on the drawings and per manufacturer's recommendation.
(3) All athletic equipment shall be installed in strict accordance with the latest rules, regulations and specifications governing that sport or event for which is being installed.

D. Remove and replace any damaged components that cannot be successfully repaired.

E. Adjusting

(1) All athletic equipment requiring testing, adjustment and operation shall be tested for proper operation and adjusted to conform to specified standards.
(2) Turnover operating and maintenance instructions and manuals to Owner designated personnel for proper operation and care of equipment.

E. Completion of Work: General Contractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

F. Cleaning and Protection of Work:

(1) Upon completion of work, clean the equipment free of dirt, mud or stains. Touch up scratches with matching paint.
(2) Do not use harsh cleaning materials or methods that would damage the finish.
(3) Do not remove warning labels or decals.
(4) Completely clean-up work area. Remove all trash and debris.

116643: INDOOR SCOREBOARDS

1. GENERAL

A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete installation of indoor scoreboards.

B. Codes and Standards Compliance: FCC, NEC, NEMA, UL 48, UL 879, State and Local Codes

C. Quality Assurance:

(1) Source Limitation: Obtain all components including scoreboard display, control console, data cable, and other accessories from a single manufacturer.
(2) Manufacturer Qualifications:

(a) Specialization in manufacturing electronic scoreboards.
(b) Minimum of ten years of experience.

C. Submittals:

(1) Scoreboard owner's handbook.
(2) Drawings needed for installation, operation, and maintenance of the scoreboard display.
(3) Information related specifically to the control console and other accessories.
(4) Manufacturer's warranty.

D. Warranties and Guarantees: Manufacturer's standard five-year limited warranty.

F. Cross Reference: 018000: Cleaning
042200: Concrete Masonry Units
099100: Painting
Division 26
Electrical Drawings

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Electro-Mech Scoreboard Co. Scoreboards by other manufacturers may be acceptable if they meet or exceed the quality standard. All alternates must be submitted to the Architect for approval before bid date.

(1) Product Characteristics:

(a) Manufacturer/Model Number: Electro-Mech Scoreboard Co. / Model LX2655
(b) Dimensions: 60.2"H x 108.2"W x 6"D
(c) Number of Scoreboards: Two (2)
(d) Number of Wireless Consoles: Two (2)
(e) Location: See drawings for installation locations in Gymnasium

B. Scoreboard Display:

(1) Functions and Features: Indoor Scoreboard to present information pertinent to basketball, volleyball, wrestling and other indoor sports. Reversible captions to allow the information shown in the lower section of the scoreboard display to be labeled appropriately for volleyball or wrestling. Including:

(a) Four-digit Period Clock that can count up in MM:SS format, count down in MM:SS or SS.t format, or show time of day in HH:MM format. Period Clock digits 12 inches tall and made from red LEDs. Period Clock display to include an illuminated colon/decimal indicator separating Minutes from Seconds with a colon character or separating Seconds from Tenths with a decimal character.
(b) Guests and Home Scores capable of showing up to 199 points. Score digits 12 inches tall and made from amber LEDs. For wrestling, these digits may be used to represent the total points awarded to each team across multiple bouts.
(c) Period to 4. The Period digit 9 inches tall and made from green LEDs.
(d) Guest and Home Bonus and Double Bonus indicators made from green LEDs. B-Shaped characters 3 inches tall.
(e) Guests and Home Next Possession indicators made from red LEDs. Arrow-shaped characters 3 inches tall.
(f) Guest and Home Team Fouls/Points/Won to 19. Digits 9 inches tall and made from amber LEDs. For wrestling, these digits indicate the Points scored in a bout. For volleyball, these digits indicate the number of Games won by each team.
(g) Player Number/ Match/ Game to 99. Digits 9 inches tall made from green LEDs. For basketball, these digits indicate the Player who has committed the most recent Foul. For wrestling, these digits indicate the current Match Number. For volleyball, the digits indicate the current Game Number.
(h) Player Foul to 9. Indicates the number of Fouls committed by a particular Player (designated by Player Number). Digit is 9 inches tall and made from green LEDs.

(2) Additional features:

(a) Fifty levels of LED brightness, selectable via the control console.
(b) Internally mounted Horn with manual control or automatic activation when the Period Clock counts down to zero.
(c) Two dedicated 120 VAC receptacles for optional visual horn indicators.
(d) One data output port for daisy chaining additional scoreboard displays, shot times, or locker room clocks.

(3) Electrical Requirements: One circuit providing 2.2 amps, 120 VAC, 60 Hz via standard grounded power receptacle.

(4) Optional Display Features:

(a) Two ETN displays (one for Guest, one for Home) integrated into the scoreboard cabinet, internally powered, and controlled through the standard scoreboard control console.
(b) Specifications for each ETN display:

1. 5”Hx 27”W active display area
2. 9x48 pixels at 14.5 mm pitch.
3. Shows up to 9 characters, including upper- and lower-case letters.
4. Regular, bold, and condensed fonts.

C. Accessories

(1) Control Console

(a) Supports features of scoreboard without the need to enter codes or other information to configure the device.
(b) Provides direct data output ports for up to four scoreboard or shot clock displays, all synchronized to the data (including the time) generated by the control console. Additional displays may be controlled in synchronization by daisy chaining from the data output ports of displays connected to the control console.
(c) Constructed of a heavy-duty ABS plastic housing holding a 0.1-inch-thick keypad panel with stainless steel metal dome switches that provide tactile feedback and are rated for more than one million actuations.
(d) Integrated LCD screen provides key game data along with interactive prompts for editing data and configuring the behavior of the scoreboard display and accessories.
(e) Embedded software includes a Practice Segment Timer mode to allow the main scoreboard display to be used as a practice time. Users may create, save, and recall up to 45 different schedules, each containing up to 90 timed segments.
(f) Electrical Requirements: One circuit providing 0.5 amps, 120 VAC, 60 Hz via a standard (NEMA 5-15R) grounded power receptable.
(g) Mounting hardware: The scoreboard cabinet to have two keyhole plates, attached to the top rear frame, designed to allow the scoreboard display to be suspended from lag bolts mounted in the wall. Two eyebolts mounted in the top of the frame may be used to lift the scoreboard cabinet and may also provide a permanent attachment point for suspension cables or chains.

(2) Optional Accessories

(a) Data Cable: A Shielded two- conductor cable with a drain line is the typical means of providing a path for data from the control console to a scoreboard display.
(b) ScoreLink Wireless RF Modem System: This RF communications system may be substituted for the data cable at the time of installation or as a replacement for the data cable at any time after the installation. Note: May require a standard electrical outlet for the transmitter at the point of operation.
(c) ID Panels: This scoreboard may be ordered with one or more ID panels integrated into the cabinet. Additional ID panels, shipped as separate cabinets, may be added above, below, or beside the scoreboard display. These panels may be purchased blank, with simple text, or with multi-colored text and graphics applied to their faces.
(d) Carrying Case for Control Console: Hard-sided suitcase-style case includes foam cutouts for the console and various accessories for both consoles.
(e) Shot Clock Displays: A pair of these displays can be mounted on or near the two goals of a basketball court.
(f) Visual Horn Indicators: Designed to illuminate whenever the scoreboard horn sounds. These indicators must attach to receptables provided on LX-series shot chocks.
(g) Wired Clock Start/Stop Controller.

1. Plugs into connector on the main basketball scoreboard control console.
2. Allows the clock operator to start, stop, the Period Clock without touching the main control console.

(h) Wireless Hand-Held Period Clock Controller: Battery operated RF device allows for courtside start/stop of the Period Clock. Coordinates with the ScoreLink RF system.

D. Finish

(1) Standard scoreboard display face and digit masks coated with low gloss black polyester resin paint for maximum contrast and resistance to scratches. Color selected during construction.
(2) Scoreboard framing and back mill-finished aluminum.
(3) Captions and other decorative elements on the face of the scoreboard to be vinyl.

3. EXECUTION

A. Delivery, Storage, and Handling:

(1) Product delivered to installation site unless otherwise specified.
(2) Scoreboard cabinet and accessories to be stored in a clean, dry environment.
(3) Special precautions for the scoreboard face.

(a) The face of the scoreboard display will be protected during shipment by a layer of cardboard or other sheet material. Avoid removing this protective sheet until the installation begins.
(b) Never scoreboard cabinet face down or stack other objects on it.
(c) Avoid sliding objects (like another scoreboard) along the plane of the scoreboard face, even if the protective sheet is in place.

B. Project Conditions:

(1) Scoreboard display and accessories should not be installed until the area has been made weatherproof.
(2) The customer determines location of scoreboard display, control console, and other accessories.
(3) The customer is responsible for verifying that the mounting structure is capable of supporting the weight of the scoreboard cabinet, additional ID panels, and other accessories.
(4) The customer is responsible for making certain the installation meets any requirements set forth in local, state, and national codes.
(5) The scoreboard display location requires one standard grounded 120 VAC electrical outlet. Power for all scoreboard displays should be grouped onto one or more dedicated breakers or power switches, allowing the displays to be turned on and off easily.
(6) The control console location requires one standard grounded 120 VAC electrical outlet.

C. Examination:

(1) Verify 120 VAC outlets at the scoreboard display and control console locations are properly grounded.
(2) If data cable is used, verify continuity from scoreboard display to control console location.
(3) Verify data cable and AC power cable are not run in the same conduit or wire tray, if to be direct wired.
(4) Verify data able and AC power cable are secure and run in conduit where they may be exposed to abuse or where local, state, or national codes require, if direct wired.
(5) Verify the location of all scoreboard displays, junction boxes, and accessories with the customer.
(6) Test scoreboard display and control console by attaching both to the power and plugging a control console data output port into the scoreboard data port input prior to hanging the scoreboard cabinet.
(7) Commencement of installation constitutes acceptance of conditions.

D. Installation: Refer to documentation supplied by the manufacturer that is specific to the project.

E. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

F. Completion of Work: General Contractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

G. Cleaning and Protection of Work:

(1) Remove all labels, warranties, instruction manuals, etc. and give to Owner.
(2) Clean in accordance with manufacturer's recommendations.
(3) Prevent use of the safe by construction personnel during construction.

116733: RECREATION CLIMBING WALL

1. GENERAL

A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete engineering design and installation of exterior panel-formed climbing wall, hand holds, geodomes, belay brackets and belay.

B. Codes and Standards Compliance: AISC, ASCE, ASTM A36, ASTM A123, ASTM A153, ASTM A500, ASTM A500, ASTM A513, ASTM E84, ASTM E662, AWS D1.1, CWA, FSC, IBC, UL, State and Local Codes

C. Quality Assurance:

(1) Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum five (5) years' experience in the manufacture and assembly of modular panel climbing walls used in similar applications.
(2) Professional Engineer's Qualifications: Qualified professional engineer, experienced in design of modular panel climbing walls similar to those required for this Project, and licensed by the Project state.
(3) Installer Qualification: To be installed by the manufacturer.

D. Submittals:

(1) Product Data: For each type of modular panel climbing wall product, including anchors, fasteners, hand holds, geodomes, belay brackets, belays and other hardware.
(2) Shop Drawings:

(a) Include plan, elevations, sections and attachment details.
(b) Include details of climbing wall surface panels including the following:

1. Number and location of climbing routes.
2. Wall surface climbing features.
3. Belay anchor system components and locations.
4. Belay
5. Modular hold attachments.
6. Modular geodome attachments.

(c) Indicate dimensions, methods of field assembly and components.
(d) Detail fabrication and assembly of concealed structure, indicating sizes, dimensions, locations and connections for structural members, base plates and bracing.
(e) Extent of surface systems and use zones for modular panel climbing walls.
(f) Indicate dead and live loads for modular panel climbing walls.
(g) Demonstrate compliance with modular panel climbing wall design standard.

(3) Samples: For each exposed modular panel climbing wall product and for each color specified.
(4) Delegated-Design Submittal: Analysis data signed and sealed by qualified professional engineer responsible for preparation of calculations and shop drawings. Indicate direction and magnitude of reactions resulting from installation of modular panel climbing walls. Analyze building structural system to verify loading resulting from modular panel climbing walls will be adequately supported by building structural elements.

(a) Certificate: Submit certificate indicating design complies with specified design standard.
(b) Compliance Review: Review and approve submittals and field quality-control reports for compliance with design.

(5) Close-Out Submittals: Maintenance data for all climbing wall and equipment components specified herein.

E. Coordination:

(1) The Owner shall be included in the design team with the Climbing Wall manufacturer to participate in design as needed for the Owner's intended use of the Climbing Wall.
(2) General Contractor to include Climbing Wall manufacturer in design team information and meetings as needed when that correspondence or meetings pertain the to construction where the wall is to be installed.

F. Warranties and Guarantees: Provide manufacturer's standard warranty in which the manufacturer agrees to repair or replace components of modular panel climbing walls that fail in materials or workmanship within specified warranty period.

(1) Failure includes delamination or excessive surface cracking, wear of modular panel climbing wall finish.
(2) Warranty Period: Five (5) years from date of Substantial Completion

G. Cross Reference: 013300: Delegated Design Procedures
018000: Cleaning
042100: Brick Masonry Units
042200: Concrete Masonry Units
051200: Structural Steel Framing
061000: Rough Carpentry
079000: Caulking and Sealants
321816: Synthetic Resilient Surfacing

H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Adventure Solutions. Other manufacturers may be acceptable if they meet or exceed the quality standard. All alternates must be submitted to the Architect for approval before bid date.

(1) Climbing Wall Product Characteristic:

(a) Modular Climbing Panels:

1. MDO Russian Birch Core Plywood
2. Size: 3'-11" x 3'-11" x 3/4" thick
3. Number of Panels: 24, See Architect's elevations
4. Finish: Textured 2-Part Epoxy Coating
5. Color: Selected by Owner and Architect during construction

(b) Primary Support Structures and Anchoring Details

1. Delegated Design provided by Climbing Wall manufacturer Engineer of Record licensed in installation State.
2. Design to be site specific.

(c) Recessed Attachment Anchors

1. Type: As specified by Climbing Wall Engineer of Record stamped design for exterior installation.
2. Size and length required for the minimum depths required by Climbing Wall Engineer of Record's stamped engineered design.

(d) Climbing Equipment:

1. Modular Handholds: 7 per panel
2. Modular Handholds for Future Replacements: 24
3. Geodesic Volumes: 8 units
4. Geodesic Volume for Future Replacements: 2
5. TRUBLUE Auto-Belay: 3 units
6. Belay Mounting Kits: 3 units
7. Steel Belay Bar: 3 units

3. EXECUTION

A. Storage and Handling of Materials:

(1) Deliver all materials in manufacturer's original, unopened, undamaged rolls/pallets with identification labels intact.
(2) Storage and Protection: Store materials protected from exposures to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

B. Project Conditions: Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

C. Preparation of Area:

(1) Do not proceed with installation until substrates have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
(2) Commencement of installation constitutes acceptance of conditions.

D. Installation: Install in accordance with Manufacturer and Climbing Wall Engineer of Record's written instructions and recommendations as applicable to specified application.

E. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

F. Completion of Work: General Contractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

G. Cleaning and Protection of Work:

(1) Remove all labels, warranties, instruction manuals, etc. and give to Owner.
(2) Clean in accordance with manufacturer's recommendations.
(3) Prevent use of the equipment by construction personnel during construction.

122413: WINDOW ROLLER SHADES

1. GENERAL

   A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete installation of roller shades. See 090001: Color Scheme, drawings and Window Schedules

   B. Codes and Standards Compliance: ASTM G21, BIFMA HCF 8.1, C2C, NFPA 70, NFPA 701, UL, WCMA A100.1, State and Local Codes

   C. Quality Assurance:

      (1) Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years experience and minimum of five projects of similar scope and sized in manufacturing products comparable to those specified in this section.
      (2) Installer: Installer shall be trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

   D. Submittals:

      (1) Product Data: Provide Manufacturer's catalog pages and data sheets for products specified including materials, finishes, dimensions, profiles, mountings and accessories.
      (2) Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams (if motorized shades are specified) and relationship to adjacent work.
      (3) Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Architectural Drawings and include opening sizes and key to typical mounting details.
      (4) Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements.
      (5) Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

   E. Warranties and Guarantees: Provide manufacturer's standard non-depreciating warranty for interior shading for each component including hardware and shade fabric.

   F. Cross Reference: 018000: Cleaning
      042200: Concrete Masonry Units
      061000: Carpentry
      090001: Color Scheme
      092500: Gypsum Board
      099100: Painting

   G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

   A. Quality Standard: Mecho Shade UrbanShade Systems. Other manufacturers may be acceptable if they meet or exceed the quality standard herein. Alternates must be submitted to the Architect for approval before bid date.

      (1) Single Roll System (SR1): Manual UrbanShade System Regular Roll, Square Fascia, top mount inside window frame
      (2) Double Roll System (DR1): Manual DoubleShade UrbanShade Bracket Double Roll, Square Fascia, top mount inside window frame

B. Product Characteristics, General:

(1) Components capable of being removed or adjusted without removing mounted shade brackets or cassette support channel.
(2) Smoothly operation raising or lowering shades.
(3) Drop Position: Regular roll.
(4) Mounting: Top mount inside window frame (see drawings)
(5) Size: To fit window openings. See drawings.
(6) Brackets and Mounting Hardware: As recommended for mounting indicated and to accommodate shade fabric roll-up size and weight.

(a) Material: Stamped steel
(b) Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.

1. Light Filtering Fabric: Glass-side of opening
2. Room-Darkening Fabric: Room-side of opening

(7) Roller Tubes: Extruded aluminum. Capable of being removed and reinstalled without affecting roller shade limit adjustments.

(a) Size: As recommended by manufacturer; for installation conditions, span, and weight of shades.
(b) Fabric Attachment: Extruded channel in tube accepts vinyl spline welded to fabric edge.
(c) Shade Band: Removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.

(8) Hembars: Maintains bottom of shade straight and flat.

(a) Style: Full wrap fabric bottom bar, flat profile with heat sealed closed ends.
(b) Room-Darkening Shades: Provide a slot in bottom bar with wool-pile light seal.

(9) Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.

(a) Break Assembly: Mounted on a low-friction plastic hub with wrapped spring clutch.
(b) Break must withstand minimum pull force of 25 pounds in stopped position.
(c) Clutch/Brake Mounting: On support brackets, independent of roller tube components.
(d) Drive Chain: Continuous loop beaded ball chain. Upper and lower limit stops.

1. Breaking Force: 45 lbf minimum
2. Chain Retainer per WCMA A100.1: Tensioning device

(e) Lift Assist Mechanism: Contained in idler end of roller tube. When hanging weights exceed roller tube weight limits. Manufacturer’s standard.

(10) Fascia: Removable extruded aluminum fascia. Size as required to conceal shade mounting. Attachable to brackets without exposed fasteners.

(a) Finish: Clear anodized aluminum
(b) Profile: Square
(c) Install one unit across two or more shade bands in one piece.
(d) Configuration: Fascia to be installed to fit flush to either window jamb. For window installation where shade bracket extends beyond the depth of the window jamb, fascia to have end bracket returns to wall.

(11) Roller Shade Fabrication:

(a) Field measure finished openings prior to ordering or fabrication.
(b) Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances:

1. Vertical from head to sill: 1/2"
2. Horizontal: No light gap

(12) Shade Fabric:

(a) Type: 1550 Series EcoVeil
(b) Openness: 3%
(c) Color: 1569 Silver Birch
(d) Note: Shade fabric for all single and double roll shade units.

(13) Blackout Shade Fabric:

(a) Type: 0700 Series Classic Blackout
(b) Openness: Opaque
(c) Material: Vinyl coated fabric blackout material same color reverse side for exterior.
(d) Color: 0702 Light Grey
(e) Note: Blackout shade fabric for all double roll shade units.

(14) Locations: See 090001: Color Scheme. Note: In spaces where multiple windows are side-by-side, it is the intention to have one shade span all windows.

3. EXECUTION

A. Storage and Handling of Materials:

(1) Deliver materials in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on drawings and 090001: Color Scheme.
(2) Store and handle products per manufacturer's recommendations.

B. Examination:

(1) Do not begin installation until substrates have been properly prepared.
(2) Start of installation shall be considered acceptance of substrates.

C. Site Conditions: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

D. Site Preparation:

(1) Clean surfaces thoroughly prior to installation.
(2) Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
(3) Coordinate with window installation and placement of concealed blocking to support shades.

E. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

F. Manufacturer's Instructions and/or Literature: Strictly comply with Manufacturer's written instructions.

(1) Install shades level, plumb, square, and true per manufacturer's instructions and approved shop drawings. Locate so shade band is at least 2 inches from interior face of glass. Allow proper clearances for window operation hardware. Use mounting devices as indicated.
(2) Replace shades exceeding specified tolerances at no extra cost to Owner.
(3) Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric.

(4) Clean roller shade surfaces after installation, per manufacturer's written instructions.
(5) Demonstrate operation and maintenance of window shade system to Owner's personnel.
(6) Manufacturer's authorized personnel are to train Owner's personnel on operation and maintenance of system. Use operation and maintenance manual as a reference, supplemented with additional training materials as required.

G. Completion of Work: General Contractor shall inspect work prior to Architect's inspection and ensure all damage and defects are corrected.

H. Cleaning and Protection of Work:

(1) Remove all labels, warranties, instruction manuals, etc. and submit to Architect under 017000: Contract Completion Requirements.
(2) Clean soiled shades in accordance with manufacturer's recommendations.
(3) Prevent use of the equipment by construction personnel during construction.
(4) Replace shades that cannot be cleaned to “like new” condition.

126600: TELESCOPIC SEATING

1. GENERAL

A. Scope: Includes all materials, labor, tools, and equipment necessary for the complete installation of telescopic bleacher seating electrically operated systems of multiple tiered seating rows. Includes seat, deck components, and understructure that permits the opening and closing without requiring dismantling.

B. Codes and Standards Compliance: ADA, ADM 1, AISC 360, AISI S100, ANSI/AWC NDS, ASTM, AWS D1.1, AWS D1.3, IBC, ICC, NFPA 101, NFPA 70, NFPA 5000, State and Local Codes

C. Quality Assurance:

(1) Manufacturer shall be a current Certified Welding Fabricator as defined by AWS. The manufacturer shall comply with structural welding codes that are applicable to their products or materials.
(2) Product to be supplied shall have a current evaluation report issued by ICC Evaluation Services certifying that it meets all structural design requirements of the current ICC 300 Standard for Bleachers, Folding and Telescopic Seating, and Grandstands, including all specified load combinations.
(3) NFPA Standard: Comply with current NFPA 102 Standard for Assembly seating, tents and membrane structures, and specifically with Chapter 5 Folding and Telescopic Seating except where additional requirements are indicated or imposed by authorities having jurisdiction.
(4) Manufacturer Qualifications: Manufacturer who has a minimum of twenty years of experience with manufacturing of telescopic gym seats.
(5) Installer Qualifications: Engage experienced installer who has specialized in installation of telescopic gym types similar to types required for this project and who is acceptable to, or certified by, the telescopic gym seat manufacturer.

D. Submittals:

(1) Product to be supplied shall have a current evaluation report issued by ICC Evaluation Services certifying that it meets all structural design requirements of the current ICC 300 Standards for Bleachers, Folding and Telescopic Seating, and Grandstands, including all specified load combination.
(2) Provide current welding certifications: AWS.
(3) Provide Manufacturer's Certification of Insurance coverage of not less than $5,000,000 and Errors and Omissions Insurance of not less than $2,000,000.
(4) Shop drawings indicating telescopic gym seat assembly layout, show seat heights, row spacing and rise, aisle widths and locations, assembly dimensions, anchorage to supporting structure, material types, finishes and seating layout.
(5) Wiring diagrams for electrically operated seating systems.
(6) Graphics (if applicable) showing pattern of contrasting seat colors.
(7) Samples of seat materials and color finish as selected by Architect and/or Owner.
(8) Warranty: Standard warranty documentation.
(9) Closeout Submittals: Include operation and maintenance data with video operations manual.

E. Warranties and Guarantees: Includes the repair of replacement of the defective product; or defective component thereof, with a comparable product; or component thereof, or a refund of the purchase price prorated over the warranty period.

(1) Includes: Labor, materials, and freight for replacement or repairs.
(2) Structural Component parts of Understructure Warranty Period: Ten (10) years from Date of Substantial Completion.
(3) Decking Systems, Seating Collections, Electrical, Portable and Integral Dolly Systems, End Closure Curtain, Surface Material Finishes Warranty Period: Five (5) years from Date of Substantial Completion.

F. Cross Reference: 018000: Cleaning
042200: Concrete Masonry Units
090001: Color Scheme
096466: Wood Athletic Flooring
Division 26

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Hussey Seating Company, USA Wall-Attached Telescoping Stand. Other manufacturers may be acceptable if they meet or exceed the quality standard herein. Alternates must be submitted to the Architect for approval before bid date.

B. Product Characteristics, General:

(1) Steel:

(a) Structural-Steel Shapes, Plates and Bars: ASTM A36
(b) Galvanized-Steel Sheet: ASTM A653, Grade 40 coating designation G60
(c) Uncoated Steel Strip; Non-Structural Components: ASTM A1011, Commercial Quality, Type B, Hot-Rolled Strip
(d) Uncoated Steel Strip; Structural Components: ASTM A1011 Grade 33, Grade 36, Grade 40, Grade 45, or Grade 50, Structural Quality, Hot-Rolled.
(e) Galvanized Steel Strip: ASTM A653 Grade 40 or Grade 64, structural quality, coating designation G60.
(f) Tubing: ASTM A500, cold formed; Grade B, or ASTM A513, 46 ksi min yield.

(2) Polyethylene Plastic: High-density polyethylene; injection molded, color-pigmented, textured, impact-resistant, and dimensionally stable.

(3) Wood:

(a) Lumber: NIST PS 20, southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for B&B Finish (B and better) grade-of-finish requirements.
(b) Plywood: NIST PS 1, APA-grade trademarked, A-C grade.

(4) Structural Performance: Engineer, fabricate and install telescopic gym seating systems to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connections. Apply each load to produce maximum stress in each respective component of each telescoping stand unit according to ICC 300.

(5) Manufacturer's System Design Criteria:

(a) Gymnasium seat assembly, design to support and resist, in addition to its own weight, the following forces:

1. Live load of 120 lbs. per linear foot on seats and decking.
2. Uniformly distributed live load of not less than 100 psf of gross horizontal projection.
3. Parallel sway load of 24 lbs.
4. Perpendicular sway load of 10 lbs. per linear foot of row combined with uniformly distributed live load above.
5. Parallel and Perpendicular sway loads are not applied concurrently.

(b) Hand Railings, Posts and Supports: Engineered to withstand the following forces applied separately:

1. Concentrated load of 200 lbs. applied at any point and in any direction.
2. Uniform load of 50 lbs. per foot applied in any direction.

(c) Guard Railings, Post and Supports: Engineered to withstand the following forces applied separately:

1. Concentrated load of 200 lbs. applied at any point and in any direction along top rail.
2. Uniform load of 50 lbs. per foot applied in any direction at top rail.
3. Uniform load of 50 lbs. applied on an area equal to 1 ft² applied on all guardrail infill panels.

C. Components:

(1) Wall-Attached Telescoping Stands: Forward-folding system with the rear of the understructure permanently attached to the floor and to the rear wall. Rear wall provides structural support and must support loads imposed by the bleacher.
(2) Operation:

(a) Pendant Control Unit
(b) Limit Switches: Automatically stop integral power system when telescoping stands reach fully opened or closed positions.
(c) Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB, activates when stands are in motion.

(3) Seating:

(a) Material: Gas assist injection-molded, 100 percent recyclable HDPE, high density polyethylene.
(b) Seat Module Size: 26”L x 12”D
(c) Module Load: Tested to 600 lbs.
(d) Seat Height Range from Deck to Top of Seat: 18 1/8" for 9 5/8” Rise Bleachers
(e) Row to Row Deck Spacing: 26”
(f) Integrally molded end caps at aisle end locations
(g) Integrally molded recess pockets to accept seat number and row letters
(h) Seat Numbers: 1 3/4" by 1 1/4" oval Lexan plate. Color: Black number over grey background.
(i) Row Identification: 1 3/4" by 1 1/4" oval Lexan plate. Color: Black letter over grey background.
(j) Color: To be selected during construction from manufacturer’s standard colors

(4) ADA Accessible Seating:

(a) Locate first tier modular units to provide wheelchair-accessible seating at locations indicated on drawings.

1. Flex-Row: Provide first row modular recoverable seating units that can be closed to accommodate persons requiring ADA spaces or opened for standard usage. Each Flex-Row unit shall have a handle for easy operation.

a. Provide a black full-surround steel skirting with no more than 3/4" floor clearance for safety and improved aesthetics.
b. Provide a black injection molded end cap for the nose beam for safety and improved aesthetics.

c. Provide a mechanical positive lock when the Flex-Row system is in both the open and closed position. Handle shall unlock the modular recoverable seating unit for operation.
d. Flex-Row can be utilized with the full system in the open or closed position.
e. Flex-Row modular units designed to achieve multi-use front row seating to accommodate team seating, ADA requirements and facility specific requirements.
f. Provide signage to mark the location of each recoverable Flex-Row module to assist with seating identification.

(5) Rails, Panels and Steps:

(a) End Rails: Provide steel self-storing starting no higher than tier 2 (42") high above seat, end rail with tublar supports and intermediate members designed with 4" sphere passage requirements.
(b) Material and Finish: Semi-Gloss powder coated steel
(c) Color: To be selected during construction from manufacturer's standard colors

(6) Center Aisle Rails:

(a) Provide auto-rotating single pedestal mount 34" high handrails with terminating mid rail. Permanently attached handrail shall rotate in a permanently mounted socket for rail storage. Rail shall automatically rotate, lock in the use position, unlock and rotate back to the stowed position as the gym seats open and close. Ends of the handrail shall return to the post, and not extend away from it. Rails having openings to avoid interference with closed decks are not acceptable.
(b) Material and Finish: Semi-Gloss powder coated steel
(c) Color: To be selected during construction from manufacturer's standard colors

(7) Skirt Panel: On 1st row, provide galvanized steel front skirt panel to prevent players/objects from sliding underneath the first row. Not required if the entire first row is fabricated as Flex-Rows.

(8) End Closure Panels: For Closed stack position at each exposed bank end.

(a) Material: Polydeck attached to a powder coated steel framework.
(b) Color: To be selected during construction from manufacturer's standard colors

(9) Steps: Flip-up Front Aisle Steps permanently hinged to the front row to ensure availability and ease of operation. Two 3" diameter x 3/4" wide non-marking front wheels provided so that the system can be operated with the step in the stored or deployed position. All edges coined, hemmed or radiused with front edge protective rubber bumpers. Abrasive-backed non-slip tread identifier on leading edge of nosing. For aisle widths greater than 6'-0", two side by side hinged steps to be provided.

(10) End-Curtain: Provide end closure curtain.

(11) Decking:

(a) 5/8" thick BC grade polyethylene-top-coated tongue and groove Douglas fir plywood
(b) Polyethylene overlay bonded to substrate, 0.03 thickness
(c) Color: To be selected during construction from manufacturer's standard colors

(12) Understructure:

(a) Finish: Powder coated rust inhibiting black finish
(b) Hardware Finish: Powder coated rust inhibiting black finish
(c) Locks and Other Surfaces: Powder coated black rust inhibiting black finish
(d) Nose Beam and Rear Riser Beam: Nose beam shall be continuously roll-formed closed tubular shape of ASTM A653 grade 40. Riser beam shall be continuously roll-formed of ASTM A653 Grade 64. Nose and riser beam shall be designed with no steel edges exposed to spectator after product assembly. Nose beam and riser beams are through-bolted fore/aft to deck stabilizers and frame cantilevers to create the deck structure.
(e) Frame: Welded assemblies (one left hand, one right hand per tier) comprised of the following components:

1. Lower Track Subassembly: ASTM A1011 Grade 50: Continuous Positive Interglide System caster horn interlocks each adjacent frame caster horn using an integral, continuous, anti-drift feature and captive interlock with adjustable row spacing at front to prevent separation and misalignment.
2. Lower Track Wheels: 6 per frame not less than 5” diameter by 1 1/4" with non-marring soft rubber face to protect wood and synthetic floor surfaces, with molded-in sintered iron oil-impregnated bushings to fit 3/8” diameter axles secured with E-type snap rings.
3. Slant Columns: A500 Grade B, tubular shape
4. Cantilever Subassembly: Consists of ASTM A1011 Grade 50 nose connection plate, cantilever, and riser attachment plate welded together into a subassembly.

(f) Lock System: Caster horns at the end sections of powered banks to lock each row in open position and allow unlocking automatically. Provide adjustable stops to allow field adjustment of row spacings.
(g) Sway Bracing: ASTM A653 grade 40, tension members bolted to columns.
(h) Deck Stabilizer: A1011 Grade 45, member through-bolted to nose and riser at three locations per section. Securely captures front and rear edge of decking at rear edge of nose beam and lower edge of riser beam for entire length of section. Interlocks with adjacent stabilizer on upper tier using low-friction nylon roller to prevent separation and misalignment.
(i) Fasteners: Vibration proof, in manufacturer’s standard size and material.

D. Electrical Operation Systems

(1) Integral Power: Pendant control unit which plugs into seating bank for tethered operator management of stop, start, forward, and reverse control of the power operation.
(2) Furnish and Install Hussey PF integral automatic electro mechanical powered frame propulsion system, to open and close telescopic seating. Seating manufacturer shall provide all wiring within seating bank, including pendant control. Motors, housing and wiring shall be installed and grounded in complete accord with the NEC. The control system shall operate at low voltage. The electrical contractor shall perform all connections at and upstream of the equipment specified herein and ensure that supplied voltage drops not more than 4% below nominal where power connects.
(3) Motor: 1/2 HP, 1725 RPM motor. GC to coordinate power requirements.
(4) Each pair of powered frames shall consist of output shaft gear reducer with 6” diameter x 4” wide wheels covered with non-marring 1/2" thick composite rubber and operate the bleacher as required for specified system.

E. Annual Service Light: Low voltage UL listed system integrated into the electrical control system on a powered bleacher. Manufacturer shall furnish parts and instructions for installation of service light.

F. Options and Accessories:

(1) Plug & Play Power for safe cord and plug connection
(2) Limit Switches to stop power operation when seating reaches fully extended or closed position.
(3) Scorer's Table: Removable unit with gray textured top of molded 2" thick polymer with eased edges and integral 16 gage cantilevered comfort C-style leg.

(a) Size: 6'-0" x 18" x 30"

(4) Operating Handles: To operated first tier Flex-Row

3. EXECUTION

A. Storage and Handling of Materials:

(1) Deliver telescoping stands in manufacturers packaging clearly labeled with manufacturer name and content.
(2) Handle bleacher equipment in a manner to prevent damage.
(3) Deliver the telescoping stands at a scheduled time for installation that will not interfere with other trades operating in the building when at all possible.

B. Project Conditions: Coordinate actual dimensions of construction affecting telescoping stands installation by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of work.

C. Examination:

(1) Do not begin installation until substrates have been properly prepared.
(2) Start of installation shall be considered acceptance of substrates.
(3) Tolerances:

(a) Flooring and Rear Wall: Level and plumb within 1/8" in 8'-0"
(b) Maximum bleacher force on the floor of a 27'-0" section. Static point load of less than 300 psi.

D. Protection of Adjacent Work: Provide protection as required to adjacent finished work. Damage done to adjacent finished work shall be replaced.

E. Manufacturer's Instructions and/or Literature: Strictly comply with Manufacturer's written instructions.

F. Adjusting and Cleaning:

(1) On completion of installation, lubricate, test, and adjust each telescoping stand unit so that it operates according to manufacturer's written operating instructions.
(2) Clean installed telescoping stands on exposed surfaces. Touch up shop-applied finishes or replace components as required to restore damaged or soiled areas.

142123: MACHINE-ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

1. GENERAL

A. Scope: Includes materials and installation of a machine-room-less gearless traction passenger elevator.

B. Code and Standard Compliance: ADA, ANSI/ASME A17.1, ADAAG, NFPA 70, NFPA 80, UL 10B, ISO, State and Local Codes

C. Quality Assurance:

(1) Manufacturer Qualifications: Minimum 10 years experience in manufacturing and installing elevator equipment of the types specified.
(2) Regulatory Requirements:

(a) Elevator design, clearances, construction, workmanship, materials and installation, unless specified otherwise, shall be in accordance with ANSI/ASME A17.1, handicap accessibility, Americans with Disabilities Act, and other codes having legal jurisdiction.
(b) ANSI/ASME A17.1 shall govern, except where codes having legal jurisdiction include more rigid requirements or conflict with ANSI/ASME A17.1.
(c) Elevator shall follow design and manufacturing procedures certified in accordance with ISO 9001:2000 to meet product and service requirements for quality assurance for new products.
(d) Where product is in variance to the published ANSI/ASME A17.1 model code, provide a third party AECO certification demonstrating equivalent function, safety, and performance.

(3) Pre-installation Meeting:

(a) Convene pre-installation meeting before start of installation of elevators.
(b) Require attendance of parties directly affecting work of this section, including Contractor, Architect and elevator manufacturer/installer.
(c) Review examination, installation, field quality control, adjusting, cleaning, protection, and coordination with other work.

D. Submittals:

(1) Product Data:

(a) Descriptive brochures or detail drawings of cab and hall fixtures, cab decoration options, and product features.
(b) Power Information: Horsepower, starting current, running current, machine and control heat release, and electrical requirements

(2) Shop Drawings: Submit manufacturer/installer's shop drawings, including plans, elevations, sections, and details, indicating location of equipment, loads, dimensions, tolerances, materials, components, fabrication, fasteners, hardware, finish, options, accessories, and other information to render totally functional elevators.
(3) Samples: Submit manufacturer/installer's samples of standard colors and finishes of finish materials.
(4) Operation and Maintenance Manual: Submit manufacturer/installer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; renewal parts catalogs; and electrical wiring diagrams.
(5) Warranty: Submit documentation associated with manufacturer/installer's standard warranty.

E. Warranties and Guarantees: Manufacturer/installer shall guarantee materials and workmanship of equipment installed under these specifications and make good, defects not due to ordinary wear or to improper use, which may develop within 1 year after completion of installation or acceptance thereof by beneficial use, whichever is earlier.

F. Maintenance Service:

(1) Elevator maintenance service shall be performed by elevator manufacturer/installer.
(2) Elevators shall receive regular maintenance as scheduled by Owner.
(3) Trained employees shall make periodic examinations and perform work including necessary adjusting, greasing, oiling and replacing parts to keep elevator in operation, except parts that require replacement.

G. Cross Reference: 033000: Cast-in-Place Concrete
036000: Grout
042200: Concrete Masonry Units
051200: Structural Steel Framing
061000: Rough Carpentry
090001: Color Scheme
092500: Gypsum Board
Mechanical, Electrical and Communications Drawings and Specifications

H. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supporting all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Schindler Elevator Corporation series 3100 Gearless Traction Machine-Room-Less Passenger Elevator

(1) Other manufacturer's may be acceptable if they meet or exceed the quality standard. Alternates must be submitted to the Architect for approval before bid date.

B. Elevator System and Components:

(1) Elevator Equipment Summary:

(a) Application: Machine Room Less (MRL)
(b) Counterweight: Side
(c) Machine Location: Top of the hoistway mounted on car and counterweight guide rails
(d) Control Space Location: Top landing entrance frame or entrance frame at one floor below the top landing.
(e) Service: General Purpose Passenger
(f) Quantity: One (1)
(g) Capacity: 3000 pounds
(h) Speed 100 fpm
(i) Travel: 12'-8"
(j) Landings: 2
(k) Front Openings: 2
(l) Rear Openings: 0
(m) Operation: Microprocessor Single Car Automatic Operation
(n) Clear Inside Dimensions: 6'-9 5/16"W x 4'-10 7/8"D
(o) Cab Height: 7'-9"

(p) Guide Rails: Equivalent to 12 lb. per foot
(q) Entrance Type and Width: Single Speed Center Opening 3'-6"W x 7'-0"H doors
(r) Entrance Height: 7'-0"
(s) Power Supply: 480 Volts 3 Phase 60 Hz

(2) Performance:

(a) Car Speed: -10% to +5% of contract speed under any loading condition or direction of travel.
(b) Car Capacity: Safely lower, stop and hold up to 125% of rated load per code.

(3) Ride Quality:

(a) Vertical Vibration (maximum): 25 mg
(b) Horizontal Vibration (maximum): 15 mg
(c) Vertical Jerk (maximum): 2 ft/sec^3
(d) Acceleration (maximum): 1.6 ft/sec^2
(e) In Car Noise: 53-60 dB(A)
(f) Stopping Accuracy: +/-5mm
(g) Starts per Hour (maximum): 180

(4) Elevator Operation:

(a) Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. When all calls have been answered, the car shall park at the last landing served.
(b) Group Automatic Operation with Demand-Based Dispatching: Provide reprogrammable group automatic system that assigns cars to hall calls based on a dispatching algorithm designed to minimize passenger waiting time.

(5) Operating Features:

(a) Door Light Curtain Protection
(b) Static AC Drive
(c) Phase Monitor Relay
(d) Cab Overload with Indicator
(e) Load-weighing
(f) Central Alarm
(g) Remote Monitoring
(h) Firefighter's Operation
(i) Independent Service
(j) Automatic Evacuation: When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. If the car is at a floor when the power fails, it remains at that floor, opens its doors, and shuts down. If the car is between floors, it is raised or lowered to the first available landing, opens its doors and shuts down.

C. Control Components and Control Space

(1) Controller: Provide microprocessor-based control system to perform all of the functions of safe elevator operation, as well as perform car and group operational control.

(a) All high voltage (110v or above) contact points inside the inspection and test panel shall be protected from accidental contact in a situation where the access panels are open.

(b) The controller shall be distributed throughout the elevator system located in the overhead, cab and inspection and test panel. The inverter will be mounted in the overhead adjacent to the hoist machine and an inspection and test panel will be located in the door jamb at the top floor or one floor below the top floor. No elevator equipment mechanical rooms or closets are required.
(c) Provide multi-bus control architecture to reduce cabling, material and waste.

(2) Drive: Provide a Variable Voltage Variable Frequency AC Closed Loop drive system. Provide stable start without high peak current, quickly reaching a low energy consumption level.
(3) Inspection and Test Panel: Integrated control equipment, main inspection and test panel in door frame at top level served or at one floor below the top level served.

D. Hoistway Components

(1) Machine:

(a) Gearless asynchronous AC motor with integral drive sheave, service and emergency brakes.
(b) Design machine to enable direct power transfer, thereby avoiding loss of power.
(c) Design machine to be compact, lightweight and durable to optimize material usage and save space.
(d) Mount to structural support channels on top of guide rail system as applicable in hoistway overhead.

(2) Governor:

(a) Tension type over-speed governor with remote manual reset.
(b) Mount to structural support channels as applicable in hoistway overhead.

(3) Buffers, Car and Counterweight: Compression spring type buffers to meet code.
(4) Hoistway Operating Devices:

(a) Emergency Stop switch in the pit.
(b) Terminal stopping switches.
(c) Emergency stop switch on the machine.

(5) Positioning System: System consisting of proximity sensors and door zone vanes.
(6) Guide Rails and Attachments: Provide Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
(7) Suspension System: Non circular Elastomeric coated suspension media with high tensile grade steel cords.
(8) Governor rope: Steel wire rope with 6 mm diameter.
(9) Ladder: Provide and install steel wall mounted ladder as required by elevator manufacturer and to meet state and local codes.

E. Hoistway Entrances:

(1) Hoistway Doors and Frames:

(a) UL rated with required fire rating.
(b) Doors: Rigid flush panel construction with reinforcement ribs.
(c) Frames: Securely fasten at corners to form unit frame. Frames shall be bolted.

(2) Finish:

(a) Exposed Areas of Corridor Frames: Stainless Steel - All Floors
(b) Doors: Stainless Steel - All Floors
(c) Sills: Aluminum - All Floors

(3) Entrance Markings and Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

F. Car Components:

(1) Car Frame and Safety: Provide car frame with adequate bracing to support the platform and car enclosure. The safety shall be integral to the car frame and shall be flexible guide clamp type.
(2) Platform: Provide platform of steel construction with plywood subfloor and aluminum threshold.
(3) Car Guides: Provide sliding guide shoes mounted to top and bottom of both car and counterweight frame. Arrange each guide shoe assembly to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
(4) Provide central guiding system to reduce mechanical friction and energy consumption.
(5) Steel Cab:

(a) Fire rating: Class A
(b) Car wall finish: Plastic laminate finish selected from manufacturer's standard selections.
(c) Base and Frieze: Aluminum
(d) Car Front Finish: Brushed stainless steel
(e) Car Door Finish: Brushed stainless steel
(f) Ceiling: Canopy ceiling, finished in #4 Stainless Steel with 4 LED down lights.
(g) Handrail: Round Bushed Stainless Steel - Return End. Locate on Rear & Side Walls.
(h) Flooring: Under separate contract. See 090001: Color Scheme and 096500: Resilient Flooring. Flooring not to exceed 3/8" finished depth.
(i) Ventilation: Provide one-speed fan in canopy.
(j) Emergency Car Lighting: Provide an emergency power unit employing a 12 volt sealed rechargeable battery and static circuits to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
(k) Emergency Siren: Provide siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged.
(l) Emergency Exit Switch: Provide an electrical contact to open the safety circuit when the emergency car top exit is opened. When the exit door is opened, the top exit switch shall signal the control and the car will be unable to move.
(m) Emergency Exit Lock: Provide an emergency exit lock where required by local code.
(n) Emergency Exit Guard: Provide emergency exit guard on top of car when required for hoistway wall to platform clearance exceeds 12" or for multiple cars in hoistway.

G. Door Operator and Reopening Devices

(1) Door Operator: Provide a closed loop VVVF high performance door operator with frequency-controlled drive for fast and reliable operation to open and close the car and hoistway doors simultaneously.
(2) In case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Provide emergency devices and keys for opening doors from the landing as required by local code.
(3) Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. Provide door open button in the car operating panel. Momentary pressing of this button shall reopen the doors and reset the time interval.
(4) Provide door hangers and tracks for each car and hoistway door. Contour tracks to match the hanger sheaves. Design hangers for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed for life bearings.

(5) Electronic Door Safety Device: Equip car doors with concealed transmitter and receiver infrared beam devices to detect presence of object in process of passing through hoistway entrance and car doorway (light curtain device).

(a) Use multi-beam scanning without moving parts to detect obstructions in door opening.
(b) Detector Device: Prevent doors from closing, or if they have already started closing, cause doors to reopen and remain open while object is within detection zone.
(c) Horizontal Beams: Minimum of 33 infra-red beams to fill doorway from ground level to a height of 6 feet.

H. Signal Devices and Fixtures:

(1) Car Operating Panel: Provide a car operating panel with all push buttons, key switches and message indicators for elevator operation.

(a) Full height car operating panel shall be surface-mounted on front return.
(b) Comply with handicap requirements.
(c) Push Buttons: Mechanical, illuminating using long-lasting LEDs for each floor served.
(d) Emergency Buttons: Provide in accordance with code. Emergency alarm button, door open and door close buttons.

(2) Features of the Car Operating Panel Shall Include:

(a) Audible chime to signal that the car is either stopping at or passing a floor served by the elevator.
(b) Raised markings and Braille provided to the left-hand side of each push button.
(c) Car Lantern: Provide LED illuminated car lantern with direction arrows to comply with local code when hall lanterns are not provided.
(d) Door “open” and “close” push buttons.
(e) Firefighter’s hat and Phase 2 Key-switch
(f) Inspection key-switch.
(g) Key-switch for optional Independent Service Operation
(h) Illuminated alarm button with raised marking.
(i) Elevator Data Plate marked with elevator capacity and car number.
(j) Help Button: Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
(k) Certificate Frame.

(3) Hall Fixtures: Provide hall fixtures with necessary push buttons and key switches for elevator operation.

(a) Push buttons: Metallic tactile push buttons, up button and down button at intermediate floors, single button at each terminal floor.
(b) Height: Comply with handicap requirements.
(c) Illumination: Illuminating using long-lasting low power LEDs.

(4) Hall Lanterns and Position Indicators: LED illuminated direction arrows with audible and visible call acknowledgement.
(5) Hoistway access switches: Provide key-switch at top and/or bottom floor in entrance jamb as required by local code.
(6) Firefighter’s Phase 1 Service: Key switch in brushed stainless steel cover plate.
(7) Fixture Cover Plates: For push buttons, hall lanterns and position indicators, resistant white back-printed glass, no screws required for mounting. Provide stainless steel cover plates for Firefighter's Phase I switch and hoistway access switches, with tamper resistant screws in same finish.
(8) Mounting: Mount hall fixtures in entrance frames.

3. EXECUTION

A. Storage and Handling of Material:

(1) Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
(2) Do not store products in location with the conditions outside manufacturer's absolute limits.
(3) Materials delivered to the site shall be examined for concealed damage or defects in shipping. Defects shall be noted and reported to the Architect in writing.

B. Project Conditions:

(1) Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
(2) Temporary Electrical Power:

(a) Coordinate availability of permanent three-phase power prior to installation start.
(b) Coordinate availability of clear, rollable access to a 10 foot by 20 foot secure and dry storage area prior to delivery.
(c) Coordinate availability of a clean, dry, and complete hoistway along with temporary installation platform and all required OSHA-compliant barricades prior to delivery.

(3) Temporary Use of Elevator:

(a) Coordinate with manufacturer/installer for temporary use of elevator, if required.
(b) Temporary use of elevator shall be in accordance with terms and conditions of manufacturer/installer's temporary acceptance form.

C. Examination:

(1) Examine hoistways, hoistway openings, pits, and overheads before starting elevator installation.
(2) Verify hoistway, pit, overhead, and openings are of correct size, within tolerances, and are ready for work of this section.
(3) Verify walls are plumb where openings occur and ready for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
(4) Verify hoistway is clear and plumb, with variations not to exceed minus 0 to plus 1 inch at any point. Verify projections greater than 4-inch must be beveled not less than 75 degrees from horizontal. No negative tolerance is permitted for minimum hoistway dimensions.
(5) Verify minimum 2-hr fire resistance rating of hatch walls.
(6) Notify Architect in writing of dimensional discrepancies or other conditions detrimental to proper installation or performance of elevator.
(7) If preparation is the responsibility of another installer, notify Architect of deviations from manufacturer's recommended installation tolerances and conditions.
(8) Do not proceed with installation until substrates have been properly prepared and deviations are corrected.
(9) Commencement of installation constitutes acceptance of conditions.

D. Installation:

(1) Elevator shall be installed by elevator manufacturer.
(2) Install elevators in accordance with manufacturer/installer's instructions and ANSI/ASME A17.1.
(3) Set entrances in vertical alignment with car openings, and aligned with plumb hoistway lines.

E. Field Quality Control: Perform tests of elevator as required by ANSI/ASME A17.1 and governing codes.

F. Adjusting:

(1) Adjust elevators for proper operation in accordance with manufacturer/installer's instructions.
(2) Adjust elevators for smooth acceleration and deceleration of car so not to cause passenger discomfort.
(3) Adjust doors to prevent opening of doors at landing on corridor side, unless car is at rest at that landing, or is in leveling zone and stopping at that landing.
(4) Adjust automatic floor leveling feature at each floor to within 1/4" of landing.
(5) Repair minor damages to finish in accordance with manufacturer/installer's instructions and as approved by Architect or Owner.
(6) Remove and replace damaged components that cannot be successfully repaired as determined by Architect or Owner.

G. Cleaning and Protection:

(1) Clean in accordance with manufacturer's recommendation. Clean elevators promptly after installation in accordance with manufacturer/installer's instructions. Do not use cleaning materials or methods that could damage finish.
(2) Protect installed elevators from damage during construction in accordance with the negotiated temporary use agreement between Owner and manufacturer's installer. Protect installed products until completion of project.
(3) Touch-up, repair or replace damaged products and finishes in accordance with manufacturer's instructions before Substantial Completion.

210500: COMMON WORK RESULTS FOR FIRE SUPPRESSION

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping materials and fittings
2. Joining materials
3. Dielectric fittings
4. Mechanical sleeve seals
5. Piping Specialties
6. Piping Installation
7. Equipment Installation
8. Concrete Bases.
9. Erection of Metal Supports
10. Erection of Wood Supports
11. Cutting and Patching
12. Grouting

1.2 The intent is to obtain a complete installation to which end the contractor shall furnish all material, equipment, labor, etc. Specified and any other accessory items which may not be specified, but which normally are furnished, required for proper operation or can be reasonably implied from the specifications and plans. The contractor shall furnish all freight, drayage, rigging, etc. Required for this work.

1.3 In this section, the word "contractor" or "this contractor" means the contractor who is engaged to execute that portion of the work under which the word is shown.

1.4 The word "provide" means to furnish, install, and connect.

1.5 The contractor agrees that upon the submittal of a bid, he will have read and studied all of the contract documents, and that all of the requirements and coordination resulting from these documents are included in his bid. The intent is to obtain a complete installation of work to which end the contractor shall provide all labor, equipment, material, freight, rigging, etc., specified, shown or scheduled on plans. He also agrees that any other accessory items which may not be specified, shown, or scheduled on the plans, but which normally are furnished or can be reasonably implied from the specifications and/or plans to be required shall be provided.

1.6 No exclusion from, or limitations in the drawings, specifications, or other contract documents for the work shall be reason for the omitting of the appurtenances or accessories necessary to complete any required system or item of equipment in this project.

1.7 Should the contractor find any discrepancies and/or omissions in the contract documents, or be in doubt as to the intent of said documents, he shall obtain clarification or correction from the architect and the engineer before submitting a bid for work under this division. The contractor will not be granted monetary allowances for discrepancies between his bid and the intent or the work after the contract is let, due to failure to follow this instruction.

1.8 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications:

1. B1.20.1 "Pipe Threads, General Purpose, Inch"

2. B16.21 "Nonmetallic Flat Gaskets for Pipes Flanges"
3. B18.2.1 "Square and Hex Bolts and Screws, Inch Series"

B. ASTM International (ASTM) Publications:

1. A47 "Standard Specification for Ferritic Malleable Iron Castings"
2. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
3. A126 "Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings"
4. A536 "Standard Specification for Ductile Iron Castings"
5. B32 "Standard Specification for Solder Metal"
6. C1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)"
7. D2235 "Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings"
8. D2564 "Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems"
9. D2657 "Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings"
10. F402 "Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings"

C. American Welding Society (AWS) Publications:

1. "Soldering Manual"
2. BRH "Brazing Handbook"
3. A5.8 "Specification For Filler Metals For Brazing And Braze Welding"
4. D1.1 "Structural Welding Code - Steel"
5. D10.12 "Guide for Welding Mild Steel Pipe"

D. American Water Works Association (AWWA) Publications:

1. C110/ANSI A21.10 " Standard for Ductile-Iron and Gray-Iron Fittings, 3 In.-48 In. (76 mm-1,219 mm), for Water "
2. C111/ANSI A21.11 "Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings"

1.9 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.10 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
2. Coordination Drawings: Detail major elements, components, and systems of fire suppression equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

a. Planned piping layout, including valve and specialty locations and valve-stem movement.
b. Clearances for installing and maintaining installation.
c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
d. Equipment and accessory service connections and support details.
e. Exterior wall and foundation penetrations.
f. Fire-rated wall and floor penetrations.
g. Sizes and location of required concrete pads and bases.
h. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
i. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
j. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.12 SEQUENCING AND SCHEDULING

A. Coordinate fire suppression equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for fire suppression installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of fire suppression materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate requirements for access panels and doors if fire suppression items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Section 08 31 00 - "Access Doors and Panels."

F. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.13 POSTED OPERATING INSTRUCTIONS

A. Provide and post operating instructions for all fire suppression systems.

2.0 PRODUCTS

2.1 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B32.

1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.

E. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.
3. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Solvent Cements: Manufacturer's standard solvent cements for the following:

1. ABS Piping: ASTM D2235.
2. CPVC Piping: ASTM F493.
3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
4. PVC to ABS Piping Transition: ASTM D3138.

G. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

H. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A126, Class B, gray iron.
2. Followers: ASTM A47 malleable iron or ASTM A536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.2 DIELECTRIC FITTINGS

A. Approved Manufacturers:

B. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

C. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

D. Insulating Material: Suitable for system fluid, pressure, and temperature.

E. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

F. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150-psig minimum working pressure as required to suit system pressures.

G. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Provide separate companion flanges and steel bolts and nuts for 150-psig minimum working pressure as required to suit system pressures.

H. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

2.3 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.4 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

a. Underdeck Clamp: Clamping ring with set screws.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
2. OD: Completely cover opening.
3. Cast Brass: Split casting, with concealed hinge and set screw.

a. Finish: Polished chrome-plate.

4. Cast-Iron Floor Plate: One-piece casting.

2.5 GROUT

A. Non-shrink, Nonmetallic Grout: ASTM C1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psig, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

3.0 EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specifies otherwise. Individual Division 21 piping Sections specifies unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings as required by Division 01 Sections and as outlined in Part 1 of this section.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass with concealed hinge, set screws, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping rings where required.

2. Build sleeves into walls and slabs as work progresses.
3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).
    b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) and larger, penetrating gypsum-board partitions.

4. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges.

    a. Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealant.
6. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

O. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves.

Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stopping materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."
4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of

dissimilar metals.

4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights is not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Owner's Representative.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install fire suppression equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope as specified in other Division 21 sections.

F. Clearance from Electrical Equipment: Wet piping is prohibited in electric rooms and closets, elevator machine rooms and installation over transformers, switchboards and motor control centers.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig 28-day compressive-strength concrete and reinforcement.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire suppression materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

C. Prime and paint all metal supports per Section 09 90 00 requirements similar to "Pipes and Mechanical Equipment".

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

D. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor fire suppression materials and equipment.

E. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

F. Attach to substrates as required to support applied loads.

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for fire suppression installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

C. Refer to Division 01 Sections for additional requirements.

3.8 GROUTING

A. Install nonmetallic, non-shrink, grout for fire suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

210517: SLEEVES AND SLEEVE SEALS FOR FIRE SUPPRESSION PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated

2.0 PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

3.0 EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

210518: ESCUTCHEONS FOR FIRE SUPPRESSION PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Escutcheons.
   2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

2.0 PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

3.0 EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

   1. Escutcheons for New Piping:

      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
      e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
      f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
      g. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
      h. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

211100: FACILITY FIRE SUPPRESSION WATER-SERVICE PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section includes fire-suppression water-service piping and related components outside the building and service entrance piping through floor into the building.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.5 COORDINATION

A. Coordinate connection requirements to Owner provided temporary water service with Owner.

2.0 PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, annealed temper.

B. Tube in first paragraph below is available in NPS 1/8 to NPS 12 (DN 6 to DN 300).

C. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.

D. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

E. Flanges in first paragraph below are available in NPS 1/2 to NPS 12 (DN 15 to DN 300).

F. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

G. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.

C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.

D. Grooved-End, Ductile-Iron Pipe Appurtenances:

1. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
2. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

E. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

3. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

F. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.
1. Gaskets: AWWA C111, rubber.

G. Flanges: ASME B16.1, Class 125, cast iron.

2.3 SPECIAL PIPE FITTINGS

A. Ductile-Iron Flexible Expansion Joints:

1. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
2. Pressure Rating: 250 psig minimum.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

2.5 OINING MATERIALS

A. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.

2.6 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners, and with ends of same sizes as piping to be joined.
2. Standard: AWWA C219.
3. Center-Sleeve Material: Manufacturer's standard.
4. Gasket Material: Natural or synthetic rubber.
5. Pressure Rating: 200 psig minimum.
6. Metal Component Finish: Corrosion-resistant coating or material.

2.7 GATE VALVES

A. AWWA Gate Valves:

1. Verify with authorities having jurisdiction whether AWWA (including small MSS or UL-listed/FM-approved valves are required.
2. 200-psig, AWWA, Iron, Nonrising-Stem, Metal-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
b. Standard: AWWA C500.
c. Pressure Rating: 200 psig.
d. End Connections: Mechanical joint.
e. Interior Coating: Complying with AWWA C550.

3. 200-psig, AWWA, Iron, Nonrising-Stem, Resilient-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
b. Standard: AWWA C509.
c. Pressure Rating: 200 psig.
d. End Connections: Mechanical or push-on joint.
e. Interior Coating: Complying with AWWA C550.

4. 200-psig, AWWA, Iron, OS&Y, Metal-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet; with cast-iron double disc, bronze disc and seat rings, and bronze stem.
b. Standard: AWWA C500.
c. Pressure Rating: 200 psig.
d. End Connections: Flanged or grooved.

5. 200-psig, AWWA, Iron, OS&Y, Resilient-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet; with bronze, gray-iron, or ductile-iron gate; resilient seats; and bronze stem.
b. Standard: AWWA C509.

c. Pressure Rating: 200 psig.
d. End Connections: Flanged or grooved.

6. Class 125, Bronze, Nonrising-Stem Gate Valves:

a. Description: Class 125, Type 1; bronze with solid wedge and malleable-iron handwheel.
b. Standard: MSS SP-80.
c. Pressure Rating: 200 psig.
d. End Connections: Solder joint or threaded.

D. UL-Listed or FM-Approved Gate Valves:

1. Verify with authorities having jurisdiction whether AWWA (including small MSS or UL-listed/FM-approved valves are required.
2. 175-psig, UL-Listed or FM-Approved, Iron, Nonrising-Stem Gate Valves:

a. Description: Iron body and bonnet, bronze seating material, and inside screw.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Mechanical or push-on joint.
e. Indicator-Post Flange: Include on valves used with indicator posts.

3. 175-psig, UL-Listed or FM-Approved, Iron, OS&Y, Gate Valves:

a. Description: Iron body and bonnet and bronze seating material.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Flanged or grooved.

4. UL-Listed or FM-Approved, OS&Y Bronze, Gate Valves:

a. Description: Bronze body and bonnet and bronze stem.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Threaded.

2.8 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.
2. Standard: MSS SP-60.
3. Tapping Sleeve: Cast-iron, ductile-iron, or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Sleeve shall match size and type of pipe material being tapped and have recessed flange for branch valve.
4. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised-face flange mating tapping-sleeve flange.

B. Indicator Valves:

1. Description: Wall mounted, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of wall penetration of valve.
2. Standards: UL 789 and "Approval Guide," published by FM Global, listing.

2.9 FIRE-DEPARTMENT CONNECTIONS

A. Description: Wall mounted, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire-department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; and round escutcheon plate.

B. Standard: UL 405.

C. Escutcheon Plate Marking: "AUTO SPKR & STANDPIPE."

2.10 ALARM DEVICES

A. General: UL 753 and "Approval Guide," published by FM Global, listing, of types and sizes to mate and match piping and equipment.

B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with two single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.

C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

3.0 EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in other sections of this Specificaiton.

3.2 PIPING INSTALLATION

A. Retain one of first two paragraphs below. Retain first paragraph if tap is made by utility company; retain second if tap is made by Contractor.

B. Water-Main Connection: Coordinate with Owner temporary fire water service and future main tap size. See included drawings in the RFP for anticipated water service location.

C. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

D. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company's standards.

2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.

F. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

1. Install encasement for tubing according to ASTM A 674 or AWWA C105.

G. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install encasement for piping according to ASTM A 674 or AWWA C105.

H. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration.

I. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.

1. Terminate fire-suppression water-service piping 4 feet from building exterior until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.

J. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

K. Install sleeves for piping penetrations of walls, ceilings, and floors.

L. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in tubing NPS 2 and smaller.

C. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of tubes and remove burrs.

E. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.

F. Copper-Tubing, Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

G. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

H. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.

I. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

J. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.4 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Retain one of first two paragraphs below to suit requirements of authorities having jurisdiction.

B. Supervisory Switches: Supervise valves in open position. Verify supervisory type as required by authorities having jurisdiction.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Locking and Sealing: Secure unsupervised valves as follows:

1. Valves: Install chain and padlock on open OS&Y gate valve.
2. Post Indicators: Install padlock on wrench on indicator post.

D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.

E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

F. Connect alarm devices to building's fire-alarm system.

3.6 CONNECTIONS

A. Connect fire-suppression water-service piping to temporary Owner provided temporary water main. Provide means for future connection to campus water main once installed.

B. Connect fire-suppression water-service piping to interior fire-suppression piping.

C. Connect waste piping from concrete vault drains to sanitary sewerage system.

3.7 FIELD QUALITY CONTROL

A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare test and inspection reports.

3.8 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in other sections of this Specification."

B. Permanently attach equipment nameplate or marker indicating plastic fire-suppression water-service piping or fire-suppression water-service piping with electrically insulated fittings, on main electrical meter panel. Comply with requirements for identifying devices.

3.9 CLEANING

A. Clean fire-suppression water-service piping as follows:

   1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use purging procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

B. Retain subparagraph below for fire-suppression water-service piping connected to potable-water supply.

C. Prepare reports of purging activities.

211313: WET-PIPE SPRINKLER SYSTEMS

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 20 percent, including losses through water-service piping, valves, and backflow preventers.
2. Minimum Density for Automatic-Sprinkler Piping Design: According to NFPA 13
3. Maximum Protection Area per Sprinkler: According to NFPA 13
4. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and other standards required by the authority having jurisdiction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For qualified Installer and professional engineer.

E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

F. Welding certificates.

G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

H. Field quality-control reports.

I. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

2.0 PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field f

B. Schedule 10 and Schedule 40, Black-Steel Pipe: ASTM A 135; A53, ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 10 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.

E. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME 16.1, Class 125.

H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating: 175 psig minimum.
2. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

K. Steel Pressure-Seal Fittings: UL 213, FM-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

2.3 CPVC PIPE AND FITTINGS

A. UL, c-UL, and FM approved, listed CPVC fire sprinkler pipe approved for use in NFPA 13 systems.

B. Pipe shall meet or exceed ASTM F442 standards.

C. CPVC piping shall meet all applicable standards for pressure rated application as required in ANSI-NSF Standard 14.

D. All CPVC fire sprinkler pipes shall be listed for wet pipe systems and shall carry a rated working pressure of 175 psi at 150° F.

E. CPVC fire piping shall not be used in hazard occupancies above manufacturer’s specified limitations for light and ordinary group 1 hazards.

F. CPVC pipe shall not be used in areas where the maximum ambient temperature exceeds 150° F.

G. CPVC pipe shall not be used in outdoor applications.

H. CPVC fire piping shall be BlazeMaster® or equivalent.

I. Contractor shall obtain approval from local Authority Having Jurisdiction prior to ordering or installing CPVC fire piping.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or

ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.

B. Check Valves:

1. Standard: UL 312.
2. Pressure Rating: 250 psig minimum.
3. Type: Swing check.
4. Body Material: Cast iron.
5. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

1. Standard: UL 262.
2. Pressure Rating: 175 psig.
3. Body Material: Bronze.
4. End Connections: Threaded.

D. Iron OS&Y Gate Valves:

1. Standard: UL 262.
2. Pressure Rating: 250 psig minimum.
3. Body Material: Cast or ductile iron.
4. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig minimum.
3. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Threaded.

4. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

5. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch and visual indicating device.

2.6 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.

2.7 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175 psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.8 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFAC Inc.
b. Elkhart Brass Mfg. Company, Inc.
c. GMR International Equipment Corporation.
d. Guardian Fire Equipment, Inc.
e. Potter Roemer.

2. Standard: UL 405.
3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching 4” Storz local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.

2.9 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175 psig minimum.

3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-T and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Standard: UL 1474.
2. Pressure Rating: 250 psig minimum.
3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

F. Flexible, Sprinkler Hose Fittings:

1. Standard: UL 1474.
2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
3. Pressure Rating: 175 psig minimum.
4. Size: Same as connected piping, for sprinkler.

2.10 SPRINKLERS

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Residential Sprinklers: 175 psig maximum.
3. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
4. Pressure Rating for High-Pressure Automatic Sprinklers: 250 psig minimum.

B. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Residential Applications: UL 1626.
4. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

C. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

D. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

F. Sprinkler Guards:

1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

2.11 ALARM DEVICES

A. Alarm shall be electric type rated for fire service.

B. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.

C. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.

2.12 PRESSURE GAGES

A. Standard: UL 393.

B. Dial Size: 3-1/2- to 4-1/2-inch diameter.

C. Pressure Gage Range: 0 to 250 psig minimum.

D. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

3.0 EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

N. Fill sprinkler system piping with water.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

P. Install sleeve seals for piping penetrations of concrete walls and slabs.

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to

AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.5 SPRINKLER INSTALLATION

E. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

F. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Retain first paragraph below to describe tests and inspections to be performed.

C. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire-department equipment.

D. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

220500: COMMON WORK RESULTS FOR PLUMBING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping materials and fittings
2. Joining materials
3. Dielectric fittings
4. Equipment Installation
5. Concrete Bases.
6. Erection of Metal Supports
7. Erection of Wood Supports
8. Cutting and Patching
9. Grouting

1.2 The contractor agrees that upon the submittal of a bid, he will have read and studied all of the contract documents, and that all of the requirements and coordination resulting from these documents are included in his bid. The intent is to obtain a complete installation of plumbing work to which end the contractor shall provide all labor, equipment, material, freight, rigging, etc., specified, shown or scheduled on plans. He also agrees that any other accessory items which may not be specified, shown, or scheduled on the plans, but which normally are furnished or can be reasonably implied from the specifications and/or plans to be required shall be provided.

1.3 No exclusion from, or limitations in the drawings, specifications, or other contract documents for the plumbing work shall be reason for the omitting of the appurtenances or accessories necessary to complete any required system or item of equipment in this project.

1.4 Should the contractor find any discrepancies and/or omissions in the contract documents, or be in doubt as to the intent of said documents, he shall obtain clarification or correction from the architect and the engineer before submitting a bid for work under this division. The contractor will not be granted monetary allowances for discrepancies between his bid and the intent or the work after the contract is let, due to failure to follow this instruction.

1.5 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications:

1. B1.20.1 "Pipe Threads, General Purpose, Inch"
2. B16.21 "Nonmetallic Flat Gaskets for Pipes Flanges"
3. B18.2.1 "Square and Hex Bolts and Screws, Inch Series"

B. ASTM International (ASTM) Publications:

1. A47 "Standard Specification for Ferritic Malleable Iron Castings"
2. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
3. A126 "Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings"
4. A536 "Standard Specification for Ductile Iron Castings"
5. B32 "Standard Specification for Solder Metal"
6. C1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout

(Nonshrink)"
7. D2235 "Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings"
8. D2564 "Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems"
9. D2657 "Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings"
10. D2672 "Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement"
11. D2846 "Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems"
12. D2855 "Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings"
13. D3138 "Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components"
14. F402 "Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings"
15. F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe"
16. F493 "Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings"
17. F656 "Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings"

C. American Welding Society (AWS) Publications:

1. "Soldering Manual"
2. BRH "Brazing Handbook"
3. A5.8 "Specification For Filler Metals For Brazing And Braze Welding"
4. D1.1 "Structural Welding Code - Steel"
5. D10.12 "Guide for Welding Mild Steel Pipe"

D. American Water Works Association (AWWA) Publications:

1. C110/ANSI A21.10 " Standard for Ductile-Iron and Gray-Iron Fittings, 3 In.-48 In. (76 mm-1,219 mm), for Water"
2. C111/ANSI A21.11 "Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings"

E. Copper Development Association (CDA) Publications:

1. "Copper Tube Handbook"

1.6 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact

by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PVC: Polyvinyl chloride plastic.

1.7 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Coordination Drawings: Detail major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

a. Planned piping layout, including valve and specialty locations and valve-stem movement.
b. Clearances for installing and maintaining insulation.
c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
d. Equipment and accessory service connections and support details.
e. Exterior wall and foundation penetrations.
f. Fire-rated wall and floor penetrations.
g. Sizes and location of required concrete pads and bases.
h. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
i. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

1.8 QUALITY ASSURANCE

A. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting plumbing and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases.

1. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design requirements. See drawings for equipment schedules and requirements.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate plumbing equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for plumbing installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if plumbing items requiring access are concealed behind finished surfaces.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.10 POSTED OPERATING INSTRUCTIONS

A. Provide and post operating instructions for all plumbing systems.

2.0 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual Divisions 22 & 23 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials.

2.3 DIELECTRIC FITTINGS

A. Refer to individual Division 22 piping Sections for special joining materials.

3.0 EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

B. General: Install piping as described below, unless piping Sections specifies otherwise. Individual Division 22 piping Sections specifies unique piping installation requirements.

C. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings as required by Division 01 Sections and as outlined in Part 1 of this section.

D. Install piping at indicated slope.

E. Install components with pressure rating equal to or greater than system operating pressure.

F. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

G. Install piping free of sags and bends.

H. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

I. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

J. Install piping to allow application of insulation plus 1-inch clearance around insulation.

K. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

L. Install fittings for changes in direction and branch connections.

M. Install couplings according to manufacturer's written instructions.

N. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass with concealed hinge, set screws, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

O. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of plumbing equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping rings where required.
2. Build sleeves into walls and slabs as work progresses.

3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).
    b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) and larger, penetrating gypsum-board partitions.

4. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

    a. Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealant.
6. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

P. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and plumbing sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing plumbing sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install plumbing sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

Q. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using plumbing sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing plumbing sleeve seals.

1. Assemble and install plumbing sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stopping materials.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

U. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."
4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

    a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. CPVC Piping: ASTM D2846 and ASTM F493.
    c. PVC Pressure Piping: ASTM D2672.
    d. PVC Non-pressure Piping: ASTM D2855.

9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657 procedures and manufacturer's written instructions.

    a. Plain-End Pipe and Fittings: Use butt fusion.
    b. Plain-End Pipe and Socket Fittings: Use socket fusion.

V. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights is not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Owner’s Representative.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope as specified in other Division 22 sections.

F. Clearance from Electrical Equipment: Piping is prohibited in electric rooms and closets, elevator machine rooms and installation over transformers, switchboards and motor control centers.

3.3 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig 28-day compressive-strength concrete and reinforcement.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

C. Prime and paint all metal supports.

3.5 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for plumbing installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

C. Refer to Division 01 Sections for additional requirements.

3.7 GROUTING

A. Install nonmetallic, non-shrink, grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

220517: SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

2.0 PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

3.0 EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Sleeve-seal systems in this article are used, in slabs-on-grade and below grade in exterior concrete walls, for a watertight seal around service piping entries into the building. These systems typically require installation in a sleeve for proper operation.

B. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

C. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

220518: ESCUTCHEONS FOR PLUMBING PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

2.0 PRODUCTS

2.1 ESCUTCHEONS

A. Retain one or both finish options in first paragraph below that match escutcheon types retained in Part 3.

B. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

C. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

D. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

3.0 EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.

h. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

220519: METERS AND GAGES FOR PLUMBING PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

2.0 PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Standard: ASME B40.200.

B. Case in first paragraph below will typically be the sealed (dry) type. Hermetically sealed cases are available.

C. Case: Stainless steel with 3-inch or 5-inch nominal diameter.

D. Dial: Permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, with unified-inch screw threads.

F. Connector Size: ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass or plastic.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES or CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Liquid-filled or Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch or 6-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass or plastic.
9. Ring: Brass.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston -type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

3.0 EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.

K. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

M. Adjust faces of meters and gages to proper angle for best visibility.

220523: GENERAL-DUTY VALVES FOR PLUMBING PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Iron, single-flange butterfly valves.
3. Bronze swing check valves.
4. Iron swing check valves.
5. Iron swing check valves with closure control.
6. Bronze gate valves.
7. Iron gate valves.
8. Bronze globe valves.
9. Iron globe valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

2.0 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

A. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Regular.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

B. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.5 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.

2.6 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:

1. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed, exterior lever and spring.

B. Class 125, Iron Swing Check Valves with Lever- and Weight-Closure Control:

1. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed, exterior lever and weight.

2.7 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Description:

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.8 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

2.11 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for

valve. Include zinc coating.

4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

3.0 EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for butterfly gate and globe valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly valves.
2. Throttling Service: Globe or butterfly valves.
3. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
    b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.
    c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

220529: HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler

and Pressure Vessel Code.

2.0 PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and

building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

3.0 EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in other sections of this Specification.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping

system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and

waste piping for plumbing fixtures.

220553: IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

2.0 PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material: Steel or Aluminum and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, and having predrilled holes for attachment hardware.

B. Letter Color: Per ANSI 13.

C. Background Color: Per ANSI 13.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-

1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover or cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

3.0 EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in other sections of this Specification.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule: Per ANSI 13.

220719: PLUMBING PIPING INSULATION

1.0 GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic hot-water piping.
2. Domestic recirculating hot-water piping.
3. Sanitary waste piping exposed to freezing conditions.
4. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

2.0 PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Special-Shaped Insulation: ASTM C 552, Type III.
2. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
3. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Adhesive shall comply with the testing and product requirements of the California

Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: Color-code jackets based on system. Verify Color with Owner].
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Factory cut and rolled to size.
2. Finish and thickness are indicated in field-applied jacket schedules.
3. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
4. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.
    e. End caps.
    f. Beveled collars.
    g. Valve covers.
    h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or

polyester scrim and laminated aluminum foil.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy, 0.062-inch soft-annealed, stainless steel, or 0.062-inch soft-annealed, galvanized steel.

2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

3.0 EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to

insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design

that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in other sections of this Specification. Retain paint

system in subparagraph below for a flat, latex-emulsion size over insulation covering an exterior that is subject to normal use and moderate environments.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

    a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

221116: DOMESTIC WATER PIPING

1.0 GENERAL

1.1 SUMMARY

A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

2.0 PRODUCTS

2.1 PIPING MATERIALS

A. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type M water tube, drawn temper.

B. Tube in "Soft Copper Tube" Paragraph below is available in NPS 1/8 to NPS 12 (DN 6 to DN 300).

C. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

D. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

E. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

F. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

G. Copper Unions:
   1. MSS SP-123.
   2. Cast-copper-alloy, hexagonal-stock body.
   3. Ball-and-socket, metal-to-metal seating surfaces.
   4. Solder-joint or threaded ends.

H. Copper Pressure-Seal-Joint Fittings:
   1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
   2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

I. Copper Push-on-Joint Fittings:
   1. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.

2. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:
1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe:
1. ASTM A 53/A 53M, Type E, Grade B, Standard Weight.
2. Include ends matching joining method.

B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless steel pipe with threaded ends.

C. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Malleable-Iron Unions:
1. ASME B16.39, Class 150.
2. Hexagonal-stock body.
3. Ball-and-socket, metal-to-metal, bronze seating surface.
4. Threaded ends.

E. Flanges: ASME B16.1, Class 125, cast iron.

2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:
1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.6 TRANSITION FITTINGS

A. General Requirements:
1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Standard: ASSE 1079.
2. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. Nonconducting materials for field assembly of companion flanges.
2. Gasket: Neoprene or phenolic.
3. Bolt Sleeves: Phenolic or polyethylene.
4. Washers: Phenolic with steel backing washers.

E. **Dielec**tric Nipples:
1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F 1545.
3. End Connections: Male threaded or grooved.
4. Lining: Inert and noncorrosive, propylene.

3.0 EXECUTION

3.1 EARTHWORK

A. Comply with requirements in other sections of this Specification for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600

and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves.

G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

L. Install piping to permit valve servicing.

M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump.

R. Install thermostats in hot-water circulation piping.

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

T. Install sleeve seals for piping penetrations of concrete walls and slabs.

U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
   2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation.

   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.

3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.

G. Install supports for vertical steel piping every 15 feet.

H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components.

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Piping Inspections:
a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of

authorities having jurisdiction:
1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:
a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or

AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:
    1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
    2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

221119: DOMESTIC WATER PIPING SPECIALTIES

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

2.0 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

B. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:
1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:
   1. Standard: ASSE 1012.
   2. Operation: Continuous-pressure applications.
   3. Body: Bronze.
   4. End Connections: Union, solder joint.
   5. Finish: Rough bronze.

B. Reduced-Pressure-Principle Backflow Preventers:
   1. Standard: ASSE 1013.
   2. Operation: Continuous-pressure applications.
   3. Accessories:
      a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
      b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
      c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:
   1. Standard: ASSE 1015.
   2. Operation: Continuous-pressure applications unless otherwise indicated.
   3. Accessories:
      a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
      b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
   1. Standard: ASSE 1003.
   2. Pressure Rating: Initial working pressure of 150 psig.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:
   1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
   2. Pressure Rating: 400-psig minimum CWP.
   3. Size: NPS 2 or smaller.
   4. Body: Copper alloy.
   5. Port: Standard or full port.
   6. Ball: Chrome-plated brass.
   7. Seats and Seals: Replaceable.
   8. End Connections: Solder joint or threaded.
   9. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:
   1. Standard: ASSE 1017.
   2. Pressure Rating: 125 psig.
   3. Type: Thermostatically controlled, water mixing valve.
   4. Material: Bronze body with corrosion-resistant interior components.
   5. Connections: Threaded union inlets and outlet.
   6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
   7. Tempered-Water Setting: 120 deg F.
   8. Valve Finish: Rough bronze.

B. Water-Temperature Limiting Devices at Public Lavatories:
1. Standard: ASSE 1070.
2. Pressure Rating: 125 psig.
3. Type: Thermostatically controlled, water mixing valve.
4. Material: Bronze body with corrosion-resistant interior components.
5. Connections: Threaded union inlets and outlet.
6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
7. Tempered-Water Setting: 120 deg F.
8. Valve Finish: Rough bronze.

C. Primary, Thermostatic, Water Mixing Valves:
1. Standard: ASSE 1017.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Type: Cabinet-type, thermostatically controlled, water mixing valve.
4. Material: Bronze body with corrosion-resistant interior components.
5. Connections: Threaded union inlets and outlet.
6. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
7. Tempered-Water Setting: 120 deg F.
8. Valve Finish: Rough bronze.
9. Piping Finish: Copper.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.9 HOSE BIBBS

A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key. Coordinate with Architect.
13. Operation for Finished Rooms: Operating key. Coordinate with Architect
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Standard: ASME A112.21.3M for concealed -outlet, self-draining wall hydrants.

2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze Verify finish with Architect.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze Verify finish with Architect.
11. Operating Keys(s): Two with each wall hydrant.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Standard: ASSE 1010 or PDI-WH 201.
2. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:
1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device :
1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
2. Size: NPS 1-1/4 minimum.
3. Material: Chrome-plated, cast brass.

3.0 EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with

authorities having jurisdiction.
1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install cabinet-type units recessed in or surface mounted on wall as specified.

E. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve and solenoid valve.

F. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.

G. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.

H. Install water-hammer arresters in water piping according to PDI-WH 201.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

J. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment.

B. Fire-retardant-treated-wood blocking is specified section "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

221123: FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe, Fittings and Joining Materials
2. Protective Coating
3. Piping Specialties
4. Valves

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publications:
1. Z21.15 “Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves”
2. Z21.21 “Automatic Valves for Gas Appliances (same as CSA 6.5)”
3. Z21.24/CGA 6.10 “Connectors for Gas Appliances”
4. Z21.41/CSA 6.9 “Quick Disconnect Devices for Use with Gas Fuel Appliances”

B. The American Society of Mechanical Engineers (ASME) Publications:
1. B1.20.1 "Pipe Threads, General Purpose, Inch"
2. B16.1 “Cast Iron Pipe Flanges and Flanged Fittings”
3. B16.11 “Forged Fittings, Socket-Welding and Threaded”
4. B16.24 “Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500 and 2500”
5. B16.3 “Malleable Iron Threaded Fittings”
6. B16.33 “Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psi (Sizes NPS ½ through NPS 2)”
7. B16.38 “Large Metallic Valves For Gas Distribution (Manually Operated NPS-2 1/2 To 12,125 PSIG Max)”
8. B16.39 “Malleable Iron Threaded Pipe Unions”
9. B16.5 “Pipe Flanges and Flanged Fittings”
10. B16.9 “Factory-Made Wrought Buttwelding Fittings”

C. ASTM International (ASTM) Publications:
1. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
1. Submit Product Data for the following:
a. Corrugated, stainless-steel tubing systems. Include associated components.
b. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
c. Pressure regulators. Include pressure rating, capacity, and settings of selected models.

1.4 QUALITY ASSURANCE

A. ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."

B. IAS Standard: Provide components listed in IAS's "Directory of A. G. A. and C. G. A Certified Appliances and Accessories" if specified to be IAS listed.

C. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.

1.5 PROJECT CONDITIONS

A. Gas System Pressure: As indicated on Drawings

B. Design values of fuel gas supplied for these systems are as follows:
1. Nominal Heating Value: As indicated on Drawings.
2. Nominal Specific Gravity: As indicated on Drawings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Steel Pipe: ASTM A53; Type E or S; Grade B; Schedule 40; black.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
3. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
4. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
5. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
6. Joint Compound and Tape: Suitable for natural gas.
7. Steel Flanges and Flanged Fittings: ASME B16.5.
8. Gasket Material: Thickness, material, and type suitable for natural gas.

B. Transition Fittings: Type, material, and end connections to match piping being joined.

2.3 PROTECTIVE COATING

A. Paint all exterior exposed gas piping with two coats of rust inhibitive paint.

2.4 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.5 VALVES

A. Valves, NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel

flanges and according to ASME B16.24 for copper and copper-alloy flanges.

C. Appliance Connector Valves: ANSI Z21.15 and IAS listed.

D. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig (13.8-kPa) minimum pressure rating.

E. Gas Valves, NPS 2 (DN 50) and Smaller: ASME B16.33 and IAS-listed bronze body and 125-psig pressure rating.

F. Plug Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig pressure rating.

G. General-Duty Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38, cast-iron body, suitable for fuel gas service, with "WOG" indicated on valve body, and 125-psig pressure rating.
   1. Gate Valves: MSS SP-70, OS&Y type with solid wedge.

H. Automatic Gas Valves: ANSI Z21.21, with electrical or mechanical operator for actuation by appliance automatic shutoff device.

I. Earthquake Valves: FM approved or listed in IAS Directory as complying with ANSI Z21.70 and UL listed. Include mechanical operator.

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with ANSI Z223.1, "Prevention of Accidental Ignition" Paragraph.

3.2 SERVICE ENTRANCE PIPING

A. Extend fuel gas piping and connect to fuel gas distribution for service entrance to building.
   1. Exterior fuel gas distribution system piping, service pressure regulator, and service meter will be provided by gas utility.

B. Install strainer upstream from each earthquake valve.

3.3 CONCRETE BASE INSTALLATION

A. Locate bases at service meters and service regulators.

B. Excavate earth and make level beds to support bases. Set bases level with top surface projecting approximately 3 inches above grade.

3.4 PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 0.5 psig or Less: Use the following:
   1. NPS 3/4 (DN 20) steel pipe, malleable-iron threaded fittings, and threaded joints.

2. NPS 3/4 and NPS 1 (DN 20 and DN 25): Steel pipe, malleable-iron threaded fittings, and threaded joints.
   a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.
3. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): Steel pipe, malleable-iron threaded fittings, and threaded joints.
4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Steel pipe, steel welding fittings, and welded joints.
5. Larger Than NPS 4 (DN 100): Steel pipe, steel welding fittings, and welded joints.

3.5 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 psig or Less: Appliance connector valve or gas stop.

B. Appliance Shutoff Valves for Pressure 0.5 to 2 psig: Gas stop or gas valve.

C. Piping Line Valves, NPS 2 (DN 50) and Smaller: Gas valve.

D. Piping Line Valves, NPS 2-1/2 (DN 65) and Larger: Plug valve or general-duty valve.

E. Valves at Service Meter, NPS 2 (DN 50) and Smaller: Gas valve.

F. Valves at Service Meter, NPS 2-1/2 (DN 65) and Larger: Plug valve.

3.6 PIPING INSTALLATION

A. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.
   1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
   2. In Floors: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in floors, subject to approval of authorities having jurisdiction. Surround piping cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
   3. In Floor Channels: Gas piping may be installed in floor channels, subject to approval of authorities having jurisdiction. Channels must have cover and be open to space above cover for ventilation.
   4. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.
      a. Exception: Tubing passing through partitions or walls.

   5. In Walls: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in masonry walls, subject to approval of authorities having jurisdiction.
   6. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
      a. Exception: Accessible above-ceiling space specified above.

B. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do

not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches (75 mm) long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

C. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.

D. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

E. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

F. Connect branch piping from top or side of horizontal piping.

G. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

H. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

I. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

J. Install flanges on valves, specialties, and equipment having NPS 2-1/2 (DN 65) and larger connections.

K. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

L. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.7 JOINT CONSTRUCTION

A. Use materials suitable for fuel gas.

1. Brazed Joints: Make with brazing alloy with melting point greater than 1000 deg F. Brazing alloys containing phosphorus are prohibited.

3.8 HANGER AND SUPPORT INSTALLATION

A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet; minimum rod

size, 1/2 inch.

5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

3.10 PAINTING

A. Paint exterior service meters, pressure regulators, specialty valves, and piping.
   1. Color: Gray.

3.11 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to Owner’s Representative and authorities having jurisdiction.

D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.12 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

221316: SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe, tube, and fittings.
   2. Specialty pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Standards: ASTM C 1277 and CISPI 310.
2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:
1. Standards: ASTM C 1277 and ASTM C 1540.
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.
1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Solvent Cement: ASTM D 2564.
1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Unshielded, Nonpressure Transition Couplings:
   a. Standard: ASTM C 1173.
   b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   c. Sleeve Materials:
      1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
   a. Standard: ASTM C 1460.
   b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install seismic restraints on piping.

I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back-to-back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building drainage piping beginning at low point of each system. Install true to

grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
   2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

N. Install aboveground ABS piping according to ASTM D 2661.

O. Install aboveground PVC piping according to ASTM D 2665.

P. Install underground PVC piping according to ASTM D 2321.

Q. Plumbing Specialties:
   1. Install backwater valves in sanitary waste gravity-flow piping.
   2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping.
   3. Install drains in sanitary drainage gravity-flow piping.

R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

T. Install sleeve seals for piping penetrations of concrete walls and slabs.

U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

E. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent

cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to backflow.
1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation.
1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:
a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 72 inches with 3/8-inch rod.

2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

H. Install supports for vertical copper tubing every 10 feet.

I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.

J. Install supports for vertical PVC piping every 48 inches.

K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

221319: SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Roof flashing assemblies.
   4. Miscellaneous sanitary drainage piping specialties.
   5. Flashing materials.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:
   1. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   2. Size: Same as connected drainage piping

B. Cast-Iron Floor Cleanouts:
   1. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
   2. Size: Same as connected branch.
   3. Type: Heavy-duty, adjustable housing.
   4. Riser: ASTM A 74, Extra-Heavy Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:
   1. Standard: ASME A112.36.2M. Include wall access.
   2. Size: Same as connected drainage piping.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:
   1. Standard: ASME A112.6.3.
   2. Sediment Bucket: Integral with drain body.

2.3 ROOF FLASHING ASSEMBLIES

A. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
   1. Open-Top Vent Cap: Without cap.
   2. Low-Silhouette Vent Cap: With vandal-proof vent cap.

3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:
1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:
1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
   a. NPS 2: 4-inch- minimum water seal.
   b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:
1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:
1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:
1. Description: Manufactured, cast-iron fitting, with clamping device,that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:
1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:
1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Position floor drains for easy access and maintenance.
   2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
      a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
      b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
      c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
   3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
   4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 2 inches above floor.

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
   1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
   2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
   1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
   2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
   3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
   4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
   1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

221400: FACILITY STORM DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

This section describes the requirements for storm drainage systems, including piping and all necessary accessories as designated in this section.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23 – Shop Drawings, Product Data, and Samples.

B. Manufacturer's Literature and Data:

1. Piping.
2. Roof Drains.
3. Cleanouts.
4. All items listed in Part 2 - Products.

1.4 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American National Standards Institute (ANSI).

C. American Society of Mechanical Engineers (ASME): (Copyrighted Society)

A112.21.2m-83	Roof Drains
A13.1-07	Scheme for Identification of Piping Systems
B16.3-06	Malleable Iron Threaded Fittings, Classes 150 and 300. B16.9-07Factory-Made Wrought Steel Butt welding Fittings
B16.11-05	Forged Steel Fittings, Socket-Welding and Threaded B16.12-98 (R 2006)Cast Iron Threaded Drainage Fittings
B16.15-06)	Cast Bronze Threaded Fittings, Class 125 and 250

D. American Society for Testing and Materials (ASTM):

A47-99 (R 2004)	Standard Specification for Steel Sheet, Aluminum Coated, by the Hot-Dip Process
A53-07	Standard Specification for Pipe, Steel, Black And Hot-Dipped, Zinc-coated Welded and Seamless
A74-06	Standard Specification for Cast Iron Soil Pipe and Fittings
A183-03)	Standard Specification for Carbon Steel Track Bolts and Nuts
A312-03	Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipe
A536-84(R 2004)	Standard Specification for Ductile Iron Castings
A733-03	Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
B32-04	Standard Specification for Solder Metal
B62-02	Standard Specification for Composition Bronze or Ounce Metal Castings
B687-99	Standard Specification for Brass, Copper, and Chromium-Plated Pipe Nipples
C564-06a	Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
D2000-08	Standard Classification System for Rubber Products in

Automotive Applications
D4101-07 ..... Standard Specification for Propylene Plastic Injection and Extrusion Materials
D2447-03 ..... Standard Specification for Polyethylene (PE) Plastic Pipe, Schedule 40 and 80, Based on Outside Diameter
D2564-04e1 ..... Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
D2665-07 ..... Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

E. American Welding Society (AWS):
A5.8-04 ..... Specification for Filler Metals for Brazing and Braze Welding

F. International Code Council (ICC):
IPC-06 ..... International Plumbing Code

G. Cast Iron Soil Pipe Institute (CISPI):
301-05 ..... Hubless Cast Iron Soil and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
310-04 ..... Couplings for Use in Connection with Hubless Cast Iron Soil and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

H. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS):
SP-72-99 ..... Standard for Ball Valves with Flanged or Butt Welding For General Purpose
SP-110-96 ..... Ball Valve Threaded, Socket Welding, Solder Joint, Grooved and Flared Ends

PART 2 - PRODUCTS

2.1 STORM WATER DRAIN PIPING

A. Cast Iron Storm Pipe and Fittings:
1. Cast iron storm pipe and fittings shall be used for the following applications:
   a. Pipe buried in or in contact with earth.
   b. Extension of pipe to a distance of approximately 5 feet outside of building walls.
   c. Interior storm piping above grade.
   d. All mechanical equipment rooms or other areas containing mechanical air handling equipment.
2. The cast iron storm Pipe shall be bell and spigot, or hubless (plain end or no-hub) as required by selected jointing method.
3. The material for all pipe and fittings shall be cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A-888, or ASTM A-74.
4. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions. Couplings for hubless joints shall conform to CISPI 310. Joints for hub and spigot pipe shall be installed with compression gaskets conforming to the requirements of ASTM Standard C-564 or be installed with leak and oakum.

B. Polyvinyl Chloride (PVC)
1. Polyvinyl chloride storm sewer pipe and fittings are permitted for single story structures except for mechanical equipment rooms and other areas containing air handling equipment or hot water generation equipment.
2. Polyvinyl chloride storm sewer pipe and fittings shall be schedule 40 solid core sewer piping conforming to ASTM D1785 and D 2665, Sewer and Drain Series, with ends for solvent cemented joints.

3. Polyvinyl chloride joints shall be solvent welded socket type using solvent cement conforming to ASTM D2564.

C. Roof drain piping in locations where the outdoor conditions are subject to freezing shall be insulated.

2.2 SPECIALTY PIPE FITTINGS

A. Transition pipe couplings shall join piping with small differences in outside diameters or be of different materials. End connections shall be of the same size and compatible with the pipes being joined. The transition coupling shall be elastomeric, sleeve type reducing or transition pattern and include shear erring and corrosion resistant metal tension band and tightening mechanism on each end. The transition coupling sleeve coupling shall be of the following material:
   1. For cast iron soil pipes, the sleeve material shall be rubber conforming to ASTM C564.
   2. For PVC soil pipes, the sleeve material shall be elastomeric seal or PVC, conforming to ASTM F 477 or ASTM D5926.
   3. For dissimilar pipes, the sleeve material shall be PVC conforming to ASTM D5926, or other material compatible with the pipe materials being joined.

B. The dielectric fittings shall conform to ASSE 1079 with a pressure rating of 125 psig at a minimum temperature of 180°F. The end connection shall be solder joint copper alloy and threaded ferrous.

C. Dielectric flange insulating kits shall be of non conducting materials for field assembly of companion flanges with a pressure rating of 150 psig. The gasket shall be neoprene or phenolic. The bolt sleeves shall be phenolic or polyethylene. The washers shall be phenolic with steel backing washers.

D. The dielectric nipples shall be electroplated steel nipple comply with ASTM F 1545 with a pressure rating of 300 psig at 225°F. The end connection shall be male threaded. The lining shall be inert and noncorrosive propylene.

2.3 CLEANOUTS

A. Cleanouts shall be the same size as the pipe, up to 4 inches; not less than 4 inches for larger pipe. Cleanouts shall be easily accessible and shall be gastight and watertight. A minimum clearance of 24 inches shall be provided for clearing a clogged storm sewer line.

B. Floor cleanouts shall be gray iron housing with clamping device and round, secured, scoriated, gray iron cover conforming to ASME A112.36.2M. A gray iron ferrule with hubless, socket, inside calk or spigot connection and counter sunk, taper-thread, brass or bronze closure plug shall be included. The frame and cover material and finish shall be nickel-bronze copper alloy with a square shape. The cleanout shall be vertically adjustable for a minimum of 2 inches. When a waterproof membrane is used in the floor system, clamping collars shall be provided on the cleanouts. Cleanouts shall consist of wye fittings and eighth bends with brass or bronze screw plugs. Cleanouts in the resilient tile floors, quarry tile and ceramic tile floors shall be provided with square top covers recessed for tile insertion. In the carpeted areas, carpet cleanout markers shall be provided. Two way cleanouts where shall be provided where indicated on the drawings and at each building exit. The loading classification for cleanouts in sidewalk areas or subject to vehicular traffic shall be heavy duty.

C. Cleanouts shall be provided at or near the base of the vertical stacks with the cleanout plug located approximately 24 inches above the floor. The cleanouts shall be extended to the wall access cover. Cleanout shall consist of sanitary tees. Nickel bronze square frame and stainless steel cover with minimum opening of 6 inch by 6 inch shall be provided at each wall

cleanout.

D. In horizontal runs above grade, cleanouts shall consist of cast brass tapered screw plug in fitting or caulked/no hub cast iron ferrule. Plain end (no-hub) piping in interstitial space or above ceiling may use plain end (no-hub) blind plug and clamp.

2.4 ROOF DRAINS AND CONNECTIONS

A. Roof Drains: Roof Drains (RD) shall be cast iron with clamping device for making watertight connection. Free openings through strainer shall be twice area of drain outlet. For roof drains not installed in connection with a waterproof membrane, a soft copper membrane shall be provided 12 inches in diameter greater than outside diameter of drain collar. An integral gravel stop shall be provided for drains installed on roofs having built up roofing covered with gravel or slag. Integral no-hub, soil pipe gasket or threaded outlet connection shall be provided.
   1. Flat Roofs: The roof drain shall have a beehive or dome shaped strainer with integral flange not less than 12 inches in diameter. For an insulated roof, a roof drain with an adjustable drainage collar shall be provided, which can be raised or lowered to meet required insulation heights, sump receiver and deck clamp. The Bottom section shall serve as roof drain during construction before insulation is installed.
   2. Canopy Roofs: The roof drain shall have a beehive or dome shaped strainer with the integral flange not larger than 8 inches in diameter. For an insulated roof, the roof drain shall be provided with an adjustable drainage collar, which can be raised or lowered to meet the required insulation heights, sump receiver and deck clamp. Bottom section shall serve as roof drain during construction before insulation is installed.
   3. Roof Drains, Overflow: Roof Drains identified as overflow drains shall have a 2 inch water dam integral to the drain body.
   4. Roof drains in areas subject to freezing shall have heat tape and shall be insulated.

B. Expansion Joints: Expansions joints shall be heavy cast iron with cast brass or copper expansion sleeve having smooth bearing surface working freely against a packing ring held in place and under pressure of a bolted gland ring, forming a water and air tight flexible joint. Asbestos packing is prohibited.

C. Interior Downspouts: An expansion joint shall be provided, specified above, at top of run on straight, vertical runs of downspout piping 40 feet long or more.

D. Downspout Nozzle: The downspout nozzle fitting shall be of brass, unfinished, with internal pipe thread for connection to downspout.

2.5 WATERPROOFING

A. A sleeve flashing device shall be provided at points where pipes pass through membrane waterproofed floors or walls. The sleeve flashing device shall be manufactured, cast iron fitting with clamping device that forms a sleeve for the pipe floor penetration of the floor membrane. A galvanized steel pipe extension shall be included in the top of the fitting that will extend 2 inches above finished floor and galvanized steel pipe extension in the bottom of the fitting that will extend through the floor slab. A waterproofed caulked joint shall be provided at the top hub.

B. Walls: See detail shown on drawings.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

A. The pipe installation shall comply with the requirements of the International Code and these

specifications.

B. Branch piping shall be installed from the piping system and connect to all drains and outlets.

C. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe shall be reamed to full size after cutting.

D. All pipe runs shall be laid out to avoid interference with other work.

E. The piping shall be installed above accessible ceilings to allow for ceiling panel removal.

F. Unless otherwise stated on the documents, minimum horizontal slope shall be one inch for every 4 feet of pipe length.

G. The piping shall be installed free of sags and bends.

H. Seismic restraint shall be installed where required by code.

I. Changes in direction for storm drainage piping shall be made using appropriate branches, bends and long sweep bends. Sanitary tees and short sweep ¼ bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Long turn double wye branch and 1/8 bend fittings shall be used if two fixtures are installed back-to-back or side by side with common drain pipe. Do not change direction of flow more than 90 degrees. Proper size of standard increaser and reducers shall be used if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Caste iron piping shall be installed according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings"

K. Aboveground copper tubing shall be installed according to CDA's "Copper Tube Handbook".

L. Aboveground PVC piping shall be installed according to ASTM D2665. Underground PVC piping shall be installed according to ASTM D2321.

3.2 JOINT CONSTRUCTION

A. Hub and spigot, cast iron piping with gasket joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub and spigot, cast iron piping with calked joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

C. Hubless, cast iron piping shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless piping coupling joints.

D. For threaded joints, thread pipe with tapered pipe threads according to ASME B1.20.1. The threads shall be cut full and clean using sharp disc cutters. Threaded pipe ends shall be reamed to remove burrs and restored to full pipe inside diameter. Pipe fittings and valves shall be joined as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is required by the pipe service
   2. Pipe sections with damaged threads shall be replaced with new sections of pipe.

E. Copper tube and fittings with soldered joints shall be joined according to ASTM B828. A water flushable, lead-free flux conforming to ASTM B813 and a lead-free alloy solder conforming to

ASTM B32 shall be used.

F. for PVC piping, solvent cement joints shall be used for joints. All surfaces shall be cleaned and dry prior to applying the primer and solvent cement. Installation practices shall comply with ASTM F402. The joint shall conform to ASTM D2855 and ASTM D2665 appendixes.

3.3 SPECIALTY PIPE FITTINGS

A. Transition coupling shall be installed at pipe joints with small differences in pipe outside diameters.

B. Dielectric fittings shall be installed at connections of dissimilar metal piping and tubing.

3.4 PIPE HANGERS, SUPPORTS AND ACCESSORIES:

A. All piping shall be supported according to the International Plumbing Code, Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, and these specifications.

B. Hangers, supports, rods, inserts and accessories used for Pipe supports shall be shop coated with zinc Chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.

C. Horizontal piping and tubing shall be supported within 12 inches of each fitting or coupling.

D. Horizontal cast iron piping shall be supported with the following maximum horizontal spacing and minimum hanger rod diameters:
   1. NPS 1-1/2 to NPS 2 (DN 40 to DN 50): 60 inches with 3/8 inch rod.
   2. NPS 3 (DN 80): 60 inches with 1/2 inch rod.
   3. NPS 4 to NPS 5 (DN 100 to DN 125): 60 inches with 5/8 inch rod.

E. The maximum support spacing for horizontal plastic shall be 4 feet.

F. Vertical piping and tubing shall be supported at the base, at each floor, and at intervals no greater than 15 feet.

G. In addition to the requirements in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, floor, Wall and Ceiling Plates shall have the following characteristics:
   1. Solid or split unplated cast iron.
   2. All plates shall be provided with set screws.
   3. Height adjustable clevis type pipe hangers.
   4. Adjustable Floor Rests and Base Flanges shall be steel.
   5. Hanger Rods shall be low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
   6. Riser Clamps shall be malleable iron or steel.
   7. Roller shall be cast iron.
   8. Hangers and supports utilized with insulated pipe and tubing shall have 180 degree (min.) metal protection shield Centered on and welded to the hanger and support. The shield shall be 4 inches in length and be 16 gage steel. The shield shall be sized for the insulation.

H. Miscellaneous Materials shall be provided as specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. If the vertical distance exceeds 20 feet for cast iron pipe additional support shall be provided in the center of that span. All necessary auxiliary steel shall be provided to provide that support.

I. Cast escutcheon with set screw shall be installed at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.

J. Penetrations:
1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, a fire stop shall be installed that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Clearances between raceways and openings shall be completely filled and sealed with the fire stopping materials.
2. Water proofing: At floor penetrations, Clearances around the pipe shall be completely sealed and made watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

K. Piping shall conform to the following:
1. Storm Water Drain and Vent Drain to main stacks:

Pipe Size	Minimum Pitch
3 inches and smaller	2%
4 inches and larger	1%

3.5 TESTS

A. Storm sewer system shall be tested either in its entirety or in sections.

B. Storm Water Drain tests shall be conducted before trenches are backfilled or fixtures are connected. A water test or air test shall be conducted, as directed.
1. If entire system is tested with water, tightly close all openings in pipes except the highest opening, and fill system with water to point of overflow. If system is tested in sections, tightly plug each opening except highest opening of section under test, fill each section with water and test with at least a 10 foot head of water. In testing successive sections, test at least upper 10 feet of next preceding section so that each joint or pipe except upper most 10 feet of system has been submitted to a test of at least a 10 foot head of water. Water shall be kept in the system, or in portion under test, for at least 15 minutes before inspection starts. System shall then be tight at all joints.
2. For an air test, an air pressure of 5 psi gage shall be maintained for at least 15 minutes without leakage. A force pump and mercury column gage shall be used for the test.
3. Final Tests: Either one of the following tests may be used.

a. Smoke Test: After fixtures are permanently connected and traps are filled with water, fill entire drainage and vent systems with smoke under pressure of 1 inch of water with a smoke machine. Chemical smoke is prohibited.
b. Peppermint Test: Introduce 2 ounces of peppermint into each line or stack.

223400: FUEL-FIRED, DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. High efficiency gas fired water heaters.
   2. Storage tanks
   3. Expansion tanks
   4. Accessories

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publications:
   1. Z21.10.3 “Gas Water Heaters - Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous”
   2. [Z21.12] [a. “Addenda 1 to ANSI Z21.12-1990, Draft Hoods”] [“b. Addenda 2 to ANSI Z21.12-1990 and ANSI Z21.12A-1993, Draft Hoods”] 22_34_00, 2.2G, 2.3G
   3. Z21.13 “Gas-Fired Low Pressure Steam and Hot Water Boilers”
   4. Z21.15 “Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves”
   5. Z21.18 “Gas Appliance Pressure Regulators”
   6. Z21.20 “Automatic Gas Ignition Systems and Components”
   7. Z21.21 “Automatic Valves for Gas Appliances (same as CSA 6.5)”
   8. Z21.22 “Relief Valves for Hot Water Supply Systems”

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Publications:
   1. 90.1 “Energy Code for Commercial and High-Rise Residential Buildings”
   2. 90.2 “Energy Code for New Low-Rise Residential Buildings”

C. The American Society of Mechanical Engineers (ASME) Publications:
   1. “(The 2004) ASME Boiler and Pressure Vessel Code”
   2. B1.20.1 "Pipe Threads, General Purpose, Inch"
   3. B16.5 “Pipe Flanges and Flanged Fittings: NPS 1/2 through 24”
   4. B16.24 “Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500 and 2500”

D. National Fire Protection Association (NFPA) Publications:
   1. 54 “National Fuel Gas Code”
   2. 70 "National Electric Code"

E. Underwriter's Laboratories, Inc. (UL) Publications:
   1. 486A “Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors”
   2. 486B “Standard for Wire Connectors for Use With Aluminum Conductors”
   3. 778 “Standard for Motor-Operated Water Pumps”
   4. 795 “Standard for Commercial-Industrial Gas Heating Equipment”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
   1. Product Data:
      a. For each type and size of water heater, include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

b. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.
2. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.
3. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 01.
4. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ANSI Compliance: Provide gas water heaters that comply with ANSI standards for gas water heaters and related products and that bear AGA certification label.

E. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 01.

F. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.

1.5 WARRANTY

A. General Warranty: Water heaters shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
1. Failures include storage tanks, circulators, and burner assemblies.
2. Warranty Period: From date of Substantial Completion:
a. Storage Tanks: Five (5) years.
b. Circulators and Burner Assemblies: One (1) Year.
c. Tank Type Water Heaters: Three (3) Year Leakage, One (1) Year Parts.
d. Boilers: Five (5) Year Leakage, One (1) Year Parts.
e. Tankless gas heaters: Two (2) years parts, Ten (10) years for heat exchanger.

PART 2 - PRODUCTS

2.1 GAS FIRED WATER HEATERS

A. Description: Comply with ANSI Z21.10.3.

B. Storage Tank Construction: ASME -code steel with 160-psig working-pressure rating.
1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, pressure gage, thermometer, drain, anode rods, and controls as required.

Attach tappings to tank shell before testing and labeling.
a. NPS 2 (DN50) and Smaller: Threaded ends according to ASME B1.20.1, pipe threads.
b. NPS 2-1/2 (DN65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
4. Jacket: Steel, with enameled finish.

C. Burner: For use with powered vent water heaters for propane-gas fuel.
1. Temperature Control: Adjustable thermostat.
2. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
3. Automatic Ignition: ANSI Z21.20, automatic gas-ignition system and components.

D. Anode Rods: Factory installed, magnesium.

E. Dip Tube: Factory installed. Not required if cold-water inlet is near bottom of storage tank.

F. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.

2.2 EXPANSION TANKS

A. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

B. Construction: 150-psig working-pressure rating.

C. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.

D. Tank Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

E. Tank Exterior Finish: Manufacturer's standard, unless finish is indicated.

F. Air-Charging Valve: Factory installed.

2.3 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: According to the following:
1. Gas Water Heaters: ANSI Z21.22, combination temperature and pressure relief valve.

B. Pressure Relief Valves: According to the following:
1. Gas Water Heaters: ANSI Z21.22 pressure relief valve for storage tanks of 200,000 Btuh (58.6 kW).

C. Vacuum Relief Valves: According to the following:
1. Gas Water Heaters: ANSI Z21.22.
2. Exception: Omit if water heater has integral vacuum-relieving device.

D. Gas Shutoff Valves: ANSI Z21.15, manually operated. Furnish for installation in piping.

E. Gas Pressure Regulators: ANSI Z21.18, appliance type, factory or field installed. Include pressure rating, capacity, and pressure differential required for water heater and gas supply.

F. Automatic Valves: ANSI Z21.21, appliance, electrically operated, on-off automatic valve.

G. Condensate Neutralization: Provide Manufacturer fabricated condensate neutralization devices appropriate for the size and number of water heaters in the installation. Condensation devices shall be piped and securely mounted as required by manufacturer's requirements and local authority having jurisdiction.

H. Water Heater Stand and Drain Pan Units: High-density-polyethylene-plastic, 18-inch-high, enclosed-base stand complying with IAPMO PS 103 and IAS No. 2. Include integral or separate drain pan with raised edge and NPS 1 (DN25) drain outlet with ASME B1.20.1, pipe thread.

I. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN20).

J. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that is capable of isolating each water heater and of providing balanced flow through each water heater.

K. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE 90.1 or ASHRAE 90.2.

PART 3 - EXECUTION

3.1 CONCRETE BASES

A. Install concrete bases of dimensions indicated.

3.2 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.
   1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.

B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Anchor water heaters to substrate.

D. Where required, install seismic restraints for water heaters. Anchor to substrate.

E. Install and connect gas water heaters according to NFPA 54.
   1. Install appliance, gas pressure regulators on gas-burner inlets of water heaters without pressure regulators.
   2. Install vent piping from gas-train pressure regulators and valves to outside of building where required. Terminate vent piping with brass-screened vent cap fitting. Do not combine vents except with approval of authorities having jurisdiction.

F. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

G. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

H. Install vacuum relief valves in cold-water-inlet piping.

I. Install vacuum relief valves in water heater storage tanks that have copper lining.

J. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.

K. Install thermometers on water heater inlet and outlet piping.

L. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, and thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet.

M. Arrange for insulation on equipment and piping not furnished with factory-applied insulation.

N. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

O. Fill water heaters with water.

P. Charge expansion tanks with air as required by manufacturer.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.

D. Connect gas piping to gas burner with drip leg, tee, shutoff valve, and union; minimum size same as inlet connection.

E. Make connections with dielectric fittings where piping is made of dissimilar metal.

F. Gas, Water Heater Vent Connections: Connect to vent system. Include draft hoods and diverters where required. Use vents same size as or larger than water heater outlets, but not smaller than indicated unless smaller vent size has been calculated according to NFPA 54. Comply with gas utility requirements for sizing.

G. Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit service.

H. Ground equipment.
1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to perform startup service.

B. In addition to manufacturer's written installation and startup checks, perform the following:
1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
2. Verify that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Check operation of circulators.
6. Test operation of safety controls, relief valves, and devices.
7. Energize electric circuits.
8. Adjust operating controls.
9. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.
10. Balance water flow through manifolds of multiple-unit installations.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.
1. Conduct training as specified in Division 01 Sections.
2. Train Owner's maintenance personnel on procedures for starting and stopping troubleshooting, servicing, and maintaining equipment.

SECTION 224000: PLUMBING FIXTURES

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plumbing Fixture Standards
2. Miscellaneous Fixture Standards
3. Miscellaneous Component Standards

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publications:

1. A117.1 “Accessible and Useable Buildings and Facilities”
2. Z124.1 “Plastic Bathtub Units”
3. Z124.1a, and Z124.1b
4. Z124.5 “Plastic Toilet (Water Closet) Seats”
5. Z124.6 “Plastic Sinks”
6. Z358.1 “Emergency Eyewash and Shower Equipment”

B. Air-Conditioning and Refrigeration Institute (ARI) Publications:

1. 1010 “Self-Contained, Mechanically Refrigerated Drinking-Water Coolers”

C. The American Society of Mechanical Engineers (ASME) Publications:

1. A112.6.1.M “Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use”
2. A112.18.1 “Plumbing Fixture Fittings”
3. A112.19.2 “Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals”
4. A112.19.3 “Stainless Steel Fixtures (Designed for Residential Use)”
5. A112.19.4M “Porcelain Enameled Formed Steel Plumbing Fixtures”
6. A112.19.5 “Trim for Water-Closet Bowls, Tanks and Urinals”
7. A112.19.7M “Whirlpool Bathtub Appliances”
8. A112.19.8M “Suction Fittings for Swimming & Wading Pools Spas Hot Tubs & Whirlpool Bathtub Appliances”
9. A112.21.1M “Floor Drains”
10. B1.20.1 "Pipe Threads, General Purpose, Inch"
11. B1.20.7 “Hose Coupling Screw Threads, Inch”

D. American Society of Sanitary Engineering (ASSE) Publications:

1. 1001 “Performance Requirements for Atmospheric Type Vacuum Breakers”
2. 1008 “Performance Requirements for Household Food Waste Disposer Units”
3. 1011 “Performance Requirements for Hose Connection Vacuum Breakers”
4. 1014 “Performance Requirements for Backflow Prevention Devices for Hand-Held Showers”
5. 1016 “Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations”
6. 1025 “Performance Requirements for Diverters for Plumbing Faucets with Hose Spray, Anti-Siphon Type, Residential Applications”
7. 1037 “Performance Requirements for Pressurized Flushing Devices (Flushometers)

for Plumbing Fixtures”

E. ASTM International (ASTM) Publications:

1. F444 “Standard Consumer Safety Specification for Scald-Preventing Devices and Systems in Bathing Areas”
2. F445 “Consumer Safety Specification for Thermal-Shock-Preventing Devices and Systems in Showering Areas”
3. F462 “Consumer Safety Specification for Slip-Resistant Bathing Facilities”

F. National Sanitation Foundation Construction (NSF) Publications:

1. 2 “Food Equipment”
2. 61 “Drinking Water System Components - Health Effects”

G. Underwriter's Laboratories, Inc. (UL) Publications:

1. 399 “Drinking Water Coolers”
2. 430 “Waste Disposers”
3. 486A “Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors”
4. 486B “Standard for Wire Connectors for Use With Aluminum Conductors”
5. 1795 “Hydromassage Bathtubs”

1.3 DEFINITIONS

A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, traps and waste pipes. Pipe fittings, tube fittings, and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
2. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals specified in Division 01.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category from one source and by a single manufacturer.

1. Exception: Where fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for this category.

B. Regulatory Requirements: Comply with requirements of ANSI A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; regarding plumbing fixtures for physically handicapped people.

C. Energy Policy Act Requirements: Comply with requirements of Public Law 102-486, "Energy Policy Act," regarding water flow rate and water consumption of plumbing fixtures.

D. Listing and labeling: Provide electrically operated fixtures and components specified in this Section that are listed and labeled.

E. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

B. Store plumbing fixtures on elevated platforms in dry location.

1.8 PROJECT CONDITIONS

A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.

1.9 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described in Division 01 Section that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

2.0 PRODUCTS

2.1 MANUFACTURERS

A. See Plumbing Fixture Schedule for list of which Manufacturer's are approved for use on a specific item.

2.2 PLUMBING FIXTURE STANDARDS

A. Comply with applicable standards below and other requirements specified.

1. Electric Water Coolers: ARI 1010 and UL 399.
2. Emergency Equipment: ANSI Z358.1.
3. National Sanitation Foundation Construction: NSF 2 and NSF 61.
4. Bathtubs: ANSI Z124.1
5. Plastic Laundry Trays: ANSI Z124.6.
6. Plastic Mop-Service Basins: ANSI Z124.6.
7. Shower Enclosures: ANSI Z124.2.
8. Whirlpool Bathtubs: ANSI Z124.1; and ASME A112.19.7M.
9. Porcelain-Enameled Fixtures: ASME A112.19.4M.
10. Slip-Resistant Bathing Surfaces: ASTM F 462.
11. Stainless-Steel Fixtures Other than Service Sinks: ASME A112.19.3.

12. Vitreous-China Fixtures: ASME A112.19.2.
13. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
14. Water-Closet, Flushometer Tank Trim: ASSE 1037.
15. Whirlpool Bathtub Fittings: ASME A112.19.8M.

2.3 LAVATORY/SINK FAUCET STANDARDS

A. Comply with ASME A112.18.1, NSF 61 and other requirements specified for lavatory, sink, and similar-type-fixture faucet fittings. Include hot- and cold-water indicators; 2.5-gpm-maximum flow rate; and finish as shown on Plumbing Fixture Schedule on metal body. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Faucet:

    a. Handles as indicated.
    b. Pop-up or grid drain as indicated.

2. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
3. Faucet Hose: ASTM D3901.
4. Hose-Connection Vacuum Breakers: ASSE 1011.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
7. Pipe Threads: ASME B1.20.1.
8. Sink Spray Hoses: ASTM D3573.

2.4 MISCELLANEOUS FITTING STANDARDS

A. Comply with ASME A112.18.1 and other requirements specified for fittings, other than faucets. Include finish to coordinate with finishes shown on Plumbing Fixture Schedule. Coordinate fittings with other components and connectors.

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Automatic Flow Restrictors: ASSE 1028.
3. Brass and Copper, Supplies and Tubular Brass: ASME A112.18.1.
4. Fixed Flow Restrictors: ASSE 1034.
5. Manual-Operation Flushometers: ASSE 1037.

2.5 MISCELLANEOUS COMPONENT STANDARDS

A. Comply with applicable standards below and other requirements specified for components for plumbing fixtures, equipment, and appliances.

1. Disposers: ASSE 1008 and UL 430.
2. Floor Drains: ASME A112.21.1M.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Pipe Threads: ASME B1.20.1.
5. Plastic Shower Receptors: ANSI Z124.2 and ANSI Z124.2a.
6. Plastic Toilet Seats: ANSI Z124.5.
7. Supply and Drain Insulation Kits: ANSI A117.1.
8. Supports: ASME A112.6.1M.
9. Whirlpool Bathtub Equipment: UL 1795.

2.6 FITTINGS

A. Fittings for Plumbing Fixtures: Refer to plumbing fixture schedules in the Appendix for materials for supplies, supply stops, supply risers, traps, and other fittings.

B. Fittings for Equipment Specified in Other Sections: Fittings include the following:

1. Supply Inlets: Brass pipe or copper tube, size required for final connection.
2. Supply Stops: Chrome-plated brass, angle or straight; compression, loose-key type; same size as supply inlet and with outlet matching supply riser.
3. Supply Risers: 3/8-inch NPS (DN10) rigid brass tube with 1/4-inch NPS (DN8) offset, knob-end tailpiece. Use chrome-plated tube for exposed applications.
4. Traps: Tubular brass with 0.045-inch wall thickness, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.
5. Continuous Waste: Tubular brass, 0.045-inch wall thickness, with slip-joint inlet, and size to match equipment.
6. Indirect Waste: Tubular brass, 0.045-inch wall thickness, and size to match equipment.

2.7 FINISHES

A. Refer to Plumbing Fixture Schedule for Finishes.

3.0 EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Include supports for plumbing fixtures according to the following:

1. Carriers: For wall-hanging water closets and fixtures supported from wall construction.
2. Chair Carriers: For wall-hanging urinals, lavatories, sinks, drinking fountains, and electric water coolers.
3. Heavy-Duty Chair Carriers: For accessible urinals, lavatories, and other fixtures where indicated.
4. Reinforcement: For floor-mounted lavatories and sinks that require securing to wall and recessed, box-mounted, electric water coolers.
5. Fabricate reinforcement from 2-by-4-inch or 2-by-6-inch fire-retardant-treated-wood blocking between studs or 1/4-by-6-inch steel plates attached to studs, in wall construction, to secure fixtures to wall. Include length that will extend beyond ends of fixture mounting bracket and attach to at least 2 studs.

B. Include fitting insulation kits for accessible fixtures according to the following:

1. Lavatories: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
2. Sinks: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
3. Fixtures with Offset Drain: Cover hot- and cold-water supplies, offset drain, trap, and waste to wall.
4. Other Fixtures: Cover exposed fittings below fixture.

3.3 PLUMBING FIXTURE INSTALLATION

A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.

B. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.

C. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

D. Install floor-mounted, back-outlet water closets with fittings and gasket seals.

E. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.

F. Install shower arm elbow fitting secure to backing to prevent movement.

G. Install toilet seats on water closets.

H. Install wall-hanging, back-outlet urinals with gasket seals.

I. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for handicapped people to reach.

J. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

K. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

L. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

M. Fasten recessed, wall-mounted fittings to reinforcement built into walls.

N. Fasten wall-mounted fittings to reinforcement built into walls.

O. Fasten counter-mounting plumbing fixtures to casework.

P. Secure supplies to supports or substrate within pipe space behind fixture.

Q. Set shower receptors and mop basins in leveling bed of cement grout.

R. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.

1. Exception: Omit stop valves on supplies to emergency equipment, except when permitted by authorities having jurisdiction. When permitted, install valve chained and locked in OPEN position.

S. Install water-supply stop valves in accessible locations.

T. Install faucet, laminar-flow fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

U. Install supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

V. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

W. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

X. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.

Y. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

Z. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant according to sealing requirements specified in Section 07 92 00 - "Joint Sealants." Match sealant color to fixture color.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 22 Sections.

B. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for fitting sizes and connection requirements for each plumbing fixture.

C. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Arrange for electric-power connections to fixtures and devices that require power. Electric power is specified in Division 26 Sections.

3.5 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.6 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers, hot-water dispensers, and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at drinking fountains, electric water coolers, faucets, shower valves, and flushometer valves having controls, to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.8 SCHEDULES

A. See Plumbing Fixture Schedule attached to this Section.

230500: COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Piping materials and fittings
2. Joining materials
3. Dielectric fittings
4. Mechanical sleeve seals
5. Piping Specialties
6. Grout
7. Piping Installation
8. Equipment Installation
9. Concrete Bases.
10. Erection of Metal Supports
11. Erection of Wood Supports
12. Cutting and Patching
13. Grouting

1.2 The contractor agrees that upon the submittal of a bid, he will have read and studied all of the contract documents, and that all of the requirements and coordination resulting from these documents are included in his bid. The intent is to obtain a complete installation of mechanical HVAC work to which end the contractor shall provide all labor, equipment, material, freight, rigging, etc., specified, shown or scheduled on plans. He also agrees that any other accessory items which may not be specified, shown, or scheduled on the plans, but which normally are furnished or can be reasonably implied from the specifications and/or plans to be required shall be provided.

1.3 No exclusion from, or limitations in the drawings, specifications, or other contract documents for the mechanical HVAC work shall be reason for the omitting of the appurtenances or accessories necessary to complete any required system or item of equipment in this project.

1.4 Should the contractor find any discrepancies and/or omissions in the contract documents, or be in doubt as to the intent of said documents, he shall obtain clarification or correction from the architect and the engineer before submitting a bid for work under this division. The contractor will not be granted monetary allowances for discrepancies between his bid and the intent or the work after the contract is let, due to failure to follow this instruction.

1.5 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications:
1. B1.20.1 "Pipe Threads, General Purpose, Inch"
2. B16.21 "Nonmetallic Flat Gaskets for Pipes Flanges"
3. B18.2.1 "Square and Hex Bolts and Screws, Inch Series"

B. ASTM International (ASTM) Publications:
1. A47 "Standard Specification for Ferritic Malleable Iron Castings"
2. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
3. A126 "Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings"
4. A536 "Standard Specification for Ductile Iron Castings"
5. B32 "Standard Specification for Solder Metal"
6. C1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout

(Nonshrink)"
7. D2235 "Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings"
8. D2564 "Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems"
9. D2657 "Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings"
10. D2672 "Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement"
11. D2846 "Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems"
12. D2855 "Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings"
13. D3138 "Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components"
14. F402 "Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings"
15. F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe"
16. F493 "Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings"
17. F656 "Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings"

C. American Welding Society (AWS) Publications:
1. "Soldering Manual"
2. BRH "Brazing Handbook"
3. A5.8 "Specification For Filler Metals For Brazing And Braze Welding"
4. D1.1 "Structural Welding Code - Steel"
5. D10.12 "Guide for Welding Mild Steel Pipe"

D. American Water Works Association (AWWA) Publications:
1. C110/ANSI A21.10 " Standard for Ductile-Iron and Gray-Iron Fittings, 3 In.-48 In. (76 mm-1,219 mm), for Water "
2. C111/ANSI A21.11 "Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings"

E. Copper Development Association (CDA) Publications:
1. "Copper Tube Handbook"

1.6 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. ABS: Acrylonitrile-butadiene-styrene plastic.
   2. CPVC: Chlorinated polyvinyl chloride plastic.
   3. PVC: Polyvinyl chloride plastic.

1.7 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
   1. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
   2. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
      a. Planned piping layout, including valve and specialty locations and valve-stem movement.
      b. Clearances for installing and maintaining insulation.
      c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
      d. Equipment and accessory service connections and support details.
      e. Exterior wall and foundation penetrations.
      f. Fire-rated wall and floor penetrations.
      g. Sizes and location of required concrete pads and bases.
      h. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
      i. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
      j. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.8 QUALITY ASSURANCE

A. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases.
   1. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design requirements. See drawings for equipment schedules and requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.11 POSTED OPERATING INSTRUCTIONS

A. Provide and post operating instructions for all mechanical systems.

PART 2 - PRODUCTS

2.1 HVAC PIPE AND PIPE FITTINGS

A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B32.
   1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
   2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
   3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
   4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
   5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.

F. Brazing Filler Metals: AWS A5.8.
   1. BCuP Series: Copper-phosphorus alloys.
   2. BAg1: Silver alloy.
   3. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements: Manufacturer's standard solvent cements for the following:
   1. ABS Piping: ASTM D2235.
   2. CPVC Piping: ASTM F493.
   3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
   4. PVC to ABS Piping Transition: ASTM D3138.

H. Plastic Pipe Seals: ASTM F477, elastomeric gasket.

I. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

J. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
   1. Sleeve: ASTM A126, Class B, gray iron.
   2. Followers: ASTM A47 malleable iron or ASTM A536 ductile iron.
   3. Gaskets: Rubber.
   4. Bolts and Nuts: AWWA C111.
   5. Finish: Enamel paint.

2.3 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150-psig minimum working pressure as required to suit system pressures.

F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
   1. Provide separate companion flanges and steel bolts and nuts for 150-psig minimum

working pressure as required to suit system pressures.

G. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

2.4 HVAC SLEEVES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
   1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
   2. Steel Pipe: ASTM A53, Type E, Grade A, Schedule 40, galvanized, plain ends.
   3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
   4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
      a. Underdeck Clamp: Clamping ring with set screws.

2.5 HVAC SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.6 HVAC SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
   1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
   2. OD: Completely cover opening.
   3. Cast Brass: Split casting, with concealed hinge and set screw.
      a. Finish: Polished chrome-plate.
   4. Cast-Iron Floor Plate: One-piece casting.

B. Grout:
   1. Non-shrink, Nonmetallic Grout: ASTM C1107, Grade B.
      a. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.
      b. Design Mix: 5000-psig, 28-day compressive strength.
      c. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 HVAC PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install HVAC piping as described below, unless piping Sections specifies otherwise. Individual Division 22 and 23 Piping Sections specifies unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings as required by Division 01 Sections and as outlined in Part 1 of this section.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve operation and servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
   1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
   2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw, and chrome-plated finish.
   3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
   4. Insulated Piping: Cast brass with concealed hinge, set screws, and chrome-plated finish.
   5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping rings where required.
   2. Build sleeves into walls and slabs as work progresses.
   3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).
      b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) and larger, penetrating gypsum-board partitions.
   4. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
      a. Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
   5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealant.
   6. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless

otherwise indicated.

O. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
   3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stopping materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
   1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
   2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
   3. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."
   4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
   5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
      a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
      b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
      c. Align threads at point of assembly.
      d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
      e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
   6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
   7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
   8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
b. CPVC Piping: ASTM D2846 and ASTM F493.
c. PVC Pressure Piping: ASTM D2672.
d. PVC Non-pressure Piping: ASTM D2855.

9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657 procedures and manufacturer's written instructions.
   a. Plain-End Pipe and Fittings: Use butt fusion.
   b. Plain-End Pipe and Socket Fittings: Use socket fusion.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
   2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
   3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
   4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights is not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Owner’s Representative.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope as specified in other Division 22 sections.

F. Clearance from Electrical Equipment: Piping and ductwork are prohibited in electric rooms and closets, elevator machine rooms and installation over transformers, switchboards and motor control centers.

3.3 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig 28-day compressive-strength concrete and reinforcement.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and

elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

C. Prime and paint all metal supports.

3.5 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

C. Refer to Division 01 Sections for additional requirements.

3.7 GROUTING

A. Install nonmetallic, non-shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

230529: HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications:
   1. B31.9 “Building Services Piping”

B. ASTM International (ASTM) Publications:
   1. A36 “Standard Specification for Carbon Structural Steel”
   2. A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings"
   3. C1107 “Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)”

C. American Welding Society (AWS) Publications:
   1. D1.1 "Structural Welding Code - Steel"

D. Manufacturers Standardization Society of the Valve and Fittings Industry. (MSS)
   1. SP-58 “Pipe Hangers and Supports - Materials, Design, and Manufacture”
   2. SP-69 “ANSI/MSS Edition Pipe Hangers and Supports - Selection and Application”
   3. SP-89 “Pipe Hangers and Supports -Fabrication and Installation Practices”
   4. SP-90 "Guidelines on Terminology for Pipe Hangers and Supports”

1.3 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

B. Product Data:
   1. For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated. Indicate specified items selected for use in Project.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Where required by the local authority having jurisdiction design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, and seismic restraint by a qualified professional engineer.
   1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

PART 2 - PRODUCTS

2.1 HANGERS AND SUPPORTS

A. Pipe Hangers, Supports, and Components:
1. MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
a. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
b. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems:
1. MFMA-2, factory-fabricated components for field assembly.
2. Coatings: Manufacturer's standard finish.
3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts:
1. 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
2. Material for Cold Piping: ASTM C552, Type I cellular glass.
3. Material for Hot Piping: ASTM C552, Type I cellular glass.
4. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
5. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
6. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.2 MISCELLANEOUS MATERIALS

A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Structural Steel: ASTM A36, steel plates, shapes, and bars, black and galvanized.

D. Grout: ASTM C1107, Grade B, factory-mixed and -packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.
1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
2. Properties: Nonstaining, noncorrosive, and nongaseous.
3. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. General:
1. Specific hanger requirements are specified in Sections specifying equipment and systems.
2. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

B. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as

specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 if little or no insulation is required.
3. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 to allow off-center closure for hanger installation before pipe erection.
4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
5. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
6. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
7. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
8. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

C. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN20 to DN500).

D. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

E. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
3. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
4. C-Clamps (MSS Type 23): For structural shapes.
5. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.

F. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and

support together on field-assembled channel systems.
1. Field assemble and install according to manufacturer's written instructions.

C. Install building attachments to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.

D. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

E. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

J. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.9.
2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2 (DN8 to DN90): 12 inches long and 0.048 inch thick.
   b. NPS 4 (DN100): 12 inches long and 0.06 inch thick.
5. Insert Material: Length at least as long as protective shield.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Prime and Paint Equipment Supports.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments to level equipment and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

230593: TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
5. Reporting results of the activities and procedures specified in this Section.

B. Related Sections:
1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.2 REFERENCES

A. Associated Air Balance Council (AABC)
1. "National Standards for Testing, Adjusting and Balancing"

B. Air Movement & Control Association International, Inc. (AMCA)
1. 201, "Fans and Systems

C. National Environmental Balancing Bureau (NEBB)
1. “Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems”

D. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
1. "HVAC Systems--Duct Design"

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

G. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

H. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

I. Test: A procedure to determine quantitative performance of a system or equipment.

J. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
   1. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
   2. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents Review Report as specified in Part 3 of this Section.
   3. Submittals Examination Report: Prior to the start of duct or piping fabrication, submit 2 copies of the Submitted Examination Report as specified in Part 3 of this Section.
   4. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
   2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

C. Testing, Adjusting, and Balancing Reports: Use testing, adjusting, and balancing standard forms from AABC's "National Standards for Testing, Adjusting and Balancing" or NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems".

D. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

E. Testing, Adjusting, and Balancing Conference: Meet with the Owner's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location. As a minimum include the following agenda items:
   1. Submittal distribution requirements.

2. Contract Documents examination report.
3. Testing, adjusting, and balancing plan.
4. Work schedule and Project site access requirements.
5. Coordination and cooperation of trades and subcontractors.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment and submit “Contract Documents Examination Report”.
   1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
   2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
   3. Examine Engineer’s design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems’ output, and statements of philosophies and assumptions about HVAC systems and equipment controls.

B. Examine approved submittal data of HVAC systems and equipment including sheet metal duct fabrication and piping shop drawings to ensure that the distribution system is reasonably complete and sufficiently designed to accurately balance the complete building. Submit “Submitting Examination Report”.
   1. Examine equipment performance data, including fan curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 07 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 05 and 06. Compare this data with the design data and installed conditions.

C. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
   1. Examine HVAC systems and equipment installations to verify that indicated balancing

devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

2. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
3. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
4. Examine terminal units to verify that they are accessible and their controls are connected and functioning.
5. Examine plenum ceilings, utilized for return air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
6. Examine heat-transfer coils for clean and straight fins.
7. Examine equipment for installation and for properly operating safety interlocks and controls.
8. Examine automatic temperature system components to verify the following:
   a. Dampers, and other controlled devices operate by the intended controller.
   b. Dampers are in the position indicated by the controller.
   c. Integrity dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in variable-air-volume terminals.
   d. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
   e. Sensors are located to sense only the intended conditions.
   f. Sequence of operation for control modes is according to the Contract Documents.
   g. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
   h. Interlocked systems are operating.
   i. Changeover from heating to cooling mode occurs according to design values.

D. Examine project record documents described in Division 01 Section - “Project Record Documents”.

E. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:
   1. Permanent electrical power wiring is complete.
   2. Automatic temperature-control systems are operational.
   3. Equipment and duct access doors are properly located, sized, and securely closed.
   4. Verify that smoke and fire dampers are open.
   5. Isolating and balancing valves are open and control valves are operational.
   6. Access to balancing devices is provided.
   7. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section or in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, balancing, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project. Plastic plugs with retainers may be used to patch drilled holes in ductwork and housings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic single line diagrams of systems' "as-built" duct layouts and domestic hot water distribution.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each air-handling unit component.
   a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Adjust fan speed higher or lower than design with the approval of the Owner's Representative. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
   1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
      a. Where sufficient space in submains and branch ducts is unavailable for Pilot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
   2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.
   1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.
   1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
   2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 MOTORS

A. Motors, ALL: Test at final balanced conditions and record the following data:
   1. Manufacturer, model, and serial numbers.
   2. Motor horsepower rating.
   3. Motor rpm.
   4. Efficiency rating if high-efficiency motor.
   5. Nameplate and measured voltage, each phase.
   6. Nameplate and measured amperage, each phase.
   7. Starter thermal-protection-element rating.

3.7 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.8 HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:
   1. Nameplate data.
   2. Airflow.
   3. Entering- and leaving-air temperatures at full load.
   4. Voltage and amperage input of each phase at full load and at each incremental stage.
   5. Calculated kW at full load.
   6. Fuse or circuit-breaker rating for overload protection.

3.9 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor and outdoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

3.10 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Confirm interaction of electrically operated switch transducers.

G. Confirm interaction of interlock and lockout systems.

H. Verify main control supply-air pressure and observe compressor and dryer operations.

I. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

J. Note operation of electric actuators using spring return for proper fail-safe operations.

3.11 TOLERANCES

A. Set HVAC system airflow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.
   2. Air Outlets and Inlets: 0 to minus 10 percent.

3.12 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
   1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:
   1. Fan curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
   4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of testing, adjusting, and balancing Agent.
   3. Project name.
   4. Project location.
   5. Owner’s name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.
   9. Signature of testing, adjusting, and balancing Agent who certifies the report.
   10. Summary of contents, including the following:
      a. Design versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.
   11. Nomenclature sheets for each item of equipment.
   12. Data for terminal units, including manufacturer, type size, and fittings.
   13. Notes to explain why certain final data in the body of reports vary from design values.
   14. Test conditions for fans performance forms, including the following:
      a. Settings for outside-, return-, and exhaust-air dampers.
      b. Conditions of filters.
      c. Cooling coil, wet- and dry-bulb conditions.
      d. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air distribution systems and water distribution systems. Present with single-line diagrams and include the following:
   1. Quantities of outside, supply, return, and exhaust airflows.
   2. Duct, outlet, and inlet sizes.
   3. Location of manual volume control dampers.
   4. Balancing valve sizes/locations.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
   1. Fan Data: Include the following:
      a. System identification.
      b. Location.
      c. Make and type.
      d. Model number and size.
      e. Manufacturer's serial number.
      f. Arrangement and class.

g. Sheave make, size in inches and bore.
h. Sheave dimensions, center-to-center and amount of adjustments in inches.

2. Motor Data: Include the following:
   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches and bore.
   f. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).
   g. Number of belts, make, and size.
3. Test Data: Include design and actual values for the following:
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Suction static pressure in inches wg

G. Air Handling Test Reports.

H. Electric Coil Test Reports; i.e., electric baseboards, electric wall heaters, electric unit heaters, electric cabinet heaters.

I. Duct Traverse Reports.

J. Air Terminal Device Reports; i.e., diffusers/registers/grilles.

K. Pool Dehumidification Test Reports.

L. Package Terminal Air Conditioning Test Reports; including equipment leveling to ensure condensate is pitched to building exterior.

M. Instrument Calibration Reports.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

230700: HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Entire insulation system, including insulation, jackets, finishes, adhesives, shall be U.L. listed as non-combustible. Flame spread rating shall be less than 25, fuel contributed less than 50 and smoke generated less than 50.

B. Provide a complete and CONTINUOUS installation of insulation from equipment, device or fixture to main service entrance or point of discharge.

C. Insulation requirements listed in this specification are minimal. Any local or state requirements in excess of this specification shall govern.

D. Internal Acoustical Liner to be closed-cell elastomeric. Fiberglass duct liner is not allowed.

1.2 REFERENCES

A. ASTM International (ASTM) Publications:
1. A666 “Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar”
2. C534 “Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tabular Form”
3. C553 “Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications”
4. C612 “Standard Specification for Mineral Fiber Block and Board Thermal Insulation”
5. C921 “Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation”
6. C1126 “Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation”
7. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
1. Product Data:
   a. Identify thermal conductivity, thickness, and jackets (both factory and field applied) for each type of product indicated.
2. Shop Drawings:
   a. Submit manufacturer’s data for each type of insulation used.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or similar industry recognized craft training program.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

B. Coordinate clearance requirements with pipe installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing piping and duct systems. Insulation application may begin on segments of piping and ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Mineral-Fiber Board Thermal Insulation:
1. Glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

B. Mineral-Fiber Blanket Thermal Insulation:
1. Glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

C. Closed-Cell Phenolic-Foam Insulation:
1. Approved Manufacturers:
2. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C1126, Type II, Grade 1.

D. Flexible Elastomeric Thermal Insulation:
1. Closed-cell, sponge or expanded-rubber materials.
2. Comply with ASTM C534, Type I for tubular materials and Type II for sheet materials
   a. Adhesive: As recommended by insulation manufacturer.
   b. Ultraviolet Protective Coating: As recommended by insulation manufacturer.

2.2 FIELD-APPLIED JACKETS

A. General: ASTM C921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. PVC Jacket: 30 mil PVC (Color by Architect.)

2.3 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd.

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
1. Stainless Steel: ASTM A666, Type 304; 0.020 inch thick.
2. Galvanized Steel: 0.005 inch thick.
3. Aluminum: 0.007 inch thick.
4. Brass: 0.010 inch thick.
5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
1. Welded Pin Holding Capacity: 100 lb for direct pull perpendicular to the attached surface.

E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

F. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.4 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses

required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
   3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.
   1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
   2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
   1. Seal penetrations with vapor-retarder mastic.
   2. Apply insulation for exterior applications tightly joined to interior insulation ends.
   3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
   1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.
   1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
      a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
      b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
      c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
      d. Do not overcompress insulation during installation.
   4. Impale insulation over anchors and attach speed washers.
   5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
   6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
   7. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
   8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
   9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
   10. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.
   1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Space anchor pins as follows:
      a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.

4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 CLOSED-CELL PHENOLIC-FOAM INSULATION APPLICATION

A. Apply insulation as follows:
1. Secure each layer of insulation to duct with stainless-steel bands at 12-inch intervals and tighten without deforming the insulation materials.
2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch, soft-annealed, stainless-steel wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.
3. On exposed applications, finish insulation with a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation. When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.

3.6 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:
1. Follow manufacturer’s written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer’s recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:
1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer’s recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:
   1. Apply mitered sections of pipe insulation.
   2. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:
   1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
   2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to strainer basket.
   3. Apply insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.7 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
   1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch thick coats of jacket manufacturer's recommended adhesive.
   3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
   4. For PVC Jackets, Wrap Jcket around duct with 2" overlap and glue the entire length of seam to create watertight barrier. Seam location shall be uniform along the duct.

3.8 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:
   1. Indoor concealed supply-, return-, and outside-air ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Indoor exposed metal ducts, unless noted otherwise.
   2. Metal ducts with duct liner, unless noted otherwise.
   3. Factory-insulated flexible ducts.
   4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections, unless noted otherwise.
   5. Flexible connectors.
   6. Vibration-control devices.
   7. Testing agency labels and stamps.
   8. Nameplates and data plates.
   9. Access panels and doors in air-distribution systems.

232300: REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tubes
   2. Fittings
   3. Joining Materials
   4. Specialties

1.2 REFERENCES

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Publications:
   1. 15 “Safety Standard for Refrigeration Systems”

B. The American Society of Mechanical Engineers (ASME) Publications:
   1. “(The 2004) ASME Boiler and Pressure Vessel Code”
   2. B16.22 “Wrought Copper and Copper Alloy Solder Joint Pressure Fittings”
   3. B31.5 “Refrigeration Piping and Heat Transfer Components”

C. ASTM International (ASTM) Publications:
   1. B88 “Standard Specification for Seamless Copper Water Tube”
   2. B280 “Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service”

D. American Welding Society (AWS) Publications:
   1. A5.8 "Specification For Filler Metals For Brazing And Braze Welding"

E. Underwriter's Laboratories, Inc. (UL) Publications:
   1. 207 “Standard for Refrigerant-Containing Components and Accessories, Nonelectrical”
   2. 429 “Standard for Electrically Operated Valves”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
   1. Product Data for each valve type and refrigerant piping specialty specified.
   2. Refrigerant piping indicated is schematic only. Contractor shall size and design the piping configuration and install the piping, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and conformance with warranties of connected equipment.
   3. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.
   4. Maintenance data for refrigerant valves and piping specialties to include in the operation and maintenance manual specified in Division 01 Sections.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Qualify brazing and welding processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications."

B. Regulatory Requirements: Comply with provisions of the following codes:

1. ASME B31.5, "Refrigeration Piping."
2. ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

D. Listing and Labeling: Provide products specified in this Section that are UL listed and labeled.

PART 2 - PRODUCTS

2.1 TUBES

A. Use pre-charged tubing where possible.

B. Soft Copper Tube: ASTM B280, Type ACR, annealed temper.

2.2 TUBE FITTINGS

A. Copper Fittings: ASME B16.22, wrought-copper streamlined pattern.

2.3 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver).

2.4 REFRIGERANT PIPING SPECIALTIES

A. Moisture/Liquid Indicators: 500-psig operating pressure, 200 deg F operating temperature; forged-brass body, with replaceable, polished, optical viewing window with color-coded moisture indicator, and solder-end connections.

B. Permanent Filter-Dryer: 350-psig maximum operating pressure, 225 deg F maximum operating temperature; steel shell, and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for compliance with requirements for installation tolerances and other conditions affecting performance of refrigerant piping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Above ground, within Building: Type ACR drawn-copper tubing.

B. Below ground for 2-Inch NPS (DN50) and Smaller: Type L (Type B) annealed-copper tubing installed in schedule 40 PVC sleeve.

3.3 INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Basic piping installation requirements are specified in Section 23 05 00 - "Common Work

Results for HVAC".

C. Install piping in short and direct arrangement, with minimum number of joints, elbows, and fittings.

D. Arrange piping to allow normal inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

E. Install piping with adequate clearance between pipe and adjacent walls and hangers, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation. Maximum fill: 40%.

F. Below ground, install copper tubing in schedule 40 PVC conduit. Vent conduit outdoors.

G. Insulate suction lines.
   1. Do not install insulation until system testing has been completed and all leaks have been eliminated.

H. Install branch lines to parallel compressors of equal length, and pipe identically and symmetrically.

I. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

J. Slope refrigerant piping as follows:
   1. Install horizontal suction lines with a uniform slope of 0.4 percent downward to compressor.
   2. Install traps and double risers where indicated and where required to entrain oil in vertical runs.
   3. Liquid lines may be installed level.

K. Use fittings for changes in direction and branch connections.

L. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

M. Reduce pipe sizes using eccentric reducer fittings installed with level side down.

N. Provide bypass around moisture-liquid indicators in lines larger than 2-inch NPS (DN50).

O. Install unions to allow removal of solenoid valves, pressure-regulating valves, expansion valves, and at connections to compressors and evaporators.

P. Install refrigerant valves according to manufacturer's written instructions.

Q. When brazing, remove solenoid-valve coils; remove sight glasses; and remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties. Do not apply heat near bulb of expansion valve.

R. Electrical wiring for solenoid valves is specified in Division 26 Sections. Coordinate electrical requirements and connections.

S. Charge and purge systems, after testing, dispose of refrigerant following ASHRAE 15 procedures.

3.4 HANGERS AND SUPPORTS

A. General: Hangers, supports, and anchors are specified in Section 23 05 29 - "Hangers and Supports for HVAC Piping and Equipment." Provide according to ASME B31.5 and MSS SP-69.

B. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes. Tube sizes are nominal or standard tube sizes as expressed in ASTM B 88.
   1. 1/2 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   2. 5/8 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   3. 1 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   4. 1-1/4 Inches: Maximum span, 72 inches; minimum rod size, 1/4 inch.
   5. 1-1/2 Inches: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.5 PIPE INSULATION

A. Piping insulation is specified in Section 23 07 00 “HVAC Insulation”.

3.6 SPECIALTIES APPLICATION AND INSTALLATION

A. Install permanent filter dryers in low-temperature systems using hermetic compressors, and before each solenoid valve.

3.7 PIPE JOINT CONSTRUCTION

A. Basic pipe and tube joint construction is specified in Section 23 05 00 - "Common Work Results for HVAC."

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent formation of scale.

3.8 VALVE INSTALLATIONS

A. Install refrigerant valves according to manufacturer's written instructions.

3.9 CONNECTIONS

A. Electrical: Conform to applicable requirements of Division 16 Sections for electrical connections.

3.10 FIELD QUALITY CONTROL

A. Inspect and test refrigerant piping according to ASME B31.5, Chapter VI.
   1. Pressure test with nitrogen to 200 psig. Perform final tests at 27-psig vacuum and 200 psig using halide torch or electronic leak detector. Test to no leakage.

B. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

C. Repair leaks using new materials; retest.

3.11 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

3.12 CLEANING

A. Before installation of copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.

3.13 VRF SYSTEM PIPING

A. Where VRF manufacturer's recommended installation deviates from this specification, the manufacturer's guidelines shall be followed.

3.14 COMMISSIONING

A. Charge system using the following procedures:
   1. Install core in filter dryer after leak test, but before evacuation.
   2. Evacuate refrigerant system with vacuum pump until temperature of 35 deg is indicated on vacuum dehydration indicator.
   3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
   4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
   5. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
   6. Complete charging of system, using new filter-dryer core in charging line. Provide full-operating charge.

233113: METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sheet Metal Materials
2. Duct Liner
3. Sealant Materials
4. Hangers and Supports
5. Duct Fabrication

1.2 REFERENCES

A. ASTM International (ASTM) Publications:
1. A36 “Standard Specification for Carbon Structural Steel”
2. A1008 “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability”
3. A480 “Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip”
4. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
5. C168 “Standard Terminology Relating to Thermal Insulation”
6. C411 “Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation”
7. C916 “Standard Specification for Adhesives for Duct Thermal Insulation”
8. C920 “Standard Specification for Elastomeric Joint Sealants”
9. C1071 “Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)”

B. American Welding Society (AWS) Publications:
1. D1.1 "Structural Welding Code - Steel"
2. D1.2 “Structural Welding Code - Aluminum”
3. D9.1 “Sheet Metal Welding Code “

C. National Fire Protection Association (NFPA) Publications:
1. 90A “Standard for the Installation of Air Conditioning and Ventilating Systems”
2. 90B “Standard for the Installation of Warm Air Heating and Air-Conditioning Systems”
3. 96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations”

D. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Publications:
1. “HVAC Air Duct Leakage Test Manual”
2. “HVAC Duct Construction Standards—Metal and Flexible”

1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C168.

1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by the Engineer of Record. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
   1. Product Data:
      a. For duct liner and sealing materials.
   2. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.
   3. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
   4. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.6 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel" for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

D. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A653, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A1008, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

C. Stainless Steel: ASTM A480, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No. 1 finish for concealed ducts.

D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 DUCT LINER

A. General: Comply with NFPA 90A or NFPA 90B and NAIMA's "Fibrous Glass Duct Liner Standard."

B. Materials: ASTM C1071 with coated surface exposed to airstream to prevent erosion of glass fibers.
   1. Thickness: 1 inch.
   2. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
   3. Fire-Hazard Classification: Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM C411.
   4. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and ASTM C916.
   5. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
      a. Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.
      b. Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
      c. Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.3 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
   1. Joint and Seam Tape: 2 inches wide; glass-fiber fabric reinforced.
   2. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.
   3. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

2.4 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
   1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
   1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
   2. Straps and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A36.
   1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.
   2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.

2.5 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
   1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
   2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

2.6 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.

B. Apply adhesive to liner facing in direction of airflow not receiving metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

G. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:
   1. Fan discharge.
   2. Intervals of lined duct preceding unlined duct.

H. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

2.7 ROUND DUCT FABRICATION

A. Round Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

2.8 ROUND SUPPLY AND EXHAUST FITTING FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal seam straight duct.

B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.

C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate bend radius of die-formed, gored, and pleated elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
   1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
   2. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material-handling classes A and B; and only where space restrictions do not permit using 1.5 bend radius elbows. Fabricate with single-thickness turning vanes.
   3. Round Elbows, 8 Inches and Smaller: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
   4. Round Elbows, 9 through 14 Inches: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees, unless space restrictions require a mitered elbow. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
   5. Round Elbows, Larger Than 14 Inches: Fabricate gored elbows, unless space restrictions require a mitered elbow.
   6. Die-Formed Elbows for Sizes through 8 Inches and All Pressures: 0.040 inch thick with two-piece welded construction.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install round ducts in lengths not less than 12 feet, unless interrupted by fittings.

D. Install ducts with fewest possible joints.

E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

F. Install couplings tight to duct wall surface with a minimum of projections into duct.

G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

I. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults, electrical equipment spaces and enclosures, and through elevator equipment rooms.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Section 23 33 00 "Air Duct Accessories." Firestopping materials and installation methods are specified in Section 07 84 00 "Firestopping."

O. Cover open ends of ductwork during construction to keep clean and free of debris.

3.2 COMMERCIAL KITCHEN EXHAUST DUCTWORK

A. No internal duct lining allowed.

B. Ductwork construction 16 gauge stainless steel.

C. Ductwork to be airtight, with no seams or protruding fasteners.

D. Ductwork to be wrapped with fiber insulation or foil wrapping and pitched for grease drainage.

3.3 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Pressure Classification Less Than 2-Inch wg: Transverse and longitudinal joints.

C. Seal externally insulated ducts before insulation installation.

D. Materials: 3M Brand No. 800.

3.4 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

E. Install concrete inserts before placing concrete.

F. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3.5 CONNECTIONS

A. Connect equipment with flexible connectors according to Section 23 33 00 "Air Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

C. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

3.6 ADJUSTING

A. Refer to Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for detailed procedures.

3.7 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum interior as well as exterior of ducts before final acceptance to remove dust and debris.

233300: AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Manual-Volume Dampers
2. Fire Dampers
3. Turning Vanes
4. Duct-Mounted Access Doors
5. Flexible Connectors
6. Flexible Ducts
7. Accessories

1.2 REFERENCES

A. National Fire Protection Association (NFPA) Publications:
1. 90A "Installation of Air Conditioning and Ventilating Systems"
2. 90B "Installation of Warm Air Heating and Air Conditioning Systems"

B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Publications:
1. "HVAC Duct Construction Standards-Metal and Flexible."

C. Underwriter's Laboratories, Inc. (UL) Publications:
1. “Fire Resistance Directory”
2. 181 “Standard for Factory-Made Air Ducts and Air Connectors”
3. 181B “Closure Systems for Use with Flexible Air Ducts and Air Connectors”
4. 555 “Fire Dampers”
5. 555C “Standard for Safety for Ceiling Dampers”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
1. Product Data: For the following:
   a. Manual-volume dampers.
   b. Fire dampers.
   c. Duct-mounted access doors.
   d. Flexible ducts.
2. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:
   a. Special fittings and manual- and automatic-volume-damper installations.
   b. Fire damper installations, including sleeves and duct-mounted access doors and panels.
3. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. manuals (SMACNA) except where details or notes on drawings indicate otherwise.
   1. HVAC Construction Standards Metal and Flexible.
   2. Fire Damper and Heat Stop Guide for Air Handling Systems.

C. Underwriters Laboratories (UL) Standard for Safety UL 181, UL 555.

1.5 EXTRA MATERIALS

A. Furnish extra materials described in Division 01 Section for Spare Parts and Materials that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
   1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
   2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized, sheet steel.
   3. Blade Axles: Nonferrous.
   4. Tie Bars and Brackets: Galvanized steel.

C. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.2 FIRE DAMPERS

A. General: Labeled to UL 555.

B. Fire Rating: One and one-half hour unless noted otherwise.

C. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

D. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.
   1. Minimum Thickness: 0.052 inch or 0.138 inch thick and length to suit application.
   2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

E. Mounting Orientation: Vertical or horizontal as indicated.

F. Blades: Roll-formed, interlocking, 0.034 inch thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034 inch thick, galvanized steel blade connectors.

G. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

H. Fusible Link: Replaceable, 165 F rated as indicated.

I. Provide access door in duct adjacent to each fire damper.

2.3 CEILING FIRE DAMPERS

A. General: Labeled to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

B. Frame: 0.040 inch thick, galvanized, sheet steel; round or rectangular; style to suit ceiling construction.

C. Blades: 0.034 inch thick, galvanized, sheet steel with nonasbestos refractory insulation.

D. Fusible Link: Replaceable, 165 deg F rated.

2.4 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Manufactured Turning Vanes: Fabricate of 1-1/2 inch wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for mounting in ducts.

2.5 DUCT-MOUNTED ACCESS DOORS

A. General: Fabricate doors airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch thick, fibrous-glass.

2.6 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4 inch wide, 0.028 inch thick, galvanized, sheet steel. Select metal compatible with connected ducts.

C. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8 inch wide, 0.028 inch thick, galvanized, sheet steel Select metal compatible with connected ducts.

D. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with

polychloroprene.
1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.
3. Minimum Movement: 2 inches.
4. Minimum Weight: 26 oz./sq. yd.
5. Tensile Strength: 530 lbf/inch in the warp, and 440 lbf/inch in the filling.
6. Minimum Movement: 2 inches.

2.7 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Uninsulated: Corrugated aluminum. For use on dryer vents only.

C. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch thick, glass-fiber insulation around a continuous inner liner.
1. Reinforcement: Steel-wire helix encapsulated in inner liner.
2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
3. Inner Liner: Polyethylene film.

D. Pressure Rating: 6-inch wg positive, 1/2-inch wg negative.

2.8 ACCESSORIES

A. Louvers:
1. Provide blank off panels for unused portions of louvers. Panels shall be double wall construction with 0.032 inch aluminum, and 2 inch thick, internal glass fiber insulation in accordance with SMACNA “HVAC Duct Construction Standards.”

B. Open ducts in suspended ceiling: No. 16 USSG, ¾ inch square mesh, screen over each opening; with 1 inch wide galvanized steel enclosing frame and flanged duct opening to receive frame. In lieu or screen and volume damper, provide register or grille plus opposed blade volume damper.

C. Duct sleeves: Minimum 20 gauge USSG galvanized sheet steel unless otherwise indicated.
1. Clearances:
   a. Non-insulated duct: 1 inch between duct and sleeve on all sides.
   b. Insulated duct: 1 inch between insulation and sleeve on all sides.
   c. Grilles, registers and diffusers: Zero clearance.
2. Provide closure collars for exposed ducts on each side of wall or floor opening. Collars shall be galvanized sheet metal, minimum 4 inch wide, and fit tight against surface and around duct or insulation. Install with nails 6 inch on center.
3. Framed openings: Provide clearances and closure collars the same as for duct sleeves.
4. Duct-mounted automatic control devices: Mount on mechanical equipment all devices related to automatic controls such as automatic dampers.

D. Cleanout Doors for Kitchen Exhaust: Horizontal ducts shall be mounted maximum 20 ft. apart and in change of direction. Cleanout doors on horizontal duct shall be mounted on side of duct. Bottom edge shall be not less than 2 inch above bottom of duct. Cleanout doors at veritical ducts shall be mounted at base. Door and frame shall be same gauge as duct. Hinges shall be Ventlock No. 260, extra heavy zinc plated. Latches shall be Ventlock No. 140, cast zinc. Gaskets shall be between door and frame. Gaskets shall be 1/8 inch double thickness rated 2,000 deg F for kitchen exhaust system. Cleanout door

size shall be maximum 24 inch x 24 inch and minimum shall be 24 inch one side, and other side shall be 2 inch less than duct height.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire dampers according to manufacturer's UL-approved written instructions.
   1. Install fusible links in fire dampers.

E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, automatic dampers, smoke detectors, outside and exhaust air plenums equipment, and other locations as indicated.
   1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
   2. Install access panels on side of duct where adequate clearance is available.

F. Label access doors according to Section 23 05 53 "Identification for HVAC Piping and Equipment."

G. Provide flexible connections at fan and building joints.

H. Install automatic dampers supplied by the automatic temperature control system manufacturer. Notch end of rod and label duct/casing to indicate open and closed blade position.

I. Provide volume dampers at following locations:
   1. In all duct splits and branch connections of supply, return, and exhaust systems.
   2. Ducts connecting to common plenums.
   3. Ducts serving single outlet.
   4. At open return duct in hung ceiling.
   5. Other locations as indicated on drawings.

J. Provide access doors in following locations and as indicated on the drawings.
   1. Automatic dampers: linkage side.
   2. Main balancing dampers.
   3. Fire dampers.
   4. Smoke detection heads.
   5. On both sides of ducts where necessary to provide maintenance accessibility to equipment on the other side.
   6. Outside air and exhaust air plenums.

K. Flexible duct installation.
   1. Installation shall be in accordance with SMACNA and local building code standards.
   2. Flexible duct runs shall be a maximum of 5 feet, straight lengths, no bends.
   3. Connections to beaded sheet metal fittings shall be with 3 wraps of approved tape and stainless steel draw band for tight seal. Seal the outer jacket with 3 wraps of

approved UL 181B tape.

4. A 1 ½" minimum strap shall be used to support the flexible duct at a distance not greater than 5'-0". Maximum permissible sag is ½" per foot of duct length.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Section 230593 "Testing, Adjusting, and Balancing for HVAC".

233423: HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Centrifugal Roof Ventilators
2. Ceiling-Mounted Ventilators
3. In-Line Centrifugal Fans
4. Motors
5. Factory Finishes
6. Quality Control

B. Products Supplied But Not Installed Under This Section:
1. Roof curbs for roof-mounted exhaust fans.

1.2 REFERENCES

A. Air Movement & Control Association International, Inc. (AMCA) Publications:
1. 99 "Standards Handbook" (Revised 2003)
2. 210 "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating"
3. 300 "Reverberant Room Method for Sound Testing of Fans"
4. 301 "Methods for Calculating Fan Sound Ratings from Laboratory Test Data"

B. National Electrical Manufacturer's Association (NEMA) Standards Publications:
1. MG 1 "Motors and Generators"

C. National Fire Protection Association (NFPA) Publications:
1. 70 "National Electric Code"

D. Underwriter's Laboratories, Inc. (UL) Publications:
1. 486A "Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors"
2. 486B "Standard for Wire Connectors for Use With Aluminum Conductors"
3. 705 "Standard for Power Ventilators"

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on actual site elevations.

B. Operating Limits: Classify according to AMCA 99.

C. Fan Schedule: The following information is described in an equipment schedule on the Drawings.
1. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
2. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
1. Product Data including rated capacities of each unit, weights (shipping, installed, and

operating), furnished specialties, accessories, and the following:
a. Certified fan performance curves with system operating conditions indicated.
b. Certified fan sound power ratings.
c. Motor ratings and electrical characteristics plus motor and electrical accessories.
d. Material gages and finishes, including color charts.
e. Dampers, including housings, linkages, and operators.

2. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.
3. Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.
4. Maintenance data for power ventilators to include in the operation and maintenance manual.

1.5 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

C. AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA Seal.

D. NEMA Compliance: Provide components required as part of fans that comply with applicable NEMA standards.

E. UL Standard: Provide power ventilators that comply with UL 705.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements. Verify clearances.

B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

1.7 COORDINATION AND SCHEDULING

A. Coordinate the size and location of structural steel support members.

B. Coordinate the installation of roof curbs, equipment supports, and roof penetrations. Roof specialties are specified in Division 07 Sections.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Description: Belt-driven or direct-drive centrifugal fans, as indicated, consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece,

aluminum base with venturi inlet cone.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, with the following features:
   1. Fan Shaft: Turned, ground, and polished steel drive shaft keyed to wheel hub.
   2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
   3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
   4. Fan and motor isolated from exhaust air stream.

E. Accessories: The following items are required as indicated:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent. (Direct drive fans only).
   2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
   3. Bird Screens: Removable 1/2-inch mesh, aluminum or brass wire.
   4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
   5. Roof Curbs: Galvanized steel; mitered and welded corners; 2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 2-inch wood nailer. Size as required to suit roof opening and fan base. Built-in cant and mounting flange.
      a. Overall Height: 12 inches. Minimum.

2.2 CEILING-MOUNTED VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling or wall, or for concealed in-line applications.

B. Housing: Galvanized steel lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Aluminum, louvered grille or eggcrate with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Variable-Speed Controller Mounted on Fan Housing: Solid-state control to reduce speed from 100 percent to less than 50 percent.

G. Sound Level: Maximum of 1.5 Sones in Toilets

H. Accessories: Manufacturer's standard roof jack or wall cap, and transition fittings.

2.3 IN-LINE CENTRIFUGAL FANS

A. Description: In-line, belt-driven, or direct-drive centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, drive assembly, motor and disconnect switch, mounting brackets, and accessories.

B. Housing: Split, spun-aluminum housing, with aluminum straightening vanes; inlet and

outlet flanges; and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor encased in housing out of air stream, factory wired to disconnect located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories: The following accessories are required as indicated:
1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: Expanded metal in removable frame. Provide fan guards for units not connected to ductwork.

G. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.

H. Enclosure Type: The following features are required as indicated:
1. Open dripproof motors where satisfactorily housed or remotely located during operation.

2.4 FACTORY FINISHES

A. Sheet Metal Parts: Prime coat before final assembly.

B. Exterior Surfaces: Baked-enamel finish coat after assembly.

C. Aluminum Parts: No finish required.

2.5 SOURCE QUALITY CONTROL

A. Testing Requirements: The following factory tests are required as indicated:
1. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA Seal.
2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the power ventilators. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install power ventilators according to manufacturer's written instructions.

B. Support units using the vibration-control devices.

1. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
   a. Installation of roof curbs is specified in Division 07 Sections.
2. Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.
3. Ceiling Units: Suspend units from structure using steel wire or metal straps.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements.

3.3 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Electrical: Conform to applicable requirements in Division 26 Sections.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation of fans, including duct and electrical connections, and to report results in writing.

3.5 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.6 CLEANING

A. After completing installation, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

B. Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

3.7 COMMISSIONING

A. Final Checks before Startup: Perform the following operations and checks before startup:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts, and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnects.
   3. Perform cleaning and adjusting specified in this Section.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align

and adjust belts, and install belt guards.
5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in the fully open position.
7. Disable automatic temperature-control operators.

B. Starting procedures for fans are as follows:
1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
2. Measure and record motor voltage and amperage.

C. Shut unit down and reconnect automatic temperature-control operators.

D. Refer to Testing, Adjusting, and Balancing for HVAC for procedures for air-handling-system testing, adjusting, and balancing.

E. Replace fan and motor pulleys as required to achieve design conditions.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.
1. Conduct training as specified in Division 01 Sections.
2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive.

233700: AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Diffusers
   2. Registers
   3. Grilles
   4. Louvers

1.2 REFERENCES

A. Air Movement & Control Association International, Inc. (AMCA) Publications:
   1. 511 "Certified Ratings Program for Air Control Devices"

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Publications:
   1. 70 "Method of Testing for Rating the Performance of Air Outlets and Inlets"

C. National Fire Protection Association (NFPA) Publications:
   1. 90A “Standard for the Installation of Air Conditioning and Ventilating Systems”

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
   1. Product Data: For each model indicated, include the following:
      a. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
      b. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
      c. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, finish, and accessories furnished.
      d. Assembly Drawing: For each type of air outlet and inlet: indicate materials and methods of assembly of components.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated.

B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A,

"Standard for the Installation of air-conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles (As scheduled on Drawings):

B. Exterior Louvers:
1. Provide storm proof and drainable exterior wall louvers; size as indicated on Drawings.
2. Louvers shall be AMCA 511 certified for zero water penetration and maximum 1/8-inch pressure drop at a free area velocity of 900 fpm.
3. Louvers shall be minimum 4-inches deep constructed of 0.081-inch thick 6063-TS extruded aluminum complete with ½-inch square mesh aluminum screen in removable frame.
4. Frames shall be box type for masonry construction and flange type for frame construction.
5. Louver shall have a factory baked enamel prime finish ready to accept full paint to match adjacent surfaces.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

B. Noise Criteria: Diffusers, registers, and grilles shall not exceed a noise level of NC-30.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other item conflict with installation notify Owner’s Representative for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

233713: DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rectangular and square ceiling diffusers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:
   1. Devices shall be specifically designed for variable-air-volume flows.
   2. Pattern: Fixed.
   3. Dampers: Radial opposed blade.
   4. Accessories:
      a. Equalizing grid.
      b. Plaster ring.
      c. Safety chain.
      d. Wire guard.
      e. Sectorizing baffles.
      f. Operating rod extension.

2.2 REGISTERS AND GRILLES

A. Egg Crate Return Grille:
   1. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
   2. Damper Type: Adjustable opposed blade.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make

final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

237200: FIXED PLATE AIR-TO-AIR ENERGY RECOVERY VENTILATOR

PART 1 - GENERAL

1.1 SUMMARY

A. A. This section includes Energy Core Air-to-Air Energy Recovery Ventilators for indoor installation.

1.2 SUBMITTALS

A. Product Data: For each type or model include the following:
   1. Complete fan performance curves for both Supply Air and Exhaust Air, with system operating conditions indicated, as tested in an AMCA Certified Chamber.
   2. Energy core performance data for both summer and winter operation.
   3. Motor ratings, electrical characteristics and motor and fan accessories.
   4. Material types and gauges of all component pieces and assemblies.
   5. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
   6. Estimated gross weight of each installed unit.
   7. Installation, Operating and Maintenance manual (IOM) for each model.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.

B. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.

C. Product Options: Drawings must indicate size, profiles and dimensional requirements of Energy Recovery Units and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".

D. Certifications
   1. Entire unit shall be ETL Certified per U.L. 1812 and bear an ETL sticker.
   2. Energy Core shall be AHRI Certified, per Standard 1060.

1.4 COORDINATION

A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.

B. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
   1. Greenheck Fan Corporation
   2. Renewaire

2.2 MANUFACTURED UNITS

A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, energy core, motorized intake damper, motorized exhaust damper, frost control, filter assembly for intake and exhaust air, supply air blower assembly, exhaust air blower assembly and an electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

2.3 CABINET

A. Materials: Formed single wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
   1. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish.
   2. Internal assemblies: 18 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

B. Access doors shall be hinged.

C. Shall have factory-installed duct flanges on all duct openings.

D. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
   1. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
      a. Thickness: 1 inch (25 mm)
      b. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
      c. Location and application: Full coverage of entire cabinet exterior to include walls, roof and floor of unit. Insulation shall be of semi-rigid type and installed between inner and outer shells of all cabinet exterior components.

E. Supply Air and Exhaust Air blower assemblies: Blower assemblies consist of an electric motor and a direct drive blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on 1.125 inch thick neoprene vibration isolators.

F. Control panel / connections: Energy Core Ventilator shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.

G. Frost control: timed exhaust.

H. Economizer Control: None

I. Motorized dampers / Exhaust Air, Intake Air, Motorized dampers of low leakage type shall be factory installed.

2.4 BLOWER SECTION

A. Blower section construction, Supply Air and Exhaust Air: Direct drive motor and blower shall be assembled onto a 14 gauge galvanized steel platform and must have neoprene vibration isolation devices.

B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.

D. Plenum blower (fan) wheels: Aluminum construction where the wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.

E. Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.5 MOTORS

A. General: Blower motors greater than 3/4 horsepower shall be "NEMA Premium" unless otherwise indicated. Minimum compliance with EPAct minimum energy-efficiency standards for single speed ODP and TEFC enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

B. Fan motors shall be 60 cycle, 3 phase 208 volts.

2.6 UNIT CONTROLS

A. The unit shall be constructed so that it can be controlled by factory-supplied controllers, thermostats and sensors or it can be monitored and controlled by a Building Management System (BMS).

B. Variable Frequency Drive (VFD): unit shall have factory installed variable frequency drives for modulation of the blower motors. The VFDs shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

C. Sensors
1. Dirty filter sensor

2.7 FILTERS

A. Unit shall have permanent metal filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the intake air stream and MERV 8 filters in the exhaust air stream.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

3.3 CONNECTIONS

A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
   1. Duct installation and connection requirements are specified in Division 23 of this document.
   2. Electrical installation requirements are specified in Division 26 of this document.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

3.5 START-UP SERVICE

A. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.6 DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

237413: PACKAGED ROOFTOP AIR CONDITIONER

PART 1- GENERAL

1.01 SECTION INCLUDES

A. Package rooftop unit.

B. Heat exchanger.

C. Refrigeration components.

D. Unit operating controls.

E. Roof curb.

F. Electrical power connections.

G. Operation and maintenance service.

1.02 REFERENCES

A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.

B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. AHRI 340/360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard. (g/e, c/e above 135,000 btuh)

D. ANSI/ASHRAE 37 - Testing Unitary Air Conditioning and Heat Pump Equipment.

E. ANSI/ASHRAE/IESNA 90.1 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.

F. UL 60335-2-40 - Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers

G. California Energy Commission Administrative Code - Title 20/24 -

H. AHRI 210/240 - Unitary Air-Conditioning Equipment and Air- Source Heat Pump Equipment.

I. AHRI 270 - Sound Rating of Outdoor Unitary Equipment.

J. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment (all above 135,000 Btuh)

K. ANSI Z83.8/CSA 2.6 - Gas unit heaters, gas packaged heaters, gas utility heaters, and gas-fired duct furnaces

1.03 SUBMITTALS

A. Submit drawings indicating components, dimensions, weights and loadings, required clearances, and location and size of field connections.

B. Submit product data indicating rated capacities, weights, accessories, and electrical requirements.

C. Submit manufacturer's installation instructions.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, start-up and operating instructions, and maintenance procedures.

1.05 HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Leave factory shipping covers in place until installation.

1.06 WARRANTY

A. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

1.07 MAINTENANCE SERVICE

A. All work on units shall be accomplished by OEM factory trained and authorized servicing technicians.

1.08 REGULATORY REQUIREMENTS

A. Unit shall conform to UL 60335-2-40 - Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers and shall have UL/CSA label affixed to rooftop package.

PART 2 - PRODUCTS

2.01 SUMMARY

A. Base bid shall be Trane packaged rooftop air conditioning unit with approved alternate being Carrier or York. Alternates must still comply with the performance and features as specified with these specifications and indicated on the design documents. Job will be awarded on basis of specified product. Substitutions must be selected and approved within 14 calendar days after award of contract. Substitutions must meet clearance requirements.

2.02 GENERAL UNIT DESCRIPTION

A. Unit(s) furnished and installed shall be packaged rooftop as scheduled on contract documents and these specifications. Cooling performance shall be based on AHRI testing procedures. Wiring internal to the unit shall be numbered for simplified identification. Units shall be cULus listed and labeled, classified in accordance with cULus for Central Cooling Air Conditioners. Unit(s) shall be factory assembled, internally wired, fully charged and consist of insulated weathertight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, filters, supply and/or exhaust motors and drives, unit

controls.

B. Unit(s) shall be single piece construction as manufactured at the factory.

C. Unit(s) shall be factory run tested to include the operation of all fans, compressors, heat exchangers, safeties, limits, and control sequences.

D. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

2.03 UNIT CASING

A. Cabinet: Galvanized steel, with baked enamel finish. Cabinet surface shall be tested 672 hours in salt spray in compliance with ASTM B117. Fully gasketed removable access panels. Structural members shall be heavy gauge with access doors and removable panels of heavy gauge. Provide 1/2 inch thick foil faced fiberglass insulation on all exterior panels and roof in contact with the return and conditioned air stream. Cabinet top cover shall be one piece construction or where seams exist, it shall be double hemmed and gasket sealed.

B. Access Doors: Fully-gasketed doors with hold-back apparatus shall provide access to filters, supply air fan section, evaporator coil section, and unit control

2.04 ELECTRICAL POWER CONNECTIONS

A. Factory-made penetrations shall be provided for connection of all electrical wiring. Field penetrations of the unit base pan shall not be acceptable.

B. Unit shall include a phase monitor as standard that protects equipment from phase loss, phase reversal, and low voltage. Any fault condition shall send the unit into an emergency stop condition. The entire unit with this option shall be cULus approved. If not, a field UL inspection is required.

C. Unit shall include a factory-installed non-fused disconnect switch which satisfies NEC requirements for a service disconnect switch. Disconnect handle shall be accessible through the control box door such that high voltage power must be off before door can be opened.

D. Unit shall include a factory-installed, 15A 115V convenience outlet capable of ground fault protection.

2.05 AIR FILTERS

A. Air Filters: Filters shall mount integrally within unit and be accessible through hinged access panels.

2.06 FANS - SUPPLY

A. Provide forward-curved fan mounted with fixed pitch sheave drive assembly. Complete fans assemblies shall be statically and dynamically balanced.

B. Fan shaft shall be mounted on grease lubricated ball bearings.

C. All motors shall be circuit breaker protected.

D. Provide EISA rated motors for supply and exhaust fans.

E. Motors shall have VFDs.

F. Provide Internal Shaft Grounding Ring. Motors shall have internal bearing protection for use with VFDs.

2.07 HEATING OPTION
GAS FIRED HEATING SECTION

A. Completely assembled and factory-installed heating system shall be integral to unit, cULus approved specifically for outdoor applications for use downstream from refrigerant cooling coils. Threaded connection with plug or cap provided. Provide capability for gas piping connection through side of unit.

B. Heating section shall be factory run tested prior to shipment.

C. Gas Burner shall be in-shot tube type with integral carryover and shall include negative pressure gas valve, manual shut-off, direct spark ignition, and flame sensing safety control.

D. Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, and continuous flame supervision. Upon a failure to ignite, three attempts of ignition will occur before lockout of the ignition system.

E. Combustion blower shall be induced-draft type with built-in thermal overload protection on fan motor.

F. Heat Exchanger: Provide tubular heat exchanger manufactured from 18-gauge aluminized steel. Factory pressure and leak tested.

G. Heat Exchanger: Provide tubular heat exchanger manufactured from 18-gauge 409 stainless steel. Factory pressure and leak tested.

H. Limit controls: High temperature limit controls will shut off gas flow in the event of excessive temperatures resulting from restricted indoor airflow or loss of indoor airflow.

I. Modulating Gas Heaters shall be stainless steel. The heater shall have a turn down ratio of 10 to 1 for natural gas.

2.08 EVAPORATOR COIL

A. Provide heavy duty aluminum fins mechanically bonded to internally enhanced, copper tubes.

B. Provide a thermostatic expansion valve. All coils shall be leak tested at the factory to ensure pressure integrity. The evaporator coil is pressure tested to 450 psig.

C. Unit shall include a Condensate Overflow Switch to shut the unit down in the event that a clogged condensate drain line prevents proper condensate removal from the unit.

D. Unit shall include Sloped Stainless Steel evaporator coil drain pans that are durable, long-lasting and highly corrosion resistant.

2.09 CONDENSER SECTION

A. Provide all Aluminum Microchannel condenser coils. All condenser coils shall be leak tested at the factory to ensure pressure integrity and pressure tested to 650 psig.

B. Provide integral subcooling circuit(s) to prevent premature refrigerant flashing and to insure maximum operating efficiency.

C. Provide vertical discharge, direct drive fans with steel blades, and three phase motors. Fans shall be statically balanced. Motors shall be permanently lubricated, with built-in current and thermal overload protection in a weathertight casing.

E. Provide wire mesh coil guards on condensing section to protect coils from damage.

F. Provide factory installed corrosion resistant louvered hail/vandalism guards to protect condenser coils from hail or physical damage. Wire mesh coil guards shall not be acceptable.

G. Provide Corrosion Protected Condenser Coil that includes an all aluminum microchannel condenser coil with a corrosion resistant coating that shall withstand ASTM B117 Salt Spray test for 6,000 hours and ASTM G85 A2 Cyclic Acidified Salt Fog test for 2,400 hours. This coating shall be added after coil construction covering all tubes, headers and fin edges, therefore providing optimum protection in more corrosive environments.

2.10 REFRIGERATION SYSTEM

A. R410A refrigerant

B. Compressor: Hermetic compliant scroll compressor operating at 3600 rpm with isolated mounting, centrifugal oil pump and oil sight glass

C. Provide factory installed service valves which include suction, liquid, and discharge 3-way shutoff valves.

D. Provide with thermostatic temperature motor winding control for protection against excessive temperatures caused by over-/undervoltage operation or loss of charge. Also provide high and low pressure cutouts.

E. Provide integral coil frost protection based on refrigerant circuit suction temperature to prevent coil frosting with minimum energy usage for all units. Hot Gas Bypass shall not be acceptable.

F. Units shall have cooling capabilities down to 0 degrees F as standard or manufacturer shall furnish unit with installed low ambient controls to allow for operation down to 0 degrees F. For field installed low ambient accessory, the manufacturer shall provide a factory authorized serviceman that will assure proper installation and operation.

G. Provide a unit which shall provide five stages of mechanical cooling with the ability to be at or below 25% compressor displacement at stage one. Achieving this through Hot Gas Bypass shall be unacceptable.

H. Provide unit with a modulating hot gas reheat option which shall consist of the following refrigeration components: a hot gas reheat coil, a cooling modulating valve, a reheat modulating valve, a reheat check valve, a reheat pump out solenoid, and additional interconnecting tubing.

2.11 EXHAUST/RETURN SECTION

A. 100% Fresh Air Tracking Modulating Power Exhaust shall be available on all units and shall be factory installed. It shall assist with maintaining building pressurization by exhausting a proportional amount of the entering fresh air by mechanically linking the

Fresh air damper to the exhaust air damper.

2.12 OUTDOOR AIR SECTION

A. Provide a fully integrated factory installed 100% modulating outside air economizer with unit return and barometric relief air dampers. Economizer operation shall be through primary temperature controls that automatically modulate dampers to maintain space temperature conditions.

B. Provide economizer with Differential Enthalpy Controls

2.13 ECONOMIZER DAMPERS

A. Provide Fault Detection and Diagnostic (FDD) control. FDD control shall monitor the commanded position of the economizer compared to the feedback position of the damper. If the damper position is outside +/- 10% of the commanded position, a diagnostic is generated.

2.14 UNIT CONTROLS

A. General: Microprocessor controls shall be provided for all 24 volt control functions. The resident control algorithms shall make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.

B. Single Zone Variable Air Volume - Single Zone VAV option shall be provided with all necessary controls to operate a rooftop unit based on maintaining two temperature setpoints: discharge air and zone. Option shall include factory-installed variable frequency drive (VFD) to provide supply fan motor speed modulation. During One Zone VAV cooling, the unit will maintain zone cooling setpoint by modulating the supply fan speed more or less to meet zone load demand; and the unit will maintain discharge temperature to the discharge cooling setpoint by modulating economizer if available and staging direct expansion cooling.

C. Unit shall be provided with a Variable Frequency Drive (VFD) and bypass

2.15 Ventilation Override: Provide factory installed, tested, and commissioned ventilation override controls. Binary input from independent fire/life safety panel shall cause unit to override standard operation and assume one of two factory preset ventilation sequences: purge or pressurization.

2.16 Clogged filter indication: Provide factory installed differential pressure switch to indicate filter replacement status. Differential pressure switch shall cause a contact closure to display a service indication and unit will continue to operate normally. This option requires a Trane Zone Sensor with Service LED and a Communications option.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor to verify that roof is ready to receive work and opening dimensions are correct.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork. Install roof mounting curb level.

3.03 MANUFACTURER'S FIELD SERVICES

A. Compressor parts warranty for 5 years.

B. Heat exchanger warranty for 10 years.

C. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

238126: SPLIT SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Split-System Air-Conditioning and Heat Pump Units
2. Concealed Evaporator – Fan Components
3. Floor Mounted Evaporator – Fan Components
4. Ceiling Mounted Evaporator – Fan Components
5. Air Cooled, Compressor-Condenser Components

1.02 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA) Publications:
1. 70 "National Electric Code"

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Publications:
1. 90.1 “Energy Code for Commercial and High-Rise Residential Buildings”

C. Air-Conditioning and Refrigeration Institute (ARI) Publications:
1. 210/240 “Unitary Air-Conditioning and Air-Source Heat Pump”

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
1. Product Data:
a. Include the following:
1) Rated capacities
2) Furnished specialties, and accessories for each type of product indicated.
3) Performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
2. Shop Drawings: Diagram power, signal, and control wiring.
3. Field quality-control test reports.
4. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

1.05 COORDINATION

A. Coordinate size and location of concrete bases for units. Coordinate the location of cast anchor-bolt inserts into bases.

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:
   1. Trane, A Business of American Standard Companies
   2. Carrier Corp.; Carrier Air Conditioning Division, United Technologies Corporation
   3. Lennox International Inc.
   4. York, A Johnson Controls Company

2.02 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
   1. Insulation: Foil-faced fiberglass insulation or closed-cell elastomeric insulation.
   2. Drain Pans: Galvanized steel, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

E. Fan Motors: Comply with requirements in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
   1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Disposable Filters: 1 inch thick, in Synthetic frames. Cardboard frames are not acceptable.

G. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.03 FLOOR-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by

Architect.
1. Discharge: Ducted.
2. Insulation: Foil-faced fiberglass insulation or closed-cell elastomeric insulation
3. Drain Pans: Galvanized steel, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan: Direct drive, centrifugal, with power-induced outside air.

E. Fan Motors: Comply with requirements in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Filters: 1 inch thick, in Synthetic frames. Cardboard frames are not acceptable.

G. WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

H. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

I. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

J. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

K. Fan: Direct drive, centrifugal fan.

L. Fan Motors: Comply with requirements in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

M. Filters: Permanent, cleanable.

2.04 CEILING-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for

overcurrent protection.

D. Fan: Direct drive, centrifugal fan, with power-induced outside air, and integral condensate pump.

E. Fan Motors: Comply with requirements in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
   1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Filters: Permanent, cleanable.

2.05 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
   1. Compressor Type: Scroll.
   2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
   3. Refrigerant Charge: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F.

H. Mounting Base: Polyethylene.

2.06 ACCESSORIES

A. Time Delay Relay: Five-minute delay to prevent compressor cycling.

B. Adjustable Digital Thermostat: Remote with securable blank cover in public spaces (except meeting rooms) and locking ventilated cover in other locations to control the following:
   1. Supply Fan
   2. Condensing Unit
   3. Electric Heater
   4. Plastic guards are not acceptable in Public Spaces.

C. System Selector Switch: Off/Heat/Auto/Cool.

D. Voltage and phase monitoring.

E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Coordinate anchor installation with concrete base.

D. Install roof-mounting compressor-condenser components on equipment supports specified in respective Division 07 Roofing Sections. Anchor units to supports with removable, cadmium-plated fasteners.

E. Install seismic restraints where required.

F. Install floor mounted evaporator-fan unit and compressor-condenser components on restrained, rubber isolator mounts. Install suspended evaporator-fan units with restrained, spring isolators with a minimum static deflection of 1-inch.

G. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.02 CONNECTIONS

A. Install piping adjacent to unit to allow service and maintenance.

B. Duct Connections: Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.04 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

3.06 VRF SYSTEMS

A. VRF systems have different requirements. Follow VRF manufacturer’s guidelines.

260500: COMMON WORK RESULTS FOR ELECTRICAL

1.0 GENERAL

1.1 DEFINITIONS

Whenever occurring in Division 26 the following words shall have the meanings given below:

A. "Provide" shall mean to furnish, install and connect complete.

B. "Wiring" shall mean wire or cable, installed in conduit, cable tray, or wireways with all required boxes, fittings, connectors, and accessories completely installed.

C. "Work" shall be understood to mean the materials completely installed including the labor involved.

D. "Plans and Specifications/Contract Documents" shall be understood to mean the complete documents, including all trades, divisions, sections, addenda, etc.

E. "Review of Shop Drawings" - see Division 1.

F. "Conduit" shall mean either rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT), or plastic conduit (PVC).

1.2 The Contractor AGREES that upon the submittal of a bid, he will have read and studied ALL of the Contract Documents, and that all of the requirements and coordination resulting from these documents are included in his bid. The intent is to obtain a complete installation of electrical work to which end the Contractor shall provide ALL labor, equipment, material, freight, rigging, etc., specified, shown or scheduled on plans. He also agrees that any other accessory items which may not be specified, shown, or scheduled on the plans, but which normally are furnished or can be reasonably implied from the specifications and/or plans to be required shall be provided.

1.3 No exclusion from, or limitations in the drawings, specifications, or other contract documents for the electrical work shall be reason for the omitting of the appurtenances or accessories necessary to complete any required system or item of equipment in this project.

1.4 Should the Contractor find any discrepancies and/or omissions in the contract documents, or be in doubt as to the intent of said documents, he shall obtain clarification or correction from the Architect and the Engineer BEFORE submitting a bid for work under this division. The Contractor will not be granted monetary allowances for discrepancies between his bid and the intent or the work after the contract is let, due to failure to follow this instruction.

1.5 The contractor shall not use any material or equipment that contains asbestos, PCBs, or any other substance which is known to endanger the public health.

1.6 SCOPE OF WORK

A. The Contractor shall refer to Architectural, Mechanical, and Structural drawings and Division 15 of these specifications for related work.

B. The work of this division shall include the furnishing of all labor, supplies, materials, sales tax, permits, inspection fees, costs of testing, shop drawings, as built drawings, operation and maintenance manuals, and the performing of all operations including installation, cutting and chasing, trenching and backfilling, compaction, coordination with other trades on the job, etc., to the end of obtaining a complete installation of electrical work as shown on the drawings and called for in the written specifications.

C. The work to be performed under the electrical contract shall include, but not be limited to:
   1. Service entrance conduit and wire.
   2. Service entrance equipment including disconnects, switchboards, panelboards, etc.
   3. Feeder conduit and wire.
   4. Distribution, lighting, and miscellaneous panelboards.
   5. Branch circuit conduit and wire.
   6. Lighting Fixtures.
   7. Wiring devices including receptacles, light switches, etc.
   8. Telephone service entrance conduit, and interior conduit and outlets.
   9. Fire Alarm System complete, if called for on the drawings
   10. Disconnects
   11. Control system conduit for mechanical contract.
   12. Provision of temporary power at 120/240, single phase for construction.

D. Work not included under the electrical contract:
   1. Unless provided in motor control center, all motor starters and their associated control devices, heaters, etc. will be furnished with the motors under Division 23 of these specifications.
   2. Control and interlock wiring for mechanical contract supplied systems.
   3. Telephone instruments and wiring
   4. Cable television equipment and wiring

E. The owner will not make any consideration to the contractor for any alleged misunderstanding of the amount of work to be performed. Submittal of a bid for work shall convey full agreement by the Contractor to all items and conditions specified, indicated on the drawings, and/or required by the nature of the job site.

F. The Contractor shall be responsible for insuring that all equipment and materials are installed in a neat and workmanlike manner and are aligned, leveled and adjusted for satisfactory operation. He shall install all equipment so that all parts are easily accessible for inspection, operation, maintenance and repair. He shall insure that all equipment is solidly supported from building structures.

1.7 CODES, LAWS AND ORDINANCES

A. Comply with all laws, codes, ordinances, and etc., having jurisdiction over the work to be performed under the contract for this project, EXCEPT where the requirements of the drawings and/or specifications are in excess of those called for in said laws, codes, ordinances, etc.

B. Perform work in accordance with the locally adopted editions of the standards listed below; EXCEPT where federal, state and/or local codes are more stringent, in which case, follow them instead:

1. National Fire Protection Association	NFPA
2. Underwriters Laboratories	UL
3. American Society of Testing Materials	ASTM
4. National Electrical Code	NEC
5. National Electrical Manufacturing Association	NEMA
6. Occupational Safety & Health Act	OSHA

C. The Contractor shall be responsible for installation of the work called for in the contract documents in accordance with all codes, laws, and ordinances, which govern such work. Should he encounter anything contained within the contract documents during preparation for bid which would prohibit the successful compliance of his responsibility under this item, he shall notify the Architect prior to execution of the contract for work so that adjustments can be made to the contract.

D. The Contractor shall be responsible for obtaining all permits, inspection certificates, etc., required by local, state and/or federal authorities for this project, at his expense. Any and all additional work, expense, etc., incurred as the result of failure to request timely inspections, and or permits, shall be charged against the Contractor.

E. Approval of the Architect, Engineer, and the appropriate inspection authorities must be secured for the complete electrical installation prior to contract closeout. Upon completion of the electrical work, the Contractor will furnish the Architect with two (2) copies of all certificates of inspection, permits, etc. Final payment to the Contractor will not be made until the requirements of this paragraph have been met.

1.8 LOCAL CONDITIONS

A. Existing site utilities, underground services, structures, etc., are shown on the drawings accurately in scope only. No expressed or implied guarantee is given as to exact location of the above items. The Contractor is required to verify exact locations and subsequent effects of such on the job.

B. The Contractor shall contact the local utility companies (power, telephone, etc.) to confirm the scheme of service called for on the drawings. Should the Contractor discover the need for any change to these service schemes per the utility involved, he shall notify the Architect prior to execution of the contract so that a solution can be provided. If any cost will be incurred to the project for any of the utilities to provide their services, the Contractor shall include this cost in the bid. If the utility does not furnish this cost number to the Contractor prior to bid submittal, the Contractor shall include a letter with the bid submittal stating this fact. This letter shall state that the cost will be forthcoming and will be an addition to the contract.

C. Contractor shall verify with the Local Power Company the value of fault current in amperes which will be available at the secondary terminals of the Power Company transformer. If this value is in excess of the AIC ratings of the various panels, circuit breakers, etc., as shown on the drawings, the Contractor shall supply such equipment with AIC ratings which will accommodate the available fault current. Any increase in cost due to this item shall be included in the bid.

D. Contractors desiring to bid on work under this division are required to visit the job site before bid submittal. During said visit the Contractor shall become familiar with all site conditions which will affect his work and the cost of the work. He shall also verify exact location of the equipment of the various utility companies from whom services will be required. The Contractor shall submit a letter with his bid stating that he has complied with this requirement.

1.9 PLANS AND SPECIFICATIONS

A. While drawings are to scale, they are diagrammatic. DO NOT SCALE DRAWINGS HAVING 1/4" OR SMALLER SCALE. Equipment, conduit, outlets, etc., are not exactly positioned; therefore, the Contractor shall refer to architectural drawings for actual building dimensions, ceiling layouts, light fixture locations, work by other trades, etc.

B. Should any conflict exist between the drawings and the written specifications, the specifications shall generally govern. Contact Engineer for clarifications.

C. The drawings and written specifications for all divisions are part of the contract. Any work and material shown in the one and omitted in the other, or which may be reasonably implied by both or either, shall be fully furnished and performed by the Contractor, as required for a complete electrical system installation.

D. No deviation from the drawings and specifications shall be made without the full knowledge and consent of the Architect. Should the Contractor find, at any time during the progress of the work,

that, in his judgment, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such item promptly to the Architect for his decision and instructions.

E. The right is reserved by the Architect to move any equipment, outlet, conduit, etc.; as much as ten (10) feet at no increase in cost, provided the Contractor is notified of the change before work on the detail in question is started.

F. It shall be the responsibility of the Contractor to insure that the equipment he provides will fit into the available space, leaving reasonable space for maintenance and servicing of the equipment. If, after the installation of any equipment, it is determined that the space requirements have not been met, the Contractor shall rearrange the work at no additional cost.

1.10 COORDINATION OF WORK

A. It is the responsibility of the Contractor to plan all work so that it proceeds with a minimum of interference with all other trades. He is to inform all parties concerned of openings in the building construction for equipment or conduit required for the electrical work. He is to coordinate the electrical work with the mechanical and plumbing installation.

B. The contractor shall review and coordinate the locations of all electrical equipment (meters, instrument transformer cabinets, panels, disconnect switches, lighting contactors, etc.) mounted on the outside walls of buildings with the drawings for the mechanical, plumbing, and architectural disciplines to avoid any conflicts in locations with sprinkler risers, plumbing risers, rain downspouts, doors, etc. Generally, meter center risers are shown on the drawings for the purposes of information only; they are not dimensioned. In addition, the locations of the meter centers on the site plans are diagrammatic only. They are not dimensioned. The contractor must coordinate these installations. If there are any questions as to locations of equipment, notify the engineer for clarification prior to installation of equipment.

C. The Contractor shall provide all required frames, sleeves, inserts, supports, anchor bolts, etc., as required for completion of the work.

D. The Contractor shall lay out and coordinate all work well enough in advance so as to avoid conflicts or interference with other work in progress. If there is any interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work and at no additional cost to the Owner. Consult the Architect for instructions.

E. The contractor shall verify the location of all disconnect switches required by the project, prior to their installation. The installed location of any disconnect shall not impede the access to, or working space around, any piece of equipment. Neither shall the location cause any loss of equipment performance due to impeded air flow, etc. This requirement applies regardless of the location shown for the disconnects on the plans. If there is any question as to disconnect location, the contractor shall ask the engineer for clarification prior to installation. If any disconnect is found to be installed in such a way that it causes any problems as mentioned above, it shall be relocated at the expense of the contractor.

F. Work lines and established heights shall be in strict accordance with architectural drawings and specifications, insofar as these drawings and specifications extend. It is the Contractor's responsibility to verify all elevations and detailed dimensions not indicated.

G. The Contractor shall coordinate all outlets, fixtures, equipment, etc., with floor, wall and ceiling patterns. Any lines which must pitch shall have right-of-way over lines whose elevations can be changed.

1.11 EQUIPMENT DATA

A. Deliver all printed tags, instructions, certified drawings, parts lists, certificates, etc., supplied with equipment items, to the Architect at completion of the project.

B. Assemble all such printed materials into a stiff-back binder identified on its face. Provide quadruple copies.

1.12 SHOP DRAWINGS

A. Shop drawings for switchboards, panelboards, transformers, generators, bus duct, cable tray, fire alarm systems, security systems, lighting fixtures, and other items as might be requested, shall be submitted to the Architect's Engineer for his approval, by the Contractor promptly upon receipt of the contract for work.

B. The engineer will review the shop drawings for errors in the contractor's interpretation of the contract documents only, and to assist the contractor in compliance with the documents. Corrections of comments made on shop drawings during the review do not relieve the contractor from compliance with requirements of the contract documents, plans, and specifications. Review of the shop drawings shall not relieve the contractor from responsibility for confirming and correlating all quantities and dimensions, coordination of his work with the other trades, and performance of his work in a safe and satisfactory manner. Review of shop drawings shall not permit any deviations from plans and specifications by the contractor, nor shall it permit changes to the plans and specifications by the engineer. Changes to, or deviations from, the contract documents may only be made by a Change Order issued by the architect and executed properly.

C. The contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the engineer and shall include the form, Exhibit 2, entitled "Certification of Compliance – Shop Drawings" with each submittal (see end of specifications). Failure to complete and submit this form will result in rejection of the submittal without review.

D. Equipment subject to shop drawing approval shall not be ordered until approved by the Engineer. Material ordered or installed without such approval, if rejected by the Engineer, shall be removed and replaced with approved items at the Contractor's expense.

E. In order to procure approval for such equipment, the Contractor shall submit a minimum of six (6) sets of shop drawings and/or brochures describing each piece of equipment. Description shall include rated capacities, dimensions, manufacturer's catalog number, performance data with operating characteristics, optional features, modifications, etc.

F. ALL BROCHURES AND DRAWINGS SHALL BE SUBMITTED AT THE SAME TIME. Items not approved shall be resubmitted with the necessary corrections made until final approval is obtained.

G. See individual specification sections for additional shop drawing requirements.

F. If equipment is substituted and approved in the shop drawing process; its use may affect electrical, mechanical, structural, and other systems which were designed based on the original equipment specifications. Any changes, and their cost, in any of the divisions of work affected by the substitution of equipment, shall be the sole responsibility of the contractor making the substitution.

2.0 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new and the best grade. They shall conform to all standards and requirements governing the work. Any and all equipment and materials damaged during installation shall be immediately replaced at NO cost to the Owner.

B. Reference shall be made to drawing schedules and details and/or specifications for manufacturer, model, catalog number, size, capacity, performance, installation, etc., of equipment and material. Such information is used to denote design, workmanship, and quality desired.

C. The Contractor shall offer his bid for work based on the electrical equipment (including light fixtures) which is described in these specifications and described in the respective schedules on the drawings. Pre-bid approvals for substitute equipment will not be given.

D. PRODUCT SELECTION PROCEDURES:

Product selection shall be governed by the Contract Documents, and not by previous project experience which the Contractor or his suppliers may possess. Procedures governing product selection include the following:

1. PROPRIETARY SPECIFICATION REQUIREMENTS: Where only a single product or manufacturer is named, provide the product indicated. No substitutions shall be permitted.
2. SEMIPROPRIETARY SPECIFICATION REQUIREMENTS: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions shall be permitted.
3. NON-PROPRIETARY SPECIFICATONS: When the specification lists products or manufacturers that are available for incorporation into the work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product which complies with the contract requirements. Such products are still subject to the shop drawings submittal process.

E. In the submission of substitute equipment and materials, the Contractor shall note the following: (1) capacities are absolute minimum and must be equaled, (2) physical size limitations for space allotted, (3) structural properties, (4) noise levels, (5) interchangeability, (6) compatibility with other materials, (7) similar items shall be same manufacturer and style wherever possible.

F. All materials and equipment, for which a UL or NEMA standard is established, shall be so approved and labeled or stamped.

G. NEMA standards shall be taken as minimum requirements for electrical equipment.

H. Electrical equipment shall operate properly under a 10 percent plus or minus voltage variation.

I. Adhesives are not acceptable as mounting, supporting or assembling media.

3.0 EXECUTION

3.1 All materials required for the project shall be ordered by the Contractor in a timely manner which allows the material to be received at the job site for installation in agreement with the job schedule, so that work of the other divisions is not held up in any way.

3.2 All materials and equipment received at the job site by the Contractor shall be stored and protected from damage while they wait to be installed.

3.3 All work shall be carried out in a neat and orderly manner by experienced electricians, under the constant supervision of a competent electrician, trained and licensed in this field, who shall represent the Contractor at all times in connection with the work.

3.4 Materials or work installed, rejected by the Architect's Engineer upon inspection shall be completely removed by the Contractor, and the work redone in a manner acceptable to the Engineer by the Contractor at no charge.

3.5 When rejected work is removed, should other material, equipment, etc., be damaged in the process, the Contractor shall make all necessary repairs, so that the damaged equipment is equal in quality, strength and appearance to its original state.

3.6 SPACE REQUIREMENTS

A. The Contractor is fully responsible for determining in advance of purchase that all equipment and materials proposed for installation will fit into the space indicated while allowing sufficient clearance about the equipment and materials to allow proper maintenance and servicing of all components requiring such, including equipment and materials of other divisions located in the vicinity.

B. Clearances in front of panelboards, switchboards, motor starters, busway taps, and other electrical equipment requiring servicing while energized, shall be provided in accordance with the NEC, table 110-16a, as required by the code text.

C. The contractor shall prepare, and submit for review and approval prior to ordering equipment, dimensioned rough-in drawings at ½" = 1'-0" scale for each equipment room and meter equipment layout. These drawings shall show all equipment to scale based on the actual equipment ordered and shall be fully dimensioned.

3.7 FIRESTOPPING

A. Firestop all penetrations of building fire rated surfaces made by this division.

B. Each penetration shall be protected by a firestop system with a rating equal to or greater than the original assembly in which the penetration occurs.

C. All firestop material shall be installed in accordance with manufacturer's standard details and the UL Building Materials Directory for each type of fire rated assembly penetrated.

D. Telephone sleeves shall be firestopped with materials that will permit re-entry and use of the sleeves.

3.8 WIRING ELECTRICALLY OPERATED EQUIPMENT

A. The Contractor shall provide all conduit, conductors, wiring, etc., required to connect power to all electrically operated equipment installed on the project, whether provided by this division or other divisions, or by the owner.

B. The Contractor shall install, support, and electrically connect motor starters, disconnects, etc., and shall complete all power wiring circuits so that each is left in satisfactory condition.

C. All control equipment associated with any equipment furnished under any other division, or by the owner, shall be furnished by that provider.

D. This division shall provide all conduit required for control wiring as needed for Division 23. Refer to that division and its associated drawings for specifics.

E. This division is responsible for the provision of, and fire alarm system wiring of, duct smoke detectors for all HVAC equipment requiring them. If there is a fire alarm system provided for the

project, the detectors shall be tied to that system. If there is no fire alarm system, the Contractor shall provide remote visual and audible alarm indicators per the requirements of NFPA 90A, latest edition.

3.9 RECORD AND AS-BUILT DOCUMENTS

A. The Contractor shall maintain at the job site a complete set of Contract Documents. These documents shall be kept current with all changes, substitutions, etc., to the original documents as reflected by the actual work being installed.

B. At closeout, the Contractor shall provide the Owner with one complete set of as-built reproducible drawings, and two clean sets of complete specifications. These documents shall show installed locations, sizes, etc., of all work and material as required by the contract documents and actually installed on the project.

C. For each piece of equipment installed or provided, the Contractor shall provide three (3) sets of:
   1. Manufacturer's printed catalog pages
   2. Manufacturer's operating and maintenance instructions
   3. Manufacturer's wiring and connection diagrams, etc.,
   4. Motor interlock and control diagrams, showing operating instructions for, and normal positions of, each motor and controller

   All of this information shall be provided in bound 8-1/2" by 11" hardback booklets.

3.10 CLEANING

A. The Contractor shall insure that all interior and exterior surfaces of panelboards, transformers, switchboards, motor starters, cabinets, etc., are cleaned so as to be free of dust, dirt, grease, plaster, debris, etc. Lighting fixtures shall be cleaned according to manufacturer's recommendations.

B. Any electrical equipment having sustained damage to any factory painted surfaces shall have that damage repaired and restored to original factory condition.

C. Any and all ferrous metal surfaces exposed on the electrical system shall be painted.

3.11 TEMPORARY LIGHTING AND POWER

A. As soon as is possible, the Contractor shall install temporary electrical wiring and lighting for the project in accordance with NEC Article 305.

B. Wiring shall consist of non-metallic sheathed cable with ground wire.

3.12 EXCAVATION, SHORING, AND BACKFILL

A. The Contractor shall perform all necessary excavation required for installation of his work. Each utility shall be installed in a separate trench.

B. Excavation shall be below that required for general construction and final grade. It is expected that the Contractor shall process normally difficulties encountered in excavation related to rocks, debris, etc. However, should the Contractor encounter "solid" rock impediments to his excavation, he shall contact the Architect for directions.

C. Any and all trenching shall be performed strictly in accordance with OSHA, and other authorities having jurisdiction, rules and regulations regarding "cave in" safety shoring. All shoring material

used shall be completely removed prior to backfilling the trench.

D. The Contractor shall not backfill trenches until the conduit banks have been inspected by the proper authorities.

E. Backfill shall be done simultaneously on both sides of the equipment, raceways, etc. Backfill shall be clean soil, free of rocks, cinders, wood, debris, etc.

F. Backfill shall be installed in 12-inch layers. It shall be compacted to 85% per ASTM D-1557 in areas under sidewalks and grass; and to 95% under any paved areas.

G. Should concrete encasement of raceways be required, the sides and floor of the trench shall be used as formwork for the concrete. This shall not apply unless the excavation is clean, free of debris, and of the proper size.

3.13 CUTTING AND PATCHING

A. The Contractor shall be responsible for the location and size of all openings required for his work.

B. The Contractor shall not cut into structural members or architectural finish surfaces without expressed written approval of the Architect.

C. Any patching of surfaces required by the Contractor's work shall be made so that they are equal in quality and appearance to the original surface.

3.14 FLASHING

A. Raceways which pass through walls or roof surfaces to the outside shall be flashed in accordance with architectural standards and with the requirements of the roofing manufacturer.

B. Any raceways penetrating the roof shall maintain a clearance of 18 inches minimum from all parapets.

C. Whenever raceways pass through floor structures which contain a water proofing membrane, the Contractor shall provide a watertight floor sleeve for each raceway. The lowest floor shall be exempt.

3.15 MOISTURE - DAMP PROTECTION

A. Whenever any electrical component, such as panels, raceways, etc., will be in contact with surfaces which may become damp or wet, that component shall be mounted on standoff devices so that it is a minimum of ¼" away from the surface.

3.16 GUARANTEE AND WARRANTY

A. The Contractor and the General Contractor shall, and hereby does, guarantee that all work executed, and all electrical equipment installed, under this division will be free of all defects in materials, manufacture, and workmanship for a period of one (1) year from the date of final acceptance of the building. The above parties agree that they will, at their expense, repair and/or replace all such defective work and equipment, and any and all other work damaged thereby, which becomes defective during the term of this guarantee.

260502: TESTING FOR ELECTRICAL SYSTEMS

1.0 GENERAL

1.1 SUMMARY

A. The entire electrical system shall be tested to insure proper operation and safety for building occupants and operating personnel.

B. Testing shall insure conformity to code requirements and conformity to contract documents.

1.2 REGULATORY REQUIREMENTS

A. Testing shall be in conformance local codes, utility company requirements, and standard industry practices.

B. Testing shall accomplish the requirements of the NEC, Article 110.

2.0 PRODUCTS

2.1 Testing shall be performed with instruments and materials required and approved for the purpose.

3.0 EXECUTION

3.1 Perform appropriate tests on the entire electrical system before it is energized. Testing shall be performed to insure that it is free of unintended grounds, short circuits, and open circuits.

3.2 Provide safeguards to protect all personnel involved in the testing as well as for protection of equipment being tested.

3.3 Testing shall be performed in a timely manner. Reports of results shall be filed with the Architect in written form.

3.4 TESTING shall include the following:

A. Prior to connections to equipment, all service entrance conductors and feeder conductors shall be tested for unintended grounds and for insulation integrity with a megohm meter. Any conductor found to be defective in the testing shall be replaced.

B. Ground fault protection systems on service entrance equipment shall be tested according to the NEC, Article 230-95.

C. The grounding system network shall be tested to insure a resistance value of not more than ten (10) ohms to ground. Should the system test results be higher than 10 ohms, additional ground rods shall be driven, or alterations made to the system, to produce the 10-ohm or less value required.

D. Full load currents of each feeder shall be measured to test for phase load balance. If the phases are not load balanced, circuit rearrangement shall be made to achieve balanced load conditions.

E. The proper operation of all alarm and control systems installed under this division shall be verified by system operational testing.

F. All circuits having parallel conductors shall be tested for proper phasing using hot phasing or other compatible techniques.

3.5 The Contractor shall provide additional testing as deemed necessary by the Architect to insure that all equipment functions properly and meets the requirements of the specifications and drawings.

260519: LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

1.0 GENERAL

1.1 SUMMARY

A. This section includes building wires and cables, metal clad cable, connectors, and terminations for systems rated below 600 volts.

1.2 RELATED DOCUMENTS

A. All drawings and Division 01 of the specifications and the general conditions of the Contract apply to this section.

B. Section 26 05 53 – Identification for Electrical Systems

1.3 REGULATORY REQUIRMENTS

A. All products required and furnished under this section shall be listed and labeled per the NEC by UL or other testing agency acceptable to the authority having jurisdiction, and marked for intended use.

B. All products furnished under this section, as installed, shall meet all requirements of the NEC.

1.4 WIRE AND CABLE

A. All wire and cable routing shown on the drawings is approximate. Field verify dimensions and routing lengths of all conductors and cables required prior to installation.

B. All wire and cable furnished on this project shall be copper and drawings reflect conductor sizes, conduit sizes, etc. based on copper conductors.

2.0 PRODUCTS

2.1 CONDUCTORS

A. Specified gauge sizes refer to American Wire Gauge, copper conductors.

B. All wire and cable shall be of soft drawn, annealed, copper having a conductivity of not less than 98% of that of pure copper; each wire continuous without weld, splice, or joint throughout its length; uniform in cross section and free from flaws, scales and other imperfections.

C. Sizes specified are AWG through No. 4/0 and circular mils above No. 4/0. Conductor No. 10 and smaller shall be solid; No. 8 and larger stranded.

D. Conductors No. 4 and smaller shall be Type "THHN/THWN"; larger conductors shall be type "THW".

E. All conductors shall be of the same name brand and shall be in the original wrapping.

F. All conductors shall be Anaconda, Diamond, General Electric, General Cable, Paranite, Phelps-Dodge, Simplex, Triangle, or Southwire.

2.2 BRANCH CIRCUIT CONDUCTORS

A. Minimum wire size for lighting and power circuits shall be #12. #10 shall be used where the run to the first outlet exceeds 75' for 120V circuit and 150' for 277V circuit.

B. Branch circuit wiring, which supplies more than one fluorescent fixture through the wire-way of other fixtures, shall be rated for use at 150 degrees C.

C. All installations to be based on wire in conduit except for cases where the use of MC cable is allowed on the drawings in certain applications or instances.

2.3 SPLICES AND TERMINATIONS

A. Splices for #10 AWG and smaller wire used on Branch circuits and fixtures shall be of the "Live Spring" pressure type, Ideal Co. wing nut and/or wire nut type connectors or approved equal. Splices shall be rated 600 volts or 1000 volts when enclosed in a fixture or sign.

B. Solderless, mechanical type lugs shall be used for terminal connections for copper conductors of #8 AWG or larger.

3.0 EXECUTION

3.1 WIRE AND CABLE

A. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. All splices and joints shall be carefully and securely made to be mechanically and electrically solid with "Live Spring" pressure type connectors, by "IDEAL CO." or approved equal. Tape shall be "Scotch" No. 33 for indoor and NO. 88 for outdoor or approved equal. Where connection is made to any material, copper terminal lugs shall be bolted or compression fitted to the conductors. Where multiple connections are made to the same terminal, individual lugs for each conductor shall be used.

B. Wire shall not be drawn into a conduit until all work on the conduit system, which might cause damage to the wiring, is complete. Ideal, Wire-Ease or approved equal may be used as lubricant.

C. Where two or more circuits run to a single outlet box, tag each circuit with linen tags as a guide to the fixture hanger in making fixture connections.

D. All stranded conductors shall be furnished with copper connecting lugs drilled or reamed the full diameter of the bare conductors.

E. Mains and feeders shall be run their entire length in continuous pieces without joints or splices. If the runs are too long for a single conductor piece, then joint and/or splices installed per these specifications shall be used.

F. All splices, taps, terminations, etc. in the conductors shall be kept where they are fully accessible for inspection and maintenance.

G. All wiring in cabinets, boxes, gutters, etc., shall be neatly tied and held in place by nylon cable ties and mounting brackets.

H. At each fixture outlet a loop or end or wire not less than 8" long shall be left for connection to fixtures.

I. The number of crosses hatches, where indicated, designates the number of conductors to be installed when the number exceeds minimum of two (2). Where crosshatches are not indicated, the number of conductors shall be as determined by switching, homeruns, etc. This does not

apply to conduit provided for telephone or other special systems.

J. Branch circuits shall contain the necessary number of conductors to afford the switch control indicated.

K. Splices, etc. in signal and/or communication conductors shall be made with crimp-on or soldered connections, which are properly insulated.

L. The Contractor shall not permit conductor bends to a radius less than 10 diameters or thickness on circuits of 600 volts or less.

M. Conductors, when installed, shall not have dents, cuts, and scars, pressure indentation, abraded areas, etc. The Contractor will be responsible for replacement of conductors so damaged, at his expense.

N. Lubricants used to ease conductor-pulling operations shall be specifically manufactured for that purpose. TALC only shall be used on isolated branch circuit wiring.

O. An UL approved non-oxidation compound or grease (PENETROX by Burndy) is to be applied at all terminations of panel feeders, secondary service conductors, and primary (high voltage) service conductors prior to connection.

260526: GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1.00 GENERAL

1.01 SUMMARY

A. This section includes the electrical grounding of all electrical systems and equipment provided on this project.

1.02 RELATED DOCUMENTS

A. All drawings and Division 01 of the specifications and the general conditions of the Contract apply to this section.

B. Specification section 260519 – Low Voltage Electric Power Conductors and Cables

1.03 REGULATORY REQUIREMENTS

A. All components, equipment, fittings, accessories, etc. required and furnished under this section shall be listed and labeled per the NEC by UL or other testing agency acceptable to the authority having jurisdiction, and marked for intended use.

B. All components, equipment, fittings, accessories, etc. required and furnished under this section shall comply with the NEC, particularly Article 250.

1.04 GROUNDING SYSTEM

A. Components of the grounding system shall include (but not limited to):
   1. Building water supply pipe
   2. Building structural steel
   3. Driven ground rod(s)

2.00 PRODUCTS

2.01 MANUFACTURERS

A. All grounding equipment shall be manufactured by ERICO International Corporation or equal.

B. Grounding conductor manufacturers shall be per Section 260519 of these specifications.

2.02 CONDUCTORS

A. All grounding conductors shall be copper. Conductors smaller than No. 8 AWG shall be solid; all other conductors shall be stranded. Ground conductors shall be bare or have type THHN insulation, green in color.

B. Aluminum grounding conductors shall not be used.

2.03 GROUND RODS

A. Ground rods shall be copper clad, sectional, solid steel, 10-ft. long, ¾ in. diameter.

B. Rods shall be threaded on both ends.

C. All couplings shall be bronze and made by the rod manufacturer.

2.04 CONNECTIONS

A. Grounding connections made to ground rods, building re-steel, counterpoise systems, etc. shall be made via exothermic welding means.

B. Grounding connections to pipes shall be made with bolted pressure type or compression type clamps manufactured for grounding purposes.

C. Grounding connections to boxes, fixtures, etc. shall be made at the factory provided grounding terminal.

3.00 EXECUTION

3.01 SERVICE GROUND

A. Provide driven ground rods in 3 separate locations arranged in a triangle, separated from each other by a minimum of 10 ft. Set rods so that top of final rod driven is 2 inches below grade at each of the 3 locations.

B. Connect ground rods together with grounding conductor via exothermic welding process. Provide connection to main service entrance disconnect ground bus connection point and to system neutral at this location with grounding conductor.

C. Provide grounding conductor from main service entrance disconnect ground bus to main building water service piping. Provide grounding conductor shuts around all valves and water meter in water service piping. Shunts shall be braided type.

3.02 BUILDING CONNECTIONS

A. Provide grounding conductors from main service entrance disconnect ground bus connection point to building foundation reinforcement steel and to building frame steel.

B. Provide bonding connections to all above ground sections of gas piping upstream from the equipment shutoff valve that the pipe feeds.

3.03 COMMUNICATIONS SYSTEMS

A. Provide a #4 AWG grounding conductor from the grounding electrode system to the communications system (fire alarm, security, telephone, data, cable television, etc.) utility service cabinet.

B. Provide connection to service and/or central equipment locations on a ¼” by 2” by 12” grounding bus.

3.04 EQUIPMENT CONNECTIONS

A. Provide grounds to all equipment requiring them, including, but not limited to:
   1. Secondary of transformers (except the isolating type).
   2. Conduit and enclosures.
   3. All neutral conductors.
   4. Panelboards, switchboards, etc.
   5. Ground terminals on receptacles, appliances, equipment, etc.

B. Make all connections with galvanically compatible materials.

C. Clean all connections points so that new bare metal surfaces are involved in connections.

D. Tighten all bolts, screws, etc. on grounding connections to torque ratings of manufacturer, or per UL 486A if there are no manufacturer's instructions on torque settings.

E. Seal all grounding connections of dissimilar metals with inert product intended for this purpose to exclude moisture infiltration into connection joints.

F. Provide grounding connection for all step-down transformer neutrals to nearest building steel member.

3.05 Route all grounding conductors via shortest physical path possible without obstructing access to other systems or placing the conductors in locations where they will be subjected to any type of damage.

3.06 All bonding conductors (straps, jumpers, etc.) shall be installed so that their connections are isolated from equipment vibrations, etc.

3.07 In all raceway systems provide an equipment grounding conductor in addition to the circuit neutral inside the raceway with the phase conductors. Equipment grounding conductor shall be "Green" in color.

260529: SUPPORTING DEVICES

1.0 GENERAL

Not used.

2.0 PRODUCTS

2.1 MATERIAL

A. Support Channel: Galvanized or painted steel.

B. Hardware: Corrosion resistant.

3.0 EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not use powder-actuated anchors.

E. Do not drill structural steel members.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. Install free-standing electrical equipment on 3" concrete pads.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

260533: RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

1.0 GENERAL

1.1 RELATED DOCUMENTS

A. The General and Supplementary Conditions, and General Requirements (Division 1), apply to the work specified in this Section.

1.2 LOCATION OF OUTLETS

A. Unless specifically indicated, all outlets are located diagrammatically on the drawings. Reference shall be made to the architectural and mechanical plans for the exact location of all outlets.

B. Outlets shall be located so that they will be symmetrical with architectural details and power outlets shall be so located as to properly serve the equipment.

1.3 JUNCTION BOXES AND PULL BOXES

A. Furnish and install junction and pull boxes as required to facilitate installation of the various conduit systems and as required by the NEC.

2.0 PRODUCTS

2.1 SECONDARY SERVICE CONDUIT

A. Secondary service duct shall be galvanized rigid steel conduit, IMC or schedule 40 PVC.

2.2 TELEPHONE SERVICE ENTRANCE DUCT

A. Telephone service duct shall be Schedule 40 PVC conduit. Where penetrations through slabs occur, use long sweep rigid steel conduit elbows.

2.3 FEEDERS AND BRANCH CIRCUITS

A. Rigid conduit or IMC shall be used for all feeders and sub-feeders and branch circuits, where exposed to possible physical damage. EMT shall be permitted in protected areas.

2.4 RIGID CONDUIT

A. All rigid conduit shall be of the best quality steel of standard dimensions, hot dip galvanized, threads included, clean and smooth inside. Conduit shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp on each length of conduit.

B. Fittings for all rigid conduits shall be steel or malleable iron as manufactured by Thomas and Betts or equal. DIE CAST FITTINGS OF ANY MATERIAL SHALL NOT BE USED.

2.5 ELECTRIC METALLIC TUBING (EMT)

A. EMT conduit shall be of the best quality steel of standard dimensions, hot dip galvanized, clean and smooth inside. Conduit shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp on each length of conduit.

B. Fittings for all EMT conduit shall be compression type, made of steel, with case hardened locknuts, and nylon insulated throats; or steel setscrew fillings with case hardened locknuts, and

nylon insulated throats. DIE CAST FITTINGS OF ANY MATERIAL SHALL NOT BE USED. Fittings shall be manufactured by Thomas and Betts or equal.

2.6 RIGID NONMETALLIC CONDUIT (PVC)

A. All PVC conduit shall be produced by the same manufacturer, be schedule 40, and manufactured as Electrical Conduit with the manufacturer's trade mark or stamp on each length of conduit.

B. All PVC conduit fittings and cement shall be secured from the conduit manufacturer.

C. All PVC conduit shall meet the following standards:
1. Rated for 90 degrees centigrade.
2. Shall have a tensile strength of 7,000 psi @ 73 degrees F.
3. Shall have a flexural strength of 11,000 psi.
4. Shall have a compressive strength of 8,600 psi.

D. PVC not allowed above grade.

2.7 FLEXIBLE CONDUIT

A. Flexible Steel Conduit (No Cover) shall be constructed of reduced wall galvanized steel, and shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp.

B. PVC Extruded Cover Flexible Conduit shall be used in all outdoor applications. It shall be UL listed for outdoor use.

C. Connectors and fittings for flexible conduit shall be steel type with nylon insulated throats. Connectors shall "bite" into the conduit under pressure of the connector bolt. All connectors and fittings shall be manufactured by Thomas and Betts or equal.

2.8 BELOW GRADE CONDUIT AND CABLE SEAL

A. Seals for either conduit or cable below grade shall form a reliable lasting seal between building and the outside and shall be able to withstand pressures to a minimum head of 50 feet of water. The below grade seals shall be as manufactured by O.Z./Gedney and sized for the particular application.

2.9 THREADED JOINT COMPOUND

A. Threaded joint compound shall be a corrosive inhibiting compound that is electrically conductive under pipe joint pressure. The compound shall be Thomas and Betts "KOPR-HIELD" or approved equal.

2.10 CONDUIT IDENTIFICATION TAPE

A. Conduit identification tape for use in marking underground conduit runs shall be inert polyethylene, resistant to acids, alkalis, etc., which might be in the soil. The tape shall be a minimum of 4 mils thick, 6 inches wide, and yellow in color. It shall have the words "CAUTION – ELECTRIC LINE BURIED BELOW" imprinted along its entire length with a contrasting color permanent ink. The tape shall be "Terra Tape" as manufactured by Reef Industries, Inc., Houston, Texas; or equal.

2.11 PULL BOXES

A. All pull boxes shall be constructed of code gauge galvanized steel of the dimensions required by

Article 370 of the NEC, according to the number, size, and position of conduits entering the box.

B. Pull boxes installed in vertical runs of conductors shall be provided with Red Seal type VVC or approved equal cable supports as required by Table 300-19 of the NEC.

C. Pull boxes for horizontal runs of feeder conductors which contain more than one feeder shall be provided with reinforced flange and removable 12 gauge 1-1/2" by 1-1/2" galvanized channel for support of conductors. Wood supports shall not be used.

D. Pull boxes installed in finished spaces shall be flush mounted and shall be provided with trim, hinged door, and flush latch with lock to match trims for flush mounted panelboards.

2.12 OUTLET BOXES

A. All outlet boxes shall be constructed of code gauge galvanized steel.

B. Outlet boxes specified herein are minimum size boxes. Larger boxes of the same type shall be provided if required by the NEC in consideration of the number and size of conductors installed.

C. Outlet boxes for surface mounted and pendant mounted lighting fixtures shall be four-inch octagon boxes, 1-1/2 inches deep. Fixtures studs shall be provided for support of fixtures if required.

D. Outlet boxes for flush mounted lighting fixtures shall be four-inch square boxes, 1-1/2 inches deep with blank cover.

E. Outlet boxes for switches, receptacles, and wall mounted junction boxes shall be four-inch square boxes, 1-1/2 inches deep. Where only one conduit enters box, 3-1/2-inch-deep single gang switch boxes may be used. Outlet boxes for GFCI receptacles shall be 2-3/4 inches deep.

F. Outlet boxes recessed in concrete lock walls and partitions shall be designed especially for installation in concrete block and tile walls and partitions. Single gang or multi-gang square cornered masonry boxes shall be used for one or more devices at the termination of a conduit run. Conventional four inch octagonal or 4-11/16-inch square boxes fitted with square tile covers of proper depth for concrete block shall be used where two or more conduits enter a box.

G. Where specialty equipment such as fire alarm components, security components, etc., are installed provide outlet boxes suitable in size for these devices.

H. Outlet boxes to be used in exposed conduit run shall be cast ferrous alloy type. Outlet boxes for vapor-tight lighting fixtures shall be cast corrosion resistant type.

2.13 FLOOR BOXES

A. Floor outlet boxes shall be adjustable, sheet steel, designed for use in concrete slabs, and water tight if noted on drawings.

B. Boxes for use in a floor to be carpeted shall be supplied with an adjustable brass

carpet flange.

C. Unless otherwise noted on the drawings, boxes installed in slabs less than four inches thick shall be:
1. Hubbell # B-2529
2. Walker # 801

3. Thomas & Betts # 1752

D. Boxes installed in slabs more than four inches thick shall be:
   1. Hubbell # B-2557
   2. Walker # 800
   3. Thomas & Betts # 1754

E. Watertight boxes shall be cast metal and adjustable. Provide rubber gasket and bronze disk. Boxes shall be:
   1. Hubbell # B-2536
   2. Walker # 800-C1
   3. Thomas & Betts # 1810

F. Covers for all floor boxes shall be supplied in accordance with the use of the box.

3.0 EXECUTION

3.1 INSTALLATION

A. Unless otherwise specifically noted on the drawings, ALL CONDUCTORS installed on this project shall be installed in conduit as specified herein.

B. Any conduit installed on this project shall be no smaller than ¾", except as otherwise noted on the drawings. Where desirable for ease of installation, larger sizes than those called out on the drawings may be used. The contractor is responsible for resolution of any conflicts arising from the use of larger sizes.

C. Conduit shall be continuous from outlet to outlet, from outlet to panelboard cabinet, junction box, and/or pull box. Conduit shall enter and be secured to all boxes, etc., in such a manner that each raceway system will be electrically continuous from the service entrance to all outlets. All conduit from panelboard cabinets and junction boxes shall terminate in approved outlet boxes or conduit fittings. Conduit connection to any box, which has no threaded hub for its reception, shall be installed with two locknuts.

D. In general, the conduit installation shall follow the layout shown. However, this layout is diagrammatic only; and where changes are necessary due to structural conditions, other apparatus, or other causes, such changes shall be made without any additional cost to the Owner. Offsets in conduit are not indicated, and must be provided as required.

E. Junction boxes and pull boxes shall be provided and installed as required to facilitate the systems shown on the drawings. "AX" expansion fittings shall be installed in all conduit runs wherever they cross building expansion joints.

F. At couplings, conduit ends shall be threaded so they meet in the coupling. Right and left couplings shall not be used; conduit couplings of the Erickson type or approved equal shall be used at locations requiring such joints.

G. Connections in conduit installed in outdoor or indoor locations where exposed to continuous or intermittent moisture, shall provide a liquid-tight seal. The sealing hub fittings shall be of steel or malleable iron, with recessed sealing "0" ring and a nylon insulated throat, Thomas and Betts Series 370. All conduit and cable, telephone or otherwise, which extend from the interior to the exterior below grade shall be sealed with a fitting designed for that particular use so as to be watertight.

H. No bends will be permitted with a radius less than size (6) times the diameter of the conduit nor

more than 90 degrees.

I. All conduits shall be concealed in the wall, in or below floors or above ceilings unless otherwise directed or indicated. Concealed conduit shall be supported from the building construction at intervals not exceeding 8'-0". Concealed conduit above the ceiling shall be supported independent of ceiling construction. Where ceilings of the lay-in type are used, conduit must be installed high enough to permit removal of ceiling panels and lighting fixtures.

J. Where conduit is expressly shown to be run exposed, the conduit shall be supported at intervals not exceeding 8'-0" with straps and wood screws for wood construction, machine screws for metal construction, and expansion bolts for masonry construction. Exposed conduit in finished spaces that pass through walls or ceilings shall be provided with chrome plated escutcheons. Run exposed conduit, where permitted by this specification, parallel or at right angles to the building with approved galvanized iron clamps or hangers. Devices attached to masonry or slabs shall be secured with inserts and bolts or lead expansion sleeves. Provided a support at each outlet box, at each conduit elbow, and at each junction box. Wooden plugs inserted in drilled holes are not acceptable as support bases.

K. Where two (2) or more conduits are run parallel and adjacent, they shall be installed on gang hangers.

L. Where connections are made to motors more than 2'-0" away from walls or columns, a vertical conduit, minimum size 3/4", securely attached to floor and ceiling shall be installed and the wiring carried into and out of this conduit by means of condulets and flexible conduit.

M. Conduit embedded in concrete, which is in contact with the earth, and conduit installed outside the building below grade shall be rigid steel conduit, IMC or PVC.

N. Conduit shall be located 6" minimum from surfaces with temperature ranges above 140 degrees F.

O. Conduit shall not be installed in any manner, which will result in the accumulation of condensation in the pipe.

P. In masonry construction, wooden plugs inserted in drilled holes are NOT acceptable as bases for supports for conduit. The Contractor shall use approved types of galvanized wall brackets, beam clamps, strap hangers, or pipe straps secured by means of toggle bolts in hollow masonry units, expansion bolts in concrete or brick, machine screws or bolts and nuts in metal surfaces, and wood screws in wood surfaces.

Q. Conduit runs left for future use shall be checked for unblocked passage by the use of a ball mandrel. Contractor shall leave a non-mildewing polyolefin pull line in each such conduit. The line shall have an average tensile strength of 200 lbs. for 1" or smaller conduit and 500-lbs. for conduit larger than 1". Pull lines shall be based on the standard set by Ideal Co. product #31-343 for 200-lb. line and 32-244 for 500-lb. line.

R. Electrical contractor to furnish and install all conduit for controls systems. Coordinate with Steve Greeson of ALC for requirements.

3.2 CONDUIT PROTECTION

A. Conduit shall not be installed in any manner that will result in the accumulation of water inside the pipe.

B. Conduit shall be located a minimum of 6 inches away from any surfaces which will reach surface

temperatures of 140°F or above.

C. All conduit installed in the ground outside of the building shall be buried a minimum of 36 inches below finished grade, but in no case shall it be buried more than 48 inches deep without the written consent of the Engineer.

D. Conduit run inside the building below floor slabs shall be included within the concrete pour of the slab, located between the reinforcing steel vertically.

E. For all conduit installed in the ground outside of the building, provide identifying marker tape over the entire length of the conduit run. Place tape below finished grade between 12 inches and 18 inches absolute.

F. All conduit shall be secured in place and protected to prevent damage to work during construction. The ends of all conduit and conduit fittings shall be plugged to avoid filling with dirt, plaster, gypsum, etc. Plugs shall be Thomas and Betts series 1470.

G. All conduit shall be blown out and swabbed clear of water and trash prior to the installation of any conductors in the conduit.

3.3 GROUNDING AND TERMINATIONS

A. Connections to all panelboards, cabinets, pull boxes, etc., shall be installed with a grounding wedge lug between the bushings and the box; or with locknuts designed to “bite” into the metal of the box.

B. To insure continuity of electrical ground and to improve conductivity, use Kopr-Shiel compound, series CP-8 as manufactured by Thomas and Betts on all rigid conduit threaded joints.

C. In ALL conduit runs, rigid or otherwise provide a green colored insulated grounding conductor inside the conduit with the phase conductors.

3.4 PENETRATIONS

A. Where any electrical item such as conduit, cable, telephone cable, busway, etc., penetrates a wall, floor, or ceiling, the original integrity for the respective wall, floor, or ceiling shall be restored. The opening around the item making the penetration shall be sealed airtight. If the surface penetrated is fire rated, the sealant shall have a fire rating equal to the original surface. In no case shall the penetration result in a lessening of the fire rating of the surface penetrated.

B. Any openings in surfaces left for future routing of electrical work shall be left sealed as noted in Item A above.

C. Provide sleeves for conduit, cables, busway, etc., accurately before concrete floors are poured; or set boxes in the forms so as to leave openings in the floors so the required sleeves can be subsequently located.

D. Sleeves shall be rigid conduit with bushings installed on each end. Sleeves shall extend 6 inches beyond the surface they penetrate.

3.5 FLEXIBLE CONDUIT

A. Non-covered flexible steel conduit shall be used in making short connections from outlet boxes to recessed lighting fixtures. Such conduit runs shall be no longer than 72-inches.

B. Flexible conduit runs to other equipment shall be kept as short as possible, but shall have a minimum length of 12 inches.

C. Flexible conduit connections to dry type transformers, rotating or vibrating machinery, kitchen equipment, or any other equipment, which may result in the conduit being exposed to moisture, shall be PVC covered.

3.6 PVC CONDUIT

A. PVC conduit shall not be used above grade under any circumstances.

B. All PVC conduit joints of any type shall be solvent welded in accordance with the manufacturer's recommendations.

3.7 PULL BOXES

A. Pull boxes shall be provided where indicated on the drawings and/or where required to facilitate the installation of all required conductors or as required by NEC.

B. Pull boxes shall be installed exposed only in unfinished spaces. They shall be accessible.

C. Feeders within pull boxes shall be individually laced with nylon tie straps of the type with enlarged tab to permit identification of each feeder.

D. Conductors shall not be spliced inside pull boxes except with the approval in writing of the Architect. Where splices are permitted, they shall be made with splicing sleeves attached to the conductors with hydraulic crimping tools. Split bolt connectors shall not be permitted.

3.8 OUTLET LOCATIONS

A. Furnish and install outlet, junction, and pull boxes as required to facilitate the installation of the electrical systems as required.

B. All outlet, junction, and pull boxes shall be accessible with covers designed for quick removal. Where boxes are located above non-accessible ceilings, in walls, etc., in finished areas, the removable cover shall be flush with the finished surface. Cover finish and the exact location of the boxes shall be approved by the Architect.

C. The drawings are intended to show the locations of outlets, devices, fixtures and arrangement and control of circuits only. Exact locations shall be determined by actual measurement at the building and/or reference to the architectural drawings.

D. The location of any outlet may be moved ten feet with the prior approval of the Architect and before it is installed without any additional expense to the Owner.

E. Contractor shall check the location of all wall outlets including light fixtures, receptacles and switches, to verify that the outlets will clear any wall fixture, shelving, work tables, sinks or similar equipment that will be installed.

F. Outlets occurring in architectural features shall be accurately centered in same. Install wall switch outlets on the STRIKE SIDE of doors with cover plate clearing door trim.

G. Outlet boxes in non fire rated partitions shall NOT be set back-to-back. Boxes set side by side facing separate rooms or spaces, shall be connected together by offset nipple; after conductors are pulled, the nipples shall be tightly packed with mineral wool to prevent sound transmission.

H. Outlet boxes in fire-rated partitions shown to be mounted on the opposite side of the partition at the same height, shall be separated horizontally by a minimum of 24 inches.

I. The mounting height of all wall outlets is indicated on the architectural or electrical drawings. The height is from the finished floor to the center line of the device or outlet. The Contractor may with the Architect's approval vary the mounting heights to correspond to masonry joints.

J. Were outlets are shown as being adjacent and different mounting heights are indicated for each, they shall be mounted one directly over the other at the heights specified.

3.9 OUTLET BOXES

A. All outlet boxes shall be flush mounted within the wall regardless of wall construction, unless they are specifically shown as being used with exposed conduit. Cuts for outlet boxes in masonry walls shall be made so that the cover plate will completely cover the cut. The edge of all boxes shall be flush with the surface in which they are installed.

B. The devices that are to be installed in the boxes shall be screwed tight before cover plates are installed. Plates shall not be used as a means for tightening the devices or holding them in place.

C. Provide extension rings for all boxes when required by wall finish.

D. Junction boxes shall be provided with blank covers. Covers on ceiling outlets shall be round, and shall be painted to match ceilings. Covers on wall junction boxes shall be of size and finish as used on switch and receptacle outlets.

E. Where outlets are shown as being adjacent and different mounting heights are specified for each, they shall be mounted ONE DIRECTLY over the other, on the center line of the group or on the center line of the room or wall.

F. The mount height of all wall outlets is indicated on the architectural or electrical plans. The mounting height is from finished floor to the centerline of the device or outlet. The Contractor may, with the Architect's approval on the job, slightly vary the mounting height of wall outlet so that the outlet box, top or bottom, will occur at a masonry joint.

G. Outlet boxes shall be provided with 3/8" fixture stud to support light fixture. Outlet boxes shall be firmly anchored to structural member of the building, using wood screws for wood construction, bolts for steel construction, and expansion bolts secured in place with cement mortar for masonry construction. Ceiling outlet flush in furred acoustical tile ceiling construction for surface or pendant mounted lighting fixtures shall be in 4" square or octagonal pressed steel boxes supported from stud and rod, bars or hangers supported from the building structure independent of the ceiling construction. For outlet boxes located between steel studs, provide Caddy No. BHA; and adjacent to studs, provide Caddy No. MSC.

H. Where drawings indicate ganged installation of switches controlling 277 Volt lighting circuits of opposite phase, switches shall be separated by one full gang width, or separated with a permanently installed barrier between phase and/or different voltages.

I. Outlet boxes shall not be used as support for fluorescent lighting fixtures.

260548: VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

1.0 GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Electrical component importance factor (I_p) table.
   2. Electrical seismic restraint coordination drawings.
   3. Electrical system flexible connections.
   4. Designated - design submittal
   5. Field quality control test reports

B. Related Sections include the following:
   1. Division 26 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.2 PERFORMANCE REQUIREMENTS

A. Refer to structural drawings for Wind-load, Occupancy Category, Seismic Design Category, and Structural Spectral Response. If no structural drawings are available, Contractor shall provide structural engineering assistance to obtain the above.

B. Component Importance Factor, I_p:

Equipment / Component / Wiring System	I_p	
	Occupancy Category	
	II, III	IV
EPSS:		
- engine generators	1.5	1.5
- genset peripherals (controls, charger, battery, daytank, heaters, fuel system & controls, annunciator, etc.)	1.5	1.5
- paralleling (emergency) switchgear & controls	1.5	1.5
- electrical distribution from genset to transfer switch	1.5	1.5
- generator room HVAC (dampers, fans, controls)	1.5	1.5
- transfer switch and controls	1.5	1.5
Fire Pumps	1.5	1.5
Life Safety Branch (NFC 517-32) Power and System Wiring	1.5	1.5
- illumination of means of egress	1.5	1.5
- exit signage	1.5	1.5
- life safety alarm and alerting systems	1.5	1.5
- life safety communications systems (refer also to AHJ as some telephone & paging systems are necessary for life safety)	1.5	1.5
- generator set location (lighting, receptacles, generator, panelboard)	1.5	1.5
- elevator cab lighting, control, communications & signaling	1.5	1.5
- automatic doors in egress path	1.5	1.5
Critical Branch (NEC 517-33) Power and System Wiring		
- illumination	1.5	1.5
- isolated power systems	1.5	1.5

- patient care receptacles	1.5	1.5
- nurse call, code blue, staff alert systems	1.5	1.5
- telephone & data room lighting & receptacles	1.5	1.5
- medical gas pumps & compressors	1.5	1.5
- interventional diagnostic medical imaging equipment & cardiac catheterization labs	1.5	1.5
- physiological monitoring systems	1.5	1.5
- medical video & digital imaging	1.5	1.5
- selected critical receptacles & lighting, (indicated)	1.5	1.5
Equipment Branch (NEC 517-34) Power and System Wiring		
- sump pumps	1.0	1.5
- HVAC systems & controls	*	*
- elevator	1.0	1.5
- hyperbaric facilities	1.0	1.5
- hypobaric facilities	1.0	1.5
- automatic doors not in egress path	1.0	1.0
- autoclaving equipment	1.0	1.5
- medication dispensing equipment	1.5	1.5
- pneumatic tube systems	1.0	1.5
- non-essential telephone and paging systems	1.0	1.5
- infant abduction systems	1.0	1.0
- interpreter systems	1.0	1.5
- sprinkler jockey pump	1.5	1.5
- selected receptacles & lighting (indicated)	1.0	1.5
Normal Power and System Wiring		
- service entrances	1.0	1.5
- main service panels	1.0	1.5
- feeder and branch circuit panels (except those serving I_p=1.5 eq.)	1.0	1.0
- cctv, security, catv, and other non-essential systems	1.0	1.0
- doctor's dictation system	1.0	1.5
- nurse call staff location system	1.0	1.0
*Refer to Mechanical and Plumbing Seismic Restraint Specification Sections; I_p tables, for matching wiring importance		

1.3 SUBMITTALS

A. Delegated-Design Submittal: For seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
      a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 26 Sections for equipment mounted outdoors.
   2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
   3. Field-fabricated supports.
   4. Seismic-Restraint Details:
      a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
      b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the

restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.

c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

B. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

C. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic- restraint designs must be signed and sealed by a qualified professional engineer.

D. Comply with NFPA 70.

2.0 PRODUCTS

2.1 PRODUCT RESPONSIBILITY

A. Contractor shall be responsible for all seismic restraints and flexible connection products.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Kinetics Noise Control.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Ace Mountings Co., Inc.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc

3.0 EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment. Comply with requirements in Section 260533; “Raceways and Boxes”, for raceway flexible connections.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Tests and Inspections:
1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved) and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

260553: IDENTIFICATION FOR ELECTRICAL SYSTEMS

1.0 GENERAL

1.1 SECTION INCLUDES

A. This section includes equipment marking, wire and cable marking, and conduit marking.

1.2 RELATED SECTIONS

A. All conditions and requirements of Division 01 shall apply to the work specified in this section.

B. Section 099100 - Painting

1.3 REGULATORY REQUIREMENTS

A. Furnish products that are manufactured and rated for labeling and marking electrical equipment.

2.0 PRODUCTS

2.1 EQUIPMENT NAMEPLATES

A. Nameplates shall be engraved three-layer laminated plastic. In all cases, inner layer shall be white in color.

B. Nameplates shall be provided on all electrical enclosures and/or cabinets.

C. Engraved letters shall be 3/8 inches high.

D. Nameplate outer layer color shall be:
1. 480/277 Volt equipment – Red
2. 208/120 Volt equipment – Black
3. 240/120 Volt equipment – Blue

2.2 WIRE AND CABLE MARKERS

A. Markers shall be colored plastic tape for service entrance and feeder conductors and PVC sleeve type markers for branch circuit conductors.

B. PVC sleeve type markers shall be equal to Thomas & Betts E-Z-Code, white with black writing.

C. Service entrance and feeder conductor marking shall consist of phase identification follows:

208Y/120 Volt System	480Y/277 Volt System
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Purple
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White with Black Stripe
Ground - Green	Ground - Green

D. Branch circuit conductor marking shall consist of the source panel name and the branch circuit number as listed in the panel schedules on the drawings.

2.3 CONDUIT MARKERS

A. Conduit and raceway labeling shall be stenciled painted letters of height of 2 conduit diameters, or 2 inches, which ever is smaller. Voltage and function shall be stated in label.

B. Label paint shall be enamel, meeting requirements of Section 099100 - Painting. Color per voltage system:
   1. 480/277 Volt raceway – Red
   2. 208/120 Volt raceway – Black
   3. 240/120 Volt raceway – Blue

2.4 UNDERGROUND RACEWAY MARKERS

A. Raceway route markers shall be 4” by 4” by 18” long concrete stakes.

B. Raceway route warning tape shall be inert polyethylene, resistant to acids, alkalis, etc., which might be in the soil. The tape shall be a minimum of 4 mils thick, 6 inches wide, and yellow in color. It shall have the words “CAUTION – ELECTRIC LINE BURIED BELOW” imprinted along its entire length with a contrasting color permanent ink. The tape shall be “Terra Tape” as manufactured by Reef Industries, Inc., Houston, Texas; or equal.

2.5 PANELBOARD CIRCUIT DIRECTORIES

A. Circuit directory cards shall be white heavy cardboard manufactured for the purpose, with machine written black ink circuit number legends.

B. Circuit identification shall be in agreement with the actual connections as guided by the panel schedules on the drawings.

2.6 SWITCHBOARD AND DOORLESS PANELBOARD CIRCUIT BREAKER MARKERS

A. Circuit breakers markers shall be as per paragraph 2.1 above.

B. Circuit identification shall be in agreement with the actual connections as guided by the panel schedules on the drawings.

3.0 EXECUTION

3.1 Clean and remove grease, etc. from all equipment surfaces that will receive nameplates.

3.2 Provide labels for all electrical panels, switchboards, disconnects, cabinets, feeder and service raceways, motors, and major pieces of electrical equipment installed under this division

3.3 Provide panelboards that have doors with a directory card of all circuits in the panel.

3.4 Provide circuit breakers in switchboards and in panelboards that do not have doors with labels stating the circuit number and what the breaker is supplying.

3.5 Label all feeder conduits and all single equipment branch circuit conduits in excess of 6 ft. in length with painted labels located at 20 ft. on center along the entire length of the conduit run.

3.6 Mark all underground conduit runs installed outside the building with stakes set with tops flush in the ground directly over the source, end, and bends locations in the conduit run.

3.7 Provide marker tape over the entire length of all underground conduit runs installed outside the building. Tape shall be installed at a depth between 12 and 18 inches below the surface of the ground directly over the conduit.

3.8 Mark all service entrance phase conductors and the neutrals with colored plastic tape to identify phase assignments on each end of the conductor and in all pull and/or junction boxes.

3.9 Branch circuit conductors shall be color-coded via insulation color as follows:

208Y/120 Volt System	480Y/277 Volt System
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Purple
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White with Black Stripe
Ground - Green	Ground - Green

262416: PANELBOARDS

1.0: GENERAL

1.1 SECTION INCLUDES

A. Lighting and appliance panelboards

1.2 RELATED SECTIONS

A. Overcurrent Protective Devices

1.3 REFERENCES

The panelboards and protection devices in this specification are designed and manufactured according to latest revision of the following standards (unless otherwise noted).

A. ANSI 61

B. ANSI/NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment

Switches (600 Volts)

C. ANSI/NEMA PB 1, Panelboards

D. ANSI/NFPA 70, National Electrical Code

E. ASTM - American Society of Testing Materials

F. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards

G. CSA C22.2 No. 5.1, Molded Case Circuit Breakers

H. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service

I. Federal Specification W-P 115, Rev. C, Panel, Power Distribution

J. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches

K. NEMA PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

L. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures

M. UL 50, Enclosures for Electrical Equipment

N. UL 67, Panelboards

O. UL 943, Ground-Fault Circuit-Interrupters

1.4 DEFINITIONS

A. Overcurrent Protective Device -- a circuit breaker pole or single fuse. Example: a 2-pole device is considered 2 protective devices.

1.5 SYSTEM DESCRIPTION

A. Short circuit rating of panelboards shall be the interrupting rating of lowest rated device in the panel or applicable UL series rating for proper main and branch device combinations.

B. Panelboards shall have a maximum of 42 protective devices per panel, including sub-feeders and excluding main overcurrent protective devices. For more than 42 devices, 2 or more panelboards are required.

C. With 2 or more panelboards, sub-feed lug or thru-feed lugs shall be used in all but 1 section of each panelboard. Lugs shall have same capacity as incoming mains. Cable inter-connections shall be field installed.

D. Protective devices shall be molded case circuit breakers.

1.6 SUBMITTALS

A. Manufacturer shall provide copies of following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:
   1. Product Data on specified product;
   2. Shop Drawings on specified product;
   3. Certified trip curves for each specified product.

1.7 PROJECT RECORD DOCUMENTS

A. Maintain an up-to-date set of Contract documents. Note any and all revisions and deviations that are made during the course of the project.

1.8 OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.9 QUALIFICATIONS

A. Manufacturer shall have specialized in the manufacture and assembly of lighting and appliance panelboards for 25 years.

B. Lighting and appliance panelboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Article 1.03 of this specification.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products in accordance with recommended practices in manufacturer's Installation and Maintenance Manuals.

B. Deliver each lighting panelboard in individual shipping cases for ease of handling. Each panelboard shall be wrapped for protection.

C. Inspect and report concealed damage to carrier within specified time.

D. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic

to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation.)

E. Handle in accordance with NEMA and manufacturer's written instructions to avoid damaging equipment, installed devices, and finish.

1.11 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

A. Follow (standards) service conditions before, during and after panelboard installation.

B. Lighting and appliance panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between minus [30] and plus [40] degrees C. Indoor locations shall be protected to prevent moisture from entering enclosure.

1.12 SEQUENCING AND SCHEDULING

1.13 WARRANTY

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

1.14 MAINTENANCE SERVICE

A. Furnish complete service and maintenance of lighting and appliance panelboards for 1 year from date of substantial completion.

B. Include parts and labor.

1.15 EXTRA MATERIALS

A. Provide spares as indicated in drawings.

1.16 FIELD MEASUREMENTS

A. Make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

2.0 PRODUCTS

2.1 MANUFACTURER

A. General Electric Company products have been used as the basis for design. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents. Siemens, Eaton and Square D are specifically allowed.

2.2 EQUIPMENT

A. Furnish Lighting Panelboards, as indicated in drawings.

2.3 COMPONENTS

Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and

assemblies; and other required details.

A. Ratings
   1. Lighting and appliance panelboards shall be rated as indicated in drawings.
   2. Maximum current ratings for mains, sub-feeds and branches, respectively, shall be specified in drawings.

B. Enclosure
   1. Boxes shall be a nominal 20 inches wide and 5.75 inches deep with wire bending space per National Electric Code. Electrical Contractor to Coordinate with Architect to insure that any walls which have recessed panels are located and a minimum of 6” deep prior to work.
   2. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable.
   3. All door locks shall be metallic corbin latch bolt type or equivalent. All door locks shall be keyed for a single key.
   4. Clear Lexan (or equal) directory card holders shall be permanently mounted on front door.
   5. All panelboard series ratings shall be prominently displayed on dead front shield.
   6. Interiors shall permit top or bottom incoming cables.

C. Bus Bars
   1. Bus bars shall be phase sequenced, fully insulated and supported by high impact Noryl (or equal) interior base assemblies.
   2. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.
   3. Terminations shall be UL tested and listed and suitable for UL copper wire.
   4. Provide [1] continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.
   5. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length.
   6. Lugs shall be rated for 75 degree C terminations.
   7. Main lugs for copper conductors shall be bolted lugs. Lugs for aluminum conductors shall be compression lugs.
   8. Lug bodies shall bolt in place.

D. Circuit Breakers
   1. Molded case circuit breakers shall be bolt-on devices for 120/240V panels and shall be bolt-on for 277/480V panels.
   2. All circuit breakers shall have thermal and magnetic trip elements in each pole.
   3. Multi-pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
   4. Circuit breakers shall not be restricted to any mounting location due to physical size.
   5. All branch breakers 15 to 100 amperes shall be able to be mounted in any panel position for twin or double mounting without space penalty. Sum of ratings for 2 such twin mounted devices shall not exceed 180 amperes.
   6. Main and sub-feed circuit breakers may be vertically or horizontally mounted.
   7. Branch breaker panelboard connections shall be copper to copper.
   8. All panelboard terminations shall be rated as indicated in drawings.
   9. All breakers shall have an over center mechanism and be quick make and quick break.
   10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.
   11. Breaker handle and faceplate shall indicate rated ampacity.
   12. Circuit breaker escutcheon shall have standard ON/OFF markings.
   13. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits.

14. Branch breakers shall be UL listed for use with: Shunt Trips, Auxiliary and Alarm Switches.

E. Contactors shall be electronically held.

2.4 ACCESSORIES

A. Contactor control relays

B. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

C. Provide Transient Voltage Surge Suppression system as specified in the TVSS section and on prints.

2.6 FINISH

A. Boxes shall be corrosion resistant, zinc finish galvanneal.

B. Fronts shall be powder finish painted ANSI 61 gray.

3.0 EXECUTION

3.1 EXAMINATION

A. Verify that A-Series® panelboards are ready to install.

B. Verify field measurements are as shown on Drawings.

C. Verify that required utilities are available, in proper location and ready for use.

D. Beginning of installation means installer accepts conditions.

3.3 INSTALLATION

A. Install per manufacturer's instructions.

B. Install required safety labels.

3.04 FIELD QUALITY CONTROL

A. Inspect installed panelboards for anchoring, alignment, grounding and physical damage.

B. Check tightness of all accessible mechanical and electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.

C. Test each key interlock system for proper functioning.

3.5 ADJUSTING

A. Adjust all circuit breakers, access doors, operating handles for free operation as described in manufacturer's instructions.

3.6 CLEANING

A. Clean interiors of panels to remove construction debris, dirt, shipping materials.

B. Repaint scratched or marred exterior surfaces to match original finish.

262726: WIRING DEVICES

1.0 GENERAL

1.1 RELATED DOCUMENTS

A. The General Supplementary Conditions, and General Requirements (Division 1), apply to the work specified in the Section.

1.2 SWITCHES, RECEPTACLES AND COVERPLATES

A. Provide switches, receptacles, and coverplates as indicated on the plans and as specified herein.

B. All devices used by the contractor shall be UL approved and certified as meeting federal specifications as well as NEMA performance standards.

2.0 PRODUCTS

2.1 MATERIALS

A. Materials provided under this Section shall be manufactured and tested under the following standards:
   1. NEMA WD-1 General Wiring Devices
   2. ANSI/UL 498 Electrical Attachment Plugs and Receptacles
   3. ANSI/UL 20 General Use Snap Switches

B. All devices provided shall be UL listed and labeled.

C. All devices provided for use with plain steel coverplates shall be brown in color.

2.2 SWITCHES

A. Control switches for general lighting shall be quiet action, flush mounted, toggle handle type. Terminals shall be wire-wrap screw type. Switches shall be rated for 120-277 Volt service, 20 amperes.

B. Pilot light switches, where called for on the drawings, shall be the same as in “A” above complete with an internally lighted toggle. Toggle light shall be “LINE VOLTAGE”.

C. Switches shall be specification grade, color as indicated on the drawings, and manufactured as follows:
   1. Single pole - 20AC1
   2. Three way - 20AC3
   3. Four way - 20AC4

D. Wall box dimmer switches shall be of the slide dimmer type as follows:
   1. Single pole or 3-way rated at 2000 watts

2.3 RECEPTACLES

A. Convenience receptacles, either single or duplex type, for general-purpose use shall be rated 125 volts, 20 Ampere. They shall have wire-wrap screw type terminals, straight non-locking blade slots, and U-ground as by NEMA 5-20R configuration. They shall be constructed of two-piece molded housing with a wrap around type mounting strap and shall have double-wiping bronze contacts. Devices are to have finder grooves.

B. Plug receptacles shall be ivory in color unless otherwise specifically noted in these specifications or on the drawings.

C. Plug receptacles shall be commercial specification grade as manufactured by P&S as follows:
   1. Duplex rated at 20 amps – CRF20
   2. Ground fault interrupter duplex rated at 20 amps – 2094.

D. Plug receptacles for special purposes or of special construction shall be so stated and specifications given on the drawings.

2.4 FLOOR OUTLETS

A. Floor outlet receptacles shall be duplex as above installed in floor boxes as specified in Section 16131 of these specifications.

2.5 COVERPLATES

A. Coverplates shall be commercial specification grade. Plates shall match the device or combination of devices in question. See drawings for any notes on specialty plates.

B. Telephone outlet coverplates provide by others.

C. Covers for weatherproof outlets shall be gasketed and have flip covers for each device. Exposed devices to have in use covers.

3.0 EXECUTION

3.1 INSTALLATION

A. Where more than one device is indicated at a location, the devices shall be mounted in combined sectional gang boxes and covered jointly by a common plate.

B. Light switches shall be installed on the strike side of doors as actually installed; advise Architects where drawings contradict.

C. The Architect reserves the right to relocate any wiring device up to a distance of ten feet from the location shown, before rough in, without additional cost.

D. All junction boxes, outlet boxes, sectional switch boxes, utility boxes, etc. shall be covered with a finished coverplate unless specifically noted otherwise.

E. Device plates shall be securely fastened using all required screws. All four (4) edges shall be in continuous contact with finished wall surfaces.

F. Coverplates shall be mounted with vertical orientation, unless otherwise noted or shown on drawings.

262813: FUSES

1.0 GENERAL

1.1 This section covers over current devices used for switchboard main sections, disconnect switches, etc.

1.2 The equipment furnished under this section shall be designed, manufactured, and tested according to the following standards:

A. UL 977 - Fused Power Circuit Devices

B. UL - Requirements for Class L Current Limiting and High Interrupting Fuses.

2.0 PRODUCTS

2.1 FUSES

A. Fuses protecting panelboards and transformers shall be current limiting type, Class J, 600 Volt, with interrupting capacity of 200,000 amps RMS. Fuses shall be as manufactured by Ferraz Shawmut or equal.

B. Fuses protecting motor branch circuits shall be dual element type, 250 or 600 Volt, with interrupting capacity of 200,000 amps RMS. They shall be sized for motor nameplate data per manufacturer's recommendations. Fuses shall be as manufactured by Ferraz Shawmut.

C. Clips for fuses rated above 10,000 AIC shall be rejection types. Clips shall be provided in accordance with NEC 240-60 (B).

3.0 EXECUTION

3.1 Contractor shall insure that overcurrent devices are installed securely, properly and in accordance with standard industry practice. All bolt connections which secure the device to its supports shall be tight and secure. All terminal screws on lugs, etc. shall be tight and securely hold the conductor in place. Covers on enclosed devices shall be installed and left closed and secured by screws, clamp closures, or locks, as required.

3.2 All over-current protective devices shall be sized for the protected device, regardless of other considerations, such as the maximum size protective device that will physically fit in the subject unit.

3.3 The contractor shall provide the owner with a spare fuse cabinet complete with 1 set (minimum or 3) of spare fuses for each fuse size rating on the project. No more than 3 fuses of the same size rating are required.

262816: ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1.0 GENERAL

1.1 The term enclosed switch shall refer to fused switches, motor switches, twist-lock receptacles, and any other mechanical device designed to physically interrupt a circuit other than overcurrent protective devices.

1.2 Equipment furnished under this section shall be designed, manufactured, and tested in accordance with the following standards:

A. NEMA KS1 Air Break Switches

B. ANSI-C33.64 Safety Standard for Enclosed Switches

C. UL-98 Safety Standards for Enclosed Switches

D. NEMA AB-1 Molded Case Circuit Breakers

E. UL 489 Branch Circuit and Service Circuit Breakers

2.0 PRODUCTS

2.1 Switches for use on circuits of voltages at 600 and below, shall be safety switches which:

A. Are UL listed, E-4669

B. Are equipped with full cover interlocks so that they can not be opened with switch in the "ON" position, without manually overcoming the interlock as per the manufacturer’s instructions.

C. Are equipped with quick-make, quick-break mechanisms

D. Are suitable for use as service entrance equipment when installed in accordance with the NEC

E. Housed in NEMA 1 enclosures on indoor dry applications and NEMA 3R enclosures on outdoor or damp applications

F. Have covers with handles, which can be padlocked, to secure the operating handle in the "OFF" position.

G. All disconnects to be heavy duty.

2.2 Switches shall be fusible types unless otherwise noted on the drawings.

2.3 Switches shall be as manufactured by GE, SIEMENS, Eaton, or Square D.

2.4 CIRCUIT BREAKERS

A. Circuit breakers shall be molded case type, equipped with a quick-make, quick-break mechanism. Breakers shall be thermal-magnetic type and have automatic release by means of thermal elements in each phase.

B. Breakers shall be rated for the application and be ambient temperature compensated.

C. Breakers shall have silver alloy contacts, be equipped with heat-absorbing arc-chutes, and have

straight in wiring UL listed lugs of the same rating as the breaker frame.

D. Breaker ampacity shall be marked on the breaker case and be visible from the front when the breaker is installed.

E. When tripped, the breaker handle or toggle shall be in a position between "ON" and "OFF" and shall not be capable of re-closing until the handle or toggle is moved to the "OFF" position first.

F. Breakers with two or three poles shall have handles, which are factory made to trip all poles together. Field-made “tie” handles will not be permitted.

G. Breakers shall match and be manufactured by the same company that manufactures the panelboard in which they are installed.

H. Breakers shall have an interrupting capacity not less than the available fault current at the breaker. Unless otherwise specified or scheduled on the drawings, all breakers are to be series rated by the manufacturer for the available fault current indicated at the main on the drawings.

I. All circuit breakers shall be bolt in type. Plug in breakers shall not be permitted.

J. All circuit breakers sized 125 amp or larger to have interchangeable plug ratings.

2.5 GROUND FAULT CIRCUIT INTERRUPTER BREAKERS

A. Ground fault protective devices shall be constructed so as to have a sensor, which encircles all conductors, including the neutral. This sensor shall react to an unbalance of current in the conductors so as to trip the circuit-interrupting device and open the circuit. The device shall detect leaks of 5 milliamperes and open the circuit within 1-1/2 to 3 cycles of current.

3.0 EXECUTION

3.1 Disconnect switches are appurtenances to the project. Their locations, while required to meet the NEC, shall not cause any impediment to the project. Therefore, the contractor shall verify the location of all disconnect switches required by the project, prior to their installation. The installed location of any disconnect shall not impede the access to, or the working space around, any piece of equipment. Neither shall the location cause any loss of equipment performance or maintainability due to impeded air flows, blocked access panels or doors, etc. As disconnect switches are generally shown diagrammatically without dimensions, this requirement applies regardless of the location shown on the drawings. If there is any question as to the location of any disconnect, the contractor shall ask the engineer for clarification prior to installation. (While it may appear that a chosen location is appropriate, coordination with other trades must be made by the contractor to insure that other equipment to be installed at a later date will not cause the disconnect location to be problematic.) If any disconnect is found to be installed in a location which causes problems for the equipment as implied above, the disconnect shall be relocated at the sole expense of the contractor.

3.2 Switches shall be installed so as to be readily accessible with proper spacing in front per the NEC.

3.3 Switches shall be securely mounted on brackets, unistrut type rails, etc. Do not mount directly to masonry, sheetrock, etc., without proper support from structure or proper standoff brackets.

3.4 Bolts, terminal screws, etc., for switches shall be tightened to securely hold the devices, conductors, or pads to the points of termination or support. Loose connections shall not be permitted. Multiple hole pads or termination plates shall be installed with ALL bolts required so that there are no bolt holes unused.

3.5 All switches shall be identified per the corresponding sections of this specification.

264313: TRANSIENT VOLTAGE SUPPRESSION FOR LOW VOLTAGE ELECTRICAL POWER SYSTEMS

1.0 GENERAL

1.1 SUMMARY

A. Section includes field-mounted SPD for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Sections:
1. Division 26 Section "Switchboards" for factory-installed SPD.
2. Division 26 Section "Panelboards" for factory-installed SPD.
3. Division 26 Section "Wiring Devices" for devices with integral SPD.

1.2 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. VPR: Voltage Protection Rating.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

B. Qualification Data: For qualified testing agency.

C. Product Certificates: For SPD devices, from manufacturer.
1. UL 1283.
2. UL 1449.

D. Field quality-control reports.

E. Operation and Maintenance Data: For SPD devices to include in emergency, operation, and maintenance manuals.

F. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

C. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.

D. Comply with UL 1283 and UL 1449.

E. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
   1. Notify Architect and Owner no fewer than two days in advance of proposed electrical service interruptions.
   2. Do not proceed with interruption of electrical service without Architect's and Owner's written permission.

B. Service Conditions: Rate SPD devices for continuous operation under the following conditions unless otherwise indicated:
   1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
   2. Operating Temperature: 30 to 120 deg F.
   3. Humidity: 0 to 85 percent, noncondensing.
   4. Altitude: Less than 20,000 feet above sea level.

1.6 COORDINATION

A. Coordinate location of field-mounted SPD devices to allow adequate clearances for maintenance.

B. Coordinate SPD devices with Division 26 Section "Electrical Power Monitoring and Control."

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.
      a. Service Entrance Suppressor: 10 years, inclusive of lighting.
      b. Panelboard Suppressors: 7 years.

2.0 PRODUCTS

2.1 PANELBOARD SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, Current Technology, TransGuard 100 Series is basis of design for Panelboard Suppressors. Equivalent unit by Liebert is acceptable.

B. Surge Protection Devices Description: Non-modular, sine-wave-tracking type with the following features and accessories:
   1. Comply with UL 1449.
   2. Short-circuit current rating complying with UL 1449, and matching or exceeding the panelboard short-circuit rating and redundant suppression circuits; with individually fused metal-oxide varistors.
   3. Fuses, rated at 200-kA interrupting capacity.
   4. Fabrication using bolted compression lugs for internal wiring.
   5. Integral disconnect switch.
   6. Redundant suppression circuits.
   7. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
   8. LED indicator lights for power and protection status.
   9. Audible alarm, with silencing switch, to indicate when protection has failed.
   10. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

11. Six-digit transient-event counter set to totalize transient surges.

C. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 V, 3-phase, 4-wire circuits shall be as follows:
   1. Line to Neutral: 1200 V for 480Y/277 V.
   2. Line to Ground: 1200 V for 480Y/277 V.
   3. Neutral to Ground: 1200 V for 480Y/277 V.
   4. Line to Line: 2000 V for 480Y/277 V.

2.2 ENCLOSURES

A. Indoor Enclosures: NEMA 250 Type 1.

B. Outdoor Enclosures: NEMA 250 Type 4X.

3.0 EXECUTION

3.1 INSTALLATION

A. Install SPD devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install SPD devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
   1. Provide multiple, 100-A circuit breaker as a dedicated disconnecting means for SPD unless otherwise indicated.
   2. Minimum conductor size is #1/0 copper.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
   2. After installing SPD devices but before electrical circuitry has been energized, test for compliance with requirements.
   3. Complete startup checks according to manufacturer's written instructions.

B. SPD device will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Do not energize or connect panelboards, control terminals, or data terminals to their sources until SPD devices are installed and connected.

265000: LIGHTING FIXTURES

1.0 GENERAL

Not used.

2.0 PRODUCTS

2.1 INTERIOR LUMINAIRES AND ACCESSORIES

A. All LED light engines (combination of diodes, driver, heat sink, housing and optics), whether screw-in or hardwired, shall meet all of the following:
   1. The rated driver input wattage and total number of LEDs shall be published by the manufacturer for each fixture unit.
   2. The LED fixture manufacturer shall have been in business and producing LED fixtures for a minimum of 10 years.
   3. All LED fixtures shall be dimmable either by CAT 5 communications, or 0 to 10 Volt controls.
   4. All LED fixtures shall be DLC listed.
   5. All LED fixtures shall be Energy Star listed.
   6. All LED fixtures shall be UL listed

B. Housings shall be formed of cold rolled steel. Housings shall be painted after fabrication.

C. LED units shall be manufactured for 50 to 100 thousand hours of operation. LEDs shall exhibit 99% lumen maintenance at 60,000 hours of operation.

D. All drivers and internal components of all fixtures shall be accessible from the floor side of the installed fixture.

2.2 EXTERIOR LUMINAIRES AND ACCESSORIES

A. Enclosures: Complete with gaskets to form weatherproof assembly.

B. Exterior LED fixtures shall be manufactured and rated for outdoor installation.

3.0 EXECUTION

3.1 INSTALLATION

A. Install fixtures complete and ready to operate.

B. Support surface-mounted luminaires directly from building structure, provide auxiliary support laid across top of ceiling Ts. Install fluorescent luminaires larger than 2' x 4' size independent of ceiling framing.

C. Install recessed luminaires to permit removal from below. All recessed fixtures shall be supported from the structure of the building, not from the ceiling grid. Provide air plane cable ties to structure from 2 of the four corners of the recessed fixtures for seismic support.

E. Luminaire Pole Bases: Size and constructed as indicated on Drawings. Project anchor bolts 2" minimum above base. Install poles on bases plumb; provide double nuts for adjustment. Grout around pole base.

F. Use belt slings or non-chafing ropes to raise and set pre-finished luminaire poles.

3.2 REPLACEMENT

A. Replace failed fixture components as required up to complete fixture for any fixture that is not operating properly at building construction completion prior to turn over to owner.

3.3 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire and pole finish at completion of work.

270500: COMMON WORK RESULTS FOR COMMUNICATIONS

1.0 GENERAL

1.1 The Contractor shall furnish all material and equipment as specified below or on the drawings to provide a complete communications raceway system. Refer to drawings for cable and device installation requirements. Contractor is responsible for installation of all communication wiring with the exception of the Nurse Call System. Provide pull string in conduits left in readiness for installation of wiring by others.

2.0 PRODUCTS

2.1 BACKBOARDS

A. Equipment backboards shall be provided where indicated on the drawings. Backboards shall be ¾" thick plywood, grade B-C, fire-retardant, securely fastened to the wall. Boards shall be sized as shown on the drawings but will generally be in units of 4 ft. by 8-ft. sheets.

2.2 CONDUITS

A. Unless otherwise specified, conduits to outlet boxes will run from the outlet box up to nearest ceiling space and be stubbed and bushed at this location. Conduits shall be ¾" unless otherwise noted on the drawings.

B. Pull strings shall be provided in all conduits to be left empty.

C. Where required, or shown on the drawings, steel conduit sleeves shall be provided to allow access between floors, through walls, etc. All sleeves shall have reamed and bushed ends.

2.3 COMMUNICATION GROUND CONDUCTOR

A. Provide a #4 insulated copper wire to serve as a ground for the communication systems.

B. Install grounding conductor between backboards using a 1" conduit for horizontal runs and route from existing backboards through existing firestop sleeves in floors and ceilings.

C. Terminate #6 ground to data racks.

D. Terminate #6 ground to CATV splitters.

E. Provide a ground bar located at the backboards for use by other trades.

3.0 EXECUTION

3.1 BACKBOARDS

A. Install backboards flush with floor.

B. Paint backboard to match walls of room in which it is installed.

C. Provide a duplex receptacle outlet at backboard with circuit.

3.2 Provide all sleeves, floor or wall, with appropriate fire stopping if they penetrate a fire barrier.

312000: EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for slabs-on-grade.
   4. Subbase course for concrete walks and pavements.
   5. Base course for asphalt paving.
   6. Subsurface drainage backfill for walls and trenches.
   7. Excavating and backfilling trenches within building lines.
   8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:
   1. Division 32 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.
   2. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.
   3. Division 21, 22, 23 and 26 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.03 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.
   1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as

well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.04 SUBMITTALS

A. Product Data: For the following:
1. Each type of plastic warning tape.
2. Separation fabric.

B. Photographs of existing adjacent structures and site improvements

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Geotechnical Testing Agency Qualifications: The Geotechnical testing agency will be hired by the Owner. The Contractor shall coordinate testing requirements with the testing agency and provide access to the site.

C. After excavation of infiltration based stormwater management areas, such as pervious pavements, bio-retention, or infiltration beds, contractor shall inform engineer and request inspection of subgrade. Contractor shall have subgrade surveyed by professional surveyor and provide as-built to engineer. Photographs should be taken after installation of each layer of backfill, i.e. top of stone, and top of soil media.

1.06 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

C. The contractor shall refer to the geotechnical report for requirements regarding undercutting and importation of approved fill. The contractor shall include undercutting, offsite waste, importation and compaction of approved fill in the base bid as outlined in the geotechnical report.

C. The contractor shall refer to the geotechnical report for requirements regarding undercutting and importation of approved fill. The contractor shall include undercutting, offsite waste, importation and compaction of approved fill in the unit costs as outlined in the geotechnical report.

D. Architect's Earthwork and Site Grading Design, and this Specification Section 31 20 00 are intended to comply with recommendations of the Geotechnical Engineer as found in the Geotechnical Report mentioned in 1.01 Related Documents, part B.
   1. Contractor shall read the Geotechnical Report.
   2. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
   3. Additional test borings and other exploratory operations may be performed by the Contractor, at Contractor's option. However, no change in Contract Sum will be authorized for such additional exploration.

E. Contractor shall comply with the Architect's Specifications and Drawings, but they shall notify the Architect prior to performing any Work in question if they perceive conflicts between the Architect's Specifications and the recommendations found in the Geotechnical Report. The Architect will resolve the questions.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Imported fill soils should consist of low to moderately plastic clay or silt with a plastic index of less than thirty (PI<30) and a standard Proctor maximum dry density greater than 90 pounds per cubic feet. The imported fill should contain no rock fragments larger than 4 inches in any dimension, and should be free from organic matter and other deleterious matter. The on-site soils may be used as engineered fill as approved acceptable by the Owner's Geotechnical testing agency. Existing fill soils will require evaluation by the Owner's Geotechnical testing agency to determine if they can be used as structural fill.

C. Unsatisfactory Soils: The Geotechnical testing agency observation will determine unsatisfactory soils.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed

stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Communicaiton, Alarm or Singal Lines, Cables or Conduit.
   4. Blue: Potable Water systems.
   5. Green: Sewer and Drain systems.
   6. Purple: Reclaimed Water, Irrigation and Slurry Lines, Fire Protection or other Non-potable Water lines.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Strip all topsoil, vegetation, and any debris from the construction area and either waste it from the site or use as topsoil or fill in areas to be landscaped. The stripped area should extend at least 10 feet beyond exterior foundation excavations and at least 5 feet beyond the outside edge of paved areas.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 STABILITY OF EXCAVATIONS

A. Comply with all Federal, State and local codes, ordinances and requirements of authorities having jurisdiction to maintain stable excavations.

3.05 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Any reference to rock on the plans or specifications is not to be construed as classification of excavation.

A. Excavation shall be where indicated on the drawings and to the grades indicated.

B. Excavation shall be classified as either “common excavation” or “rock excavation.” “Rock excavation” shall be such material which cannot be removed by means other than by blasting or with air hammer. Materials, which can be removed by ripping, shall not be considered “rock excavation.” “Common excavation” shall include all types of materials that do not fall into the category of “rock excavation” as defined above. Classification of excavation shall be determined by the Owner. It shall be the Contractor’s responsibility to notify the Owner when rock excavation is encountered. The Contractor shall include in his proposal, a unit price for “rock excavation.” No payment will be made for removal of rock below the indicated sub-grade elevation.

B. Determination of Pay Quantities
   1. The volumes of rock excavation for which payment will be allowed shall be expressed in cubic yards as computed from cut measurements.
   2. For pipeline excavation, the allowable volume of rock excavation shall be based on the maximum allowable width of trench as shown on the plans and specified herein, and on the centerline depth of rock from the top of rock to the specified bottom of the trench plus whatever depth is required by the plans and Specifications for bedding if rock extends to such depth, or to the bottom of the rock if above these depths. No allowance shall be made for excavating to extra widths for construction of pipeline appurtenances, or for any other reason, and costs of such additional rock excavation shall be included in the unit price bid for

this item.

3. Rock excavation shall be computed by the average-end-area method. All measurements shall be taken to the nearest 1/10 foot.

C. Payment

1. Payment for rock excavation performed under these Specifications shall be made for the quantities determined in the manner specified above at the applicable contract unit price per cubic yard as listed in the Bid Schedule.
2. These amounts, so paid, shall cover the cost of furnishing all labor, materials, tools, plant, and other expense in connection with or incidental to rock excavation.

3.06 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

B. Rock encountered in the process of excavation for structures shall be uncovered and stripped of all loose materials over the entire limits of excavation. Rock encountered for removal in a trench section shall be uncovered for a distance of not less than fifty feet (50'). In both cases, the Engineer shall be notified immediately so that the surface can be examined and the necessary measurements and elevations taken. Any material removed prior to inspection and measurement by the Engineer shall be considered as common excavation.

D. Rock under structures shall be excavated to lines and grades shown on the Drawings. Except as hereinafter provided otherwise where rock excavation has been carried below grade, the Contractor shall backfill to grade with Class B concrete at his/her own expense.

Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, the portion of the foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock .The portion below grade shall be backfilled with Class B concrete.

Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, the portion of the foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class B concrete.

Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of 12 inches below grade, and the space below grade shall be backfilled with crushed stone as specified above for pipe lines.

C. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before construction

of any structure is started in the vicinity.

3.07 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.08 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
   1. Clearance: 12 inches on each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
   1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipe Line, Inches	Depth of Excavation Below Bottom of Pipe, Inches	
	Sewer Pipe	Water Pipe
4 to 12 incl.	6	6
15 to 33 incl.	8	8
36 and over	12	12

The space below grade for pipe sewers shall then be backfilled with 3/8 inch crushed rock or gravel or other approved material and tamped to the proper grade. Where pipe sewers are constructed on concrete cradles rock shall be excavated to the bottom of the cradle as shown on the Plans.

F. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before construction of any structure is started in the vicinity.

3.09 APPROVAL OF SUBGRADE

A. Notify Architect when excavations have reached required subgrade.

B. If Architect or Soils Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

E. Avoid overcompaction and smearing of subgrade below infiltrations areas such as pervious pavement and bio-retention. Rake or rip subgrade as necessary to remove any smearing of subgrade.

3.10 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

B. Where width of trench exceeds industry standard width, provide stronger pipe or special installation procedures, as required by the Architect at no cost to the Owner.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for record documents.
   3. Inspecting and testing underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring and bracing and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls

3.13 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. In areas where trench is under paved areas, backfill remainder of trench with Bedding or Engineered fills to subgrade.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.

D. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of public roadways, or 24 inches below surface of parking lots or driveways. After installing and testing, completely encase piping or conduit in a

minimum of 4 inches of concrete before backfilling or placing roadway subbase.

E. Place and compact initial backfill of satisfactory soil or subbase material, free of particles larger than 1 inch, to 12 inches over pipe or conduit.

F. Where sewers, water lines, etc. are to be installed within the street right-of-way, they shall be backfilled full depth with stone per local code. The trenches under the building and at least 5 feet beyond the building limits shall be backfilled with low plasticity and low permeability soils per the geotechnical reports. If sewer is located in fill and backfill is six feet or over from the top of pipe to finished subgrade, backfill in accordance with paragraph above.
   1. Carefully compact material under pipe haunch and backfill evenly on both sides and along pipe or conduit to avoid damage or displacement of system.

G. Fill voids with approved backfill materials as shoring and bracing and sheeting is removed.

H. Place and compact final backfill of satisfactory soil material to final subgrade.

I. Coordinate backfilling with utilities testing.

J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.14 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills. Areas receiving fill shall be proof rolled in the presence of a Geotechnical Engineer prior to fill placement. Areas identified as unacceptable by the Geotechnical Engineer shall be excavated (undercut) and backfilled prior to fill placement.
   1. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. When subgrade or existing ground to receive fill has density less than required for fill, break up surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.

C. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use subbase or base material, or satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use drainage fill over subgrade and engineered fill to bring to subgrade.
   5. Under footings and foundations, use engineered fill.

D. Compact rock in accordance with the Geotechnical Engineer’s recommendations

3.15 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, building slabs and steps, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.
   2. Under pavements, scarify and recompact top 24 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.
   3. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent standard Proctor compaction.
   4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent standard Proctor compaction.

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1/2 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

A. Drainage Piping: Drainage pipe is specified in Division 33 Section "Subdrainage."

B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
   1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
   1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.

3.19 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:
   1. Place base course material over subbase.
   2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry density according to ASTM D 698.
   3. Shape subbase and base to required crown elevations and cross-slope grades.
   4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
   5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.20 DRAINAGE COURSE

A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
   1. Compact drainage course to required cross sections and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.
   2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
   3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.21 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a Geotechnical engineering firm to perform field quality assurance testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
   2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on visual comparison of each subgrade

with related test strata when acceptable to the Geotechnical Engineer.

3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
4. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

313116: TERMITE CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes the following for termite control:
   1. Soil Treatment

1.03 DEFINITIONS

A EPA: Environmental Protection Agency.

B. PCO: Pest Control Operator.

1.04 SUBMITTALS

A. Product Data: Treatments and application instructions including EPA-Registered Label.

B. Product Certificates signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.

C. Qualification Data: For firm and persons specified in “Quality Assurance: Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for owner’s record information, including the following as applicable:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Brand name and manufacturer of termiticide.
   4. Quantity of undiluted termiticide used.
   5. Dilutions, methods, volumes, and rates of application used.
   6. Areas of application.
   7. Water source for application.

E. Warranties: Special warranties specified in this section.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.

B. Regulatory Requirements: formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

B. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are complete, except as otherwise required in construction operations.

1.07 COORDINATION

A. Coordinate soil treatment application with excavating, filling, grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.08 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity of damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

C. Warranty Period: Five years from date of Substantial Completion.

D. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.09 MAINTENANCE SERVICE

A. Continuing Service: Provide a proposal for continuing service, including monitoring, inspection, and retreatment for occurrences of termite activity, from applicator to Owner, in the form of a standard yearly (or other period) continuing service agreement, starting on the date of Substantial Completion. State services, obligations, conditions and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quality required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product’s EPA-Registered Label.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers

offering products that may be incorporated into the work include, but are not limited to, the following:

1. AgrEvo Environmental Health, Inc.: A company of Hoechst and Schering, Berlin.
2. American Cyanamid Co.: Agricultural Products Group, Specialty Products Department.
3. Bayer Corp.: Garden & Professional Care.
4. DowElanco
5. FMC Corp.: Pest Control Specialties.
6. Zeneca Professional Products.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.

C. Fit filling hose connected to water sources at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.03 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.04 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers,

piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

3. Masonry: Treat voids
4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect Termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instruction.

D. Post warning signs in areas of application.

E. Re-apply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application

321216: HOT MIX ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Hot-mix asphalt paving.
   2. Hot-mix asphalt patching.
   3. Hot-mix asphalt overlays.
   4. Pavement-marking paint.
   5. Wheel Stops

B. Related Sections include the following:
   1. Section 32 13 73 – Pavement Joint Sealants
   2. Section 31 20 00 – Earthwork
   3. Section 31 11 00 – Subgrade and Base Course Preparation

1.03 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
   1. Standard Specification: As indicated.

1.04 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.

C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

D. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
1. Slurry Coat: Comply with weather limitations of ASTM D 3910.
2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel;; complying with ASTM D 692 and GDOT specifications.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, or combinations thereof; complying with ASTM D 1073 and GDOT specifications.
1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass and GDOT specifications.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242 and GDOT specifications.

2.02 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.

C. Under-sealing Asphalt: ASTM D 3141, pumping consistency.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wetable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Paving Geotextile: Non-woven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.

E. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952.
1. Color: As indicated.

F. Wheel Stops: Pre-cast, air-entrained concrete, 2500-psi minimum compressive strength, approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for anchoring to substrate.
1. Dowels: Galvanized steel, diameter 3/4 inch, minimum length 10 inches.

2.04 MIXES

A. Provide mixes compling with typical specifications of GDOT.

B. Surface Course: Surface course shall conform to GDOT (Hot Mix) with aggregates meeting requirements of Type F, per GDOT Specifications, Section 828 and Section 400.

C. Asphaltic Binder Course: Binder course shall conform to Type B, per GDOT Specifications, Section 828 and Section 400.

D. Prime Coat: Asphalt emulsion prime conforming to GDOT specifications.

E. Tack Coat: ASTM D 977, emulsified asphalt or ASTM d 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application per GDOT specifications.

F. Base shall be a well-graded crushed stone conforming to GDDT specifictions, Section 815 and Section 310.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that sub-grade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll sub-base using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.02 COLD MILLING

A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
   1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.03 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Re-compact new sub-grade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
   1. Tack coat faces of excavation and allow to cure before paving.
   2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
   3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Pump hot under-sealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.

C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.
   1. Allow tack coat to cure undisturbed before paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.04 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared sub-grade is ready to receive paving.
   1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base

course.

B. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

C. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared sub-grade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

3.05 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
   1. Place Binder.
   2. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   3. Spread mix at minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
   5. Regulate paving machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide, except where fill-in edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.06 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat.
   2. Offset longitudinal joints in successive courses a minimum of 6 inches.
   3. Offset transverse joints in successive courses a minimum of 24 inches.
   4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.07 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
   2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping while surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.08 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.09 ASPHALT CURBS

A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat, unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 deg F.

1. Asphalt Mix: Same as pavement surface-course mix.

3.10 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal. /sq. yd. to existing asphalt pavement and allow to cure. Lightly dust areas receiving excess fog seal with fine sand.

B. Slurry Seals: Apply slurry coats in a uniform thickness according to ASTM D 3910 and allow curing.
1. Roll slurry seal to smooth ridges and provide a uniform, smooth surface.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to cure for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturers recommended rates to provide a minimum wet film thickness of 15 mils.
1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb./gal.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
3. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
b. Field density of in-place compacted pavement may also be determined by

nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

321313: PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Concrete sidewalks, roads, aprons, door pads, curbs and gutters.

B. Reinforcement.

C. Surface finish.

D. Curing.

1.02 RELATED WORK

A. Section 32 11 00 - Sub-grade and Base Course Preparation

B. Section 32 13 73 - Pavement Joint Sealants

C. Section 31 20 00 – Earthwork

D. Division 3 Section “Cast-in-Place Concrete”

1.03 REFERENCES

A. ACI 211.1 - Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.

B. ACI 211.2 - Recommended practice for Selecting Proportions for Structural Lightweight Concrete.

C. ACI 301 - Specifications for Structural Concrete for Buildings.

D. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.

E. ACI 305R - Hot Weather Concreting.

F. ACI 306R - Cold Weather Concreting.

G. ACI 315 - Details and Detailing of Concrete Reinforcement.

H. ACI 318 - Building Code Requirements for Reinforced Concrete.

I. ACI 347 - Recommended Practice for Concrete Formwork, Concrete Reinforcing Steel Institute, Manual of Standard Practice.

J. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

K. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

L. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

M. ASTM C31 - Standard Method of Making and Curing Concrete Test Specimens in the Field.

N. ASTM C33 - Standard Specification for Concrete Aggregates.

O. ASTM C39 - Standard Test Method of Compressive Strength of Cylindrical Concrete Specimens.

P. ASTM C78 - Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).

Q. ASTM C94 - Ready Mixed Concrete.

R. ASTM C143 - Slump of Portland Cement Concrete.

S. ASTM C150 - Portland Cement.

T. ASTM C172 - Sampling Fresh Concrete.

U. ASTM C173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.

V. ASTM C192 - Making and Curing Concrete Test Specimens in the Laboratory.

W. ASTM C231 - Air Content Of Freshly Mixed Concrete by the Pressure Method.

X. ASTM C260 - Air-Entraining Admixtures for Concrete.

Y. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

Z. ASTM C494 - Chemical Admixtures for Concrete.

AA. ASTM D8139 - Semi-rigid, Closed Cell, polypropylene form, preformed joint fillers for Concrete Paving and Structural Construction.

BB. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

C. Submit laboratory test reports for concrete materials and mix design test as specified.

D. Provide material certificates in lieu of materials laboratory test reports when permitted by Owner's Representative. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item meets specified requirements.

1.05 TESTS

A. As the work progresses, sample concrete in accordance with ASTM C172.

B. Make slump tests according to ASTM C143, one slump test for each set of test cylinders.

C. Test air content of concrete made with normal-weight aggregates having low water absorption according to either ASTM C231 or ASTM C173. For lightweight aggregates

or aggregates with high absorptions, use latter test method.

D. Make compression test specimens and cure according to ASTM C31. Each test shall consist of one set of laboratory cured cylinders. A set shall consist of four cylinders. Minimum number of tests shall be one for 100 cubic yards of concrete for each class. Make at least one test per day of each class of concrete used that day.

E. Cure specimens under laboratory conditions. Specimens cured under job conditions may be required when, in Owner's Representative's opinion, there is a possibility of the surrounding air temperature falling below 40°F, or rising above 90°F.

F. Test cylinders according to ASTM C39.

G. Test laboratory cured cylinders one at seven days, two at 28 days, and one at 56 days, if required.

H. Strength level of concrete will be considered satisfactory if averages of any three consecutive strength test results of laboratory cured cylinders equal or exceed specified strength f'c, and no individual strength test result falls below specified strength f'c by more than 500 psi.

I. Make reports on cylinder tests to Owner's Representative and show dates placed and tested, name of job, proportions of cement and aggregate, quantity of water, slump, air content, admixtures, location of concrete in the project, type of concrete, compressive strength in pounds per square inch and atmospheric and concrete temperature at time of sampling.

J. In cases where strength of laboratory cured cylinders shown by tests for any portion of paving falls below required compressive strengths specified, Owner's Representative shall have the right to order change in mix or in cement content for remaining portion of the paving.

K. Make and cure flexural test beam specimens according to ASTM C78. Each test shall consist of one set of laboratory cured beams. A set shall consist of two beams. Minimum number of tests shall be one for each 100 cubic yards of concrete placed, at least one per day. Cure specimens under laboratory conditions.

L. Test beams according to ASTM C78, simple beam with third-point loading. Test beams shall have six inch by six inch cross-section.

M. Test beams at 14 days.

N. Flexural strength level of concrete shall be considered satisfactory as long as averages of any three consecutive test results of laboratory cured beams equal or exceed specified strength, and no individual strength test result falls below specified strength by more than 100 psi.

O. Concrete cylinder and flexural tests shall be made by an independent testing laboratory selected by Owner. Cost of initial tests shall be paid for by Owner. Subsequent tests required as a result of improper strength shall be paid for by Contractor.

PART 2 - MATERIALS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150, Normal-Type I, gray color.

B. Fine and Coarse Aggregates: ASTM C33. Provide aggregates from single source for exposed concrete.
   1. For grading tests of fine and coarse aggregates, use square mesh wire cloth complying with ASTM E11.
   2. Fine Aggregate:
      a. Provide washed natural sand of strong, hard durable particles.
      b. Grade from coarse to fine within following limits:

Sieve Size	Percentage by Weight Passing Sieve	
	Minimum	Maximum
3/8”	100	--
No. 4	95	100
No. 8	65	95
No. 16	45	75
No. 30	30	50
No. 50	10	22
No. 100	2	8

   3. Coarse Aggregate:
      a. Provide coarse aggregate consisting of clean, hard, fine-grained, sound crushed rock or washed gravel, or combination of both.
      b. Any piece having length in excess of five times average thickness shall be considered flat or elongated.
      c. The maximum size coarse aggregate shall 1½ “ with the minimum size being 1 inch.
      d. Grade combined aggregates within following limits:

Sieve Size or Percentage by Weight Passing Sieve				
Size in Inches	1½” Aggregate		1” Aggregate	
	Min	Max	Min	Max
1½”	95	--	--	--
1”	75	90	90	100
¾”	55	77	70	90
⅜”	40	55	45	65
No. 4	30	0	31	7

No. 8	22	35	23	40
No. 16	16	30	17	35
No. 30	0	20	10	23
No. 50	2	8	2	10
No. 100	0	3	0	3

e. Water: Clean, not detrimental to concrete, and conforming to ACI 318, Article 3.4.
f. Form Materials.
1) Conform to ACI 301.

C. Reinforcement
1. Reinforcing Steel: ASTM A615; 60 ksi yield grade; deformed billet steel bars.
2. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.
3. Tie Wire: Annealed steel, minimum 16 gauge size.
4. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.

D. Accessories
1. Curing Compound: FS TT-C-800, Type 1, 30% solids; ASTM C309, Kurey DR, manufactured by Euclid Chemical Company and L&M Cure Resin by L&M Construction Materials, or approved equal.
2. Expansion Joint Filler: Non-extruding, non-bituminous, resilient type complying with AASHTO M153 and ASTM D1752.
3. Joint Sealant for Pavements Unless Noted Otherwise on Drawings: Urethane complying with ASTM D1850 and ASTM C290 such as “Urexpan NR-200” by Pecora Corp., “VULKEM-245” by Mameco International, “THC-900” by Tremco or approved equal.

E. Admixtures
1. Air Entrainment: Conform to ASTM C260.
2. Water Reducing Admixture: Conform to ASTM C494, Type A, containing not more than 1% chloride ions.
3. High Range Water Reducing Admixture (Super Plasticizer): Conform to ASTM C494, Type F or G, containing not more than 1% chloride ions.
4. Non-Chloride Accelerator Admixture: Conform to ASTM C494, Type C or E. Provide long-term test data proving non-corrosive effect on reinforcing steel.

F. Concrete Mix Design
1. Design concrete for flexural strength of 650 pounds per square inch at 14 days, compressive strength of (f’c) of 3,000 pounds per square inch at 28 days.
2. Unless otherwise noted, concrete shall have minimum cement content of 517 pounds per cubic yard of concrete and maximum water content not exceeding 28.0 gallons per cubic yard.
3. Concrete shall contain no calcium chloride nor shall admixtures contain more than 1 % chloride ions or air entraining cement, unless approved by Owner’s Representative.
4. Concrete shall be air entrained and conform to air content limits of Table 1 below.

Table 1 – Air Content for Air-Entrained Concrete	
Maximum Size Coarse Aggregate Inches	Air Content Percent by Volume
1”	5.5±1
1½”	5.0±1

5. Concrete shall have maximum water-cement ratio of 0.45.
6. Concrete shall have a slump of 3”, plus or minus ½”.
7. Methods of measuring concrete materials shall be such that proportions can be accurately controlled and easily checked. Measurement of materials for ready-mixed concrete shall conform to ASTM C94.
8. Use accelerating admixtures in cold weather only when approved by Owner’s Representative. Use of admixtures will not relax cold weather placement requirements.
9. Use set-retarding admixtures during hot weather only when approved by Owner’s Representative.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade ready to support paving and imposed loads.

B. Verify correct gradients and elevations of base.

C. Beginning installation implies acceptance of existing conditions.

3.02 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Notify Owner’s Representative minimum 24 hours before start of concreting operations.

3.03 FORMING

A. Place and secure forms to correct location, dimension, and profile.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

A. Where noted on drawings, reinforce concrete paving with welded steel wire fabric.

B. Provide chairs, supports, spacers, bolsters and other devices to keep reinforcement at proper elevations and in place.

C. Interrupt reinforcement at control, contraction and expansion joints.

3.05 FORMED JOINTS

A. Place joints as shown on plans to correct elevation and profile.

3.06 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Hot Weather Placement: ACI 305R

C. Cold Weather Placement: ACI 306R

D. Ensure reinforcements, inserts, embedded parts, formed joints and are not disturbed during concrete placement.

E. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

F. Place concrete to pattern indicated. Saw cut contraction joints at an optimum time after finishing. Saw joints in accordance with details on plans.

G. Chamfer exposed corners of concrete using wood, metal, PVC, or rubber chamfer strips fabricated to produce smooth lines and tight edge strips.

3.07 FINISHING

A. Road and Apron Paving: Light broom.

B. Sidewalk Paving: Light broom and trowel joint edges.

C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer’s instructions.

3.08 FIELD QUALITY CONTROL

A. Field testing will be performed by an independent testing company as selected by the Owner.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.09 PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

321816: SYNTHETIC RESILIENT SURFACING

1. GENERAL

A. Scope: Includes all labor, materials, tools and equipment necessary for the complete installation of a seamless, pour-in-place safety surfacing system under exterior recreational climbing wall.

B. Code Compliance: ADA, ASTM C1028, ASTM D624, ASTM D412, ASTM D1418, ASTM D2240, ASTM D2859, ASTM E303, ASTM F1292, ASTM F1951, IPEMA, State and Local Codes.

C. Quality Assurance:

(1) Manufacturer and installer should have manufactured and installed playground poured in place safety surfaces for a minimum of 5 years and meet current ASTM F1292 Test Criteria.
(2) The installer must provide competent workmen skilled in this specific type of poured in place safety surfacing system installation. The designated supervisory personnel on the project must be competent in the installation of this material, including mixing, spreading and compacting the materials correctly.
(3) IPEMA Certification specific to poured in place safety surfacing.
(4) IPEMA Certification specific to ½" layer of EPDM over cushion layer.
(5) Manufacturer to provide written instructions for recommended maintenance practices.

D. Cross Reference: 013000: Contractor Submittal Requirements
018000: Cleaning
033000: Cast-In-Place Concrete
116733: Recreational Climbing Wall
Civil Drawings

E. Submittals:

(1) Provide manufacturer's product data.
(2) Provide shop drawing show locations of installation and details showing product layers including dimensions.
(3) Provide written instructions for recommended maintenance practices.
(4) Samples: Submit 6" x 6" color samples of ½" top layer with aliphatic binder.

F. Warranty: The poured in place safety surfacing manufacturer shall provide a warranty to the Owner that covers defects in materials and workmanship of the rubber for a period of five (5) years for EPDM installation.

G. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Quality Standard: Ecosoft Surfacing poured-in-place resilient surfacing system. Other products may be acceptable if they meet or exceed the Quality Standard. All alternates must be submitted to the Architect for approval before bid date.

B. Product Characteristics:

(1) Dual-density, resilient, seamless, pour-in-place, playground safety surfacing.
(2) Compliance: Meet or exceed guidelines for impact attenuation.

(3) Material: SBR rubber shreds and EPDM rubber granules mixed with binding agent.
(4) Binding Agent: 100% solids, aromatic, MDI polyurethane.
(5) Lower Base/Impact Course: Mixture of black SBR rubber shreds and binding agent.

(a) Binder to Rubber Ratio: Approximately 15 pounds of binder to 100 pounds of rubber.
(b) Thickness: Sufficient to meet impact attenuation requirements as determined by designated fall height of recreation equipment.

(6) Upper Wear/Cap Course: Mixture of colored and black EPDM rubber granules and binding agent.

(a) Binder to Rubber Ratio: Approximately 20.5 pounds of binder to 100 pounds of rubber.
(b) Thickness: 0.5" nominal

(7) Total Thickness: As determined by designated fall height of recreation equipment.
(8) Colors: To be selected from manufacturer's standard colors during construction.

3. EXECUTION

A Storage and Handling:

(1) Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
(2) Storage: Store materials in a dry area at a minimum temperature of 40°F.
(3) Handling: Protect materials during handling and installation to prevent damage or contamination.

B. Environmental Requirements:

(1) Material Temperature: Ensure material temperature is a minimum of 40°F at time of installation.
(2) Air Temperature: Ensure air temperature is a minimum of 40°F for a minimum of 24 hours before, during and a minimum of 72 hours after installation.
(3) Precipitation: Ensure no prospect of precipitation during and a minimum of 72 hours after installation.

C. Examination: Examine areas to receive pour-in-place resilient surfacing. Ensure all applicable site work, including subsurface preparation, fencing, recreational equipment installation and all other relevant work, has been completed. Notify General Contractor if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

D. Preparation: Prepare subsurface in accordance with manufacturer's instructions to ensure proper support and drainage for pour-in-place resilient safety surfacing. Finished elevations of subsurface shall be as indicated on the drawings. Finished elevations of adjacent areas/borders/edging shall be as indicated on the drawings. Subsurface shall be installed in a true, even plane and sloped to drain unless otherwise indicated on the drawings.

E. Installation:

(1) Install pour-in-place resilient surfacing in accordance with manufacturer's instructions at locations indicated on the drawings.
(2) Ensure prepared subsurface is dry, clean and free of any foreign or loose material.
(3) Install edges in accordance with manufacturer's instructions.
(4) Install cold seams as required by manufacturer's instructions.

F. Protection:

(1) No foot traffic on pour-in-place surfacing until a minimum of 80 percent cure is obtained.
(2) Protect completed pour-in-place surfacing from damage during installation and cure time.
(3) Protect completed pour-in-place surfacing from damage from subsequent construction activity.

G. Cleaning and Protection of Work: Clean in accordance with manufacturer's recommendation.

323113: FENCES AND GATES

1. GENERAL

A. Scope: Includes all labor, materials, tools and equipment necessary for the complete installation of coating chain link and aluminum privacy panel fences and gates specified herein.

B. Code Compliance: ADA, AAMA 603.8, AAMA 2604, ASTM A36, ASTM A121, ASTM A392, ASTM A780, ASTM A817, ASTM A824, ASTM B117, ASTM B209, ASTM B221, ASTM D822, ASTM D2794, ASTM D3363, ASTM F552, ASTM F567, ASTM F626, ASTM F668-07 ASTM F900, ASTM F1043, ASTM F1083, ASTM F1184, ASTM F1910, ASTM F1911, ASTM F2200, UL325, WLG2445, IBC, State and Local Codes

C. Quality Assurance:

(1) Manufacturer: Company having a minimum of three (3) years experience specializing in manufacturer of fencing products specified herein.
(2) Fence Contractor: Contractor having five (5) years experience installing similar projects in accordance with ASTM F567.
(3) Single Source: To ensure system integrity, obtain all fencing materials from a single source for each type of fence specified.

D. Cross Reference: 013000: Contractor Submittal Requirements
018000: Cleaning
033000: Cast-In-Place Concrete
087100: Finish Hardware
Civil Drawings

E. Submittals:

(1) Shop Drawings: Layout fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.
(2) Product Data: Manufacturer's catalog cuts indicating material compliance and specified options.
(3) Samples: If requested, samples of materials (e.g., fabric, wire, and accessories).

F. Jobsite Safety: The General Contractor shall be responsible for initiating, maintaining and supervising all lawful safety precautions and programs in connection with the performance of the work in this specification. The General Contractor shall immediately stop the work if there is a clear and present danger to any personnel. Review Article 10 of AIA Document A201/2017 and comply.

2. PRODUCTS

A. Chain Link Fence:

(1) Quality Standard: Ameristar PermaCoat PC-20, Master Halco Permafused II. Other manufacturers may be acceptable if they meet or exceed the quality standard. Any alternates to the Quality Standard must be submitted and approved before bid date. Specifications herein based on Ameristar PermaCoat PC-20 products.

(a) Chain Link Fabric:

1. The materials for chain link fence fabric shall be manufactured from galvanized steel wire. The weight of zinc shall meet the requirements of ASTM F668, Table 4. Galvanized wire shall be PVC-coated to meet the requirements of ASTM F668. The class of the fence fabric shall be Class 2
2. Selvage: Top and bottom edge knuckled.

3. Color: The coating color for the fence fabric shall be Black. Reference ASTM F668 and ASTM F934
4. Wire Size: 9 gauge.
5. Mesh Size: 2"
6. Height: See drawings.

(b) Steel Fence Framework:

1. Steel shall be zinc-coated steel strip, galvanized by the hot-dip process confirming to the criteria of ASTM A653 and the general requirements of ASTM A924.
2. The zinc used in the galvanizing process shall conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range allowance for ASTM A653, designation G-90.
3. The framework shall be manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, light industrial weight.
4. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.
5. The manufactured framework shall be subjected to a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.
6. The material used for the base coat shall be a (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting “no-mar” TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils. The stratification coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather meter apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.
7. The color of all framework shall be black in accordance with ASTM F934.
8. The strength of the fence pipe shall conform to the requirements of ASTM F1043; the minimum weight shall not be less than 90% of the nominal weight. The strength of line, end, corner and pull posts shall be determined by the use of 4’ or 6’ cantilevered beam test. The top rail shall be determined by a 10’ free supported beam test. The yield strength shall be determined according to the methods described in ASTM E8. For materials under this specification, the 0.2 offset method shall be used in determining yield strength. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.

(c) Fittings: The material for fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same color coating system required for the framework. All fasteners shall be stainless steel.

(d) Gates: Swing gates shall be manufactured and coated to meet the requirements of ASTM F900. Slide gates shall be manufactured to meet the requirements of ASTM F1184. The color of all gates shall be Black in accordance with ASTM F934.

(2) Locations: Interior Mezzanine Storage above Gym Storage 119A, See Civil drawings for exterior locations.

B. Aluminum Privacy Panel Fence:

(1) Quality Standard: Palm Shield Vertical Louver Security Fence. Other manufacturers may be acceptable if they meet or exceed the quality standard. Any alternates to the Quality Standard must be submitted and approved before bid date.

(2) Product Characteristics:

(a) Panels:

1. Extruded Aluminum: ASTM B221, alloy 6063, temper T6
2. Sheet Aluminum: ASTM B211, alloy 6063, temper T6
3. Powder Coating Material Hardness: ASTM 3363 2H
4. Louver Panel Height: See drawings for details
5. Louver Panel Width: See drawings for details
6. Fixed Louver Angles: 1 ¾" x 1 ¾" x 0.1250" angle louver
7. Louver Vertical Framework: 3" x 3" x ¼" aluminum angle. Framework supporting the louvers shall be solid welded and mitered.
8. Louver Horizontal Top Cap: 3" x 3" x ¼" aluminum top cap.
9. Louver Horizontal Bottom Cap: 3" x 3" x ¼" angle bottom cap.

(b) Fence Posts:

1. Panel posts shall be 4" square by ¼" minimum extruded tubular aluminum sections with solid aluminum caps. Length as specified on the contract drawings.
2. On center post spacing shall be as specified by manufacturer.
3. All fence posts to be plated with 10" x 10" x ¾" aluminum plates with four ¾" hole for anchors.

(c) Fittings and Accessories: All fittings and accessories shall be stainless steel and sized as specified by the fence manufacturer. Fence panels to be attached to posts with ¼" x 1" stainless steel screws. Panels and posts are predrilled to support level installation.

(d) Anchor bolts: Anchor bolts shall be attached as required by manufacturer for support loads based on screening height, exposure and loading.

(e) Gates: Swing to exterior of enclosure, size as shown on contract drawings.

1. Louver spacing, style and appearance shall be identical to fence panels.
2. Gate hinges to be Gorilla barrel hinge with ¾" rod, ball bearing, and grease zert. Hinge plates to be ½" thick plates offset to create a 5/8" gap. Standard hardware as required by the gate manufacturer for complete functional operation. Hinges to be bolted to gate frame and field welded to steel gate posts.
3. Gate latch to be internal lock with exterior grab handles. Lock to be keyed using Owner's keying system. See 087100: Finish Hardware
4. Welded frame, extruded aluminum tubing with aluminum fixed louver panels to match fencing material.
5. Drop rods to be 1" schedule 40 pipe and through bolted to gate frame.
6. Hinges: Size and type as determined by the manufacturer. Provide as many hinges as required by manufacturer for length of gate.
7. Gate shall have welded frame fabricated from extruded aluminum tubing with aluminum fixed louver panels to match fencing material. Frame configurations shall be as indicated on the contract drawings.
8. Gate posts shall be as determined by manufacture. Gate posts to be specified to support gates.

(f) Factory Finish: Aluminum fence panels, posts and gates shall receive polyester powder coating electrostatically applied. Colored polyester powder coating heat cured to chemically bond finish to metal substrate.

(g) Color: To be selected during construction.

(3) Location: Pool Equipment 124

3. EXECUTION

A Storage and Handling:

(1) Upon receipt at the jobsite, all materials shall be checked to ensure that no damages occur during shipping or handling.
(2) Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

B. Site Examination:

(1) Ensure property lines and legal boundaries of work are clearly established.
(2) Verify areas to receive fencing are completed to final grade.

C. Chain Link Framework Installation:

(1) Install fence systems in accordance with ASTM F567 and manufacturer's instructions.
(2) Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.
(3) Space line post uniformly as shown on drawings.
(4) Concrete Set Posts: Excavate holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6” deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36” below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts. Dive Anchor set line posts: With protective cap, drive post 36” into ground. Excavate a 6” diameter by 6” deep section around post to accommodate the drive anchor shoe clamp. Drive the 2 diagonal drive anchor angle blades into the soil and securely tighten the angle blades to post via the shoe clamp, backfill hole.
(5) Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
(6) Bracing: Install horizontal brace and truss assembly at mid-height or above for fences 6' and over at each fabric connection to the terminal post. The diagonal truss rod is installed at the point where the brace rail is attached to the terminal post and diagonally down to the bottom of the adjacent line post. Place the truss rod in tension by adjusting the turnbuckle.
(7) Tension Wire: Install tension wires so that it will be located 4" up from bottom of the fabric. If top rail is not specified, install the tension wire so that it will be located 4" down from the top of the fabric. Stretch and install tension wire before installing the chain link fabric and attach to each post using wire ties.
(8) Top Rail: Install in lengths of 21'. Connect ends with sleeves forming a rigid connection, allow for expansion and contraction.
(9) Center Rails: Install mid rails between line posts and attached to post using rail end or line rail clamps. A center rail is required for fabric height 12' and over.
(10) Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps.

D. Chain Link Fabric Installation:

(1) Fabric: Install fabric on security side, pull fabric taut; thread the tension bar through fabric and attach to terminal posts with tension bands spaced maximum of 15” (381 mm) on center and attach so that fabric remains in tension after pulling force is released. Install fabric so that it is 2” (50 mm) +/- 1” (25 mm) above finish grade.
(2) Secure fabric using wire ties to line posts at 15” (381 mm) on center and to rails and braces 24” (610 mm) on center, and to the tension wire using hog rings 24” (610 mm) on center. Tie wire shall be secured to the fabric by wrapping it two 360 degree turns around the chain link wire pickets. Cut off any excess wire and bend back so as not to protrude so as to avoid injury if a pedestrian may come in contact with the fence.

E. Chain Link Gate Installation

(1) Swing gates: Installation of swing gates and gate posts shall be per ASTM F567. Direction of swing shall be as shown on drawings. Gates shall be hung plumb in the closed position with minimal space from grade to bottom of gate leaf. Double gate drop bar receiver shall be set in a minimum concrete footing 6" diameter by 24" deep. Gate leaf holdbacks shall be installed on all double gates and all gate leafs greater than 5' in width.
(2) Cantilever slide gates: Install cantilever horizontal slide gates and gate posts in accordance with ASTM F567. Cantilever sliding gates shall be plumb in the closed position with minimal ground clearance and slide with an initial force of 40 lbs. Double gate drop bar receiver shall be set in a minimum concrete footing 6" diameter by 24" (610 mm) deep.

F. Aluminum Privacy Panel Fence Inspection:

(1) Inspection: Verify that final grading in fence location is completed and without irregularities which will interfere with fence installation.
(2) Field verify all fence dimensions and layout prior to commencing installation.

G. Aluminum Privacy Panel Fence and Gate Installation:

(1) Install fence in strict compliance with manufacturer's written installation instructions.
(2) Install fence plumb and level.

H. Completion of Work: Insure accurate installation and clean-up of equipment and adjacent surfaces upon completion. Do not use abrasives or liquid cleaners that will harm finishes. Protect surface at all times.

331000: WATER DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Adhere to Dalton Utility Standard Specifications and details, latest edition.

1.02 SUMMARY

A. This Section includes piping and specialties for potable-water service outside the building.

B. This Section does not include tapping of utility company water main.

C. Related Sections include the following:
   1. Division 22.

D. Utility-furnished products include water meters that will be furnished to site, ready for installation.

1.03 DEFINITIONS

A. The following are industry abbreviations for plastic and rubber materials:
   1. NP: Nylon.
   2. PE: Polyethylene.
   3. PP: Polypropylene.
   4. PTFE: Polytetrafluoroethylene.
   5. PVC: Polyvinyl chloride.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
   1. Potable-Water Service: 150 psig.

1.05 SUBMITTALS

A. Product Data: For the following:
   1. Water-meter bars.
   2. Backflow preventers.
   3. Pipe and fittings.
   4. Valves.
   5. Yard hydrants.

B. Shop Drawings: For precast concrete structures. Include frames and covers and drains.

C. Shop Drawings: For cast-in-place concrete structures. Include frames and covers and drains.

D. Record Drawings: At Project closeout of installed water-service piping according to Division 1 Section "Contract Closeout."

E. Test Reports: As specified in "Field Quality Control" Article in Part 3.

F. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.06 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.

C. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.

D. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."

E. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verifies existing utility locations. Contact utility-locating service for area where Project is located.

B. Verify that water-service piping may be installed to comply with original design and referenced standards.

C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.09 SEQUENCING AND SCHEDULING

A. Coordinate connection to water main with utility company.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Drilling-Machine, Sleeves, and Corporation Stops:
      a. Ford Meter Box Co., Inc.
      b. Grinnell Corp, Mueller Company - Water Products Div.
      c. Lee Brass Co.
   2. Bronze Corporation Stops and Valves:
      a. Ford Meter Box Co., Inc.
      b. Grinnell Corp.; Mueller Co.; Water Products Div.
      c. Watts Industries, Inc., James Jones Co.
   3. Tapping Sleeves and Valves:
      a. American Cast Iron Pipe Co.; Waterous Co.
      b. East Jordan Iron Works, Inc.
      c. Grinnell Corp.; Mueller Co.; Water Products Div.
   4. Gate Valves:
      a. American Cast Iron Pipe Co.; American Flow Control Div.
      b. Grinnell Corp.; Grinnell Supply Sales Co.
      c. Grinnell Corp.; Mueller Co.; Water Products Div.
      d. Hammond Valve Corp.
   5. Relief Valves:
      a. Bermad, Inc.
      b. GA Industries, Inc.
      c. MULTIPLEX Manufacturing Co.
   6. Water-Regulating Valves:
      a. Ames Co., Inc.
      b. Cla-Val Co.
      c. Watts Industries, Inc.; Water Products Div.
   7. Backflow Preventers:

a. Ames Co., Inc.
b. Cla-Val Co.
c. Watts Industries, Inc - Water Products Div.

8. Keyed Couplings:
   a. McWane, Inc., Tyler Pipe, Gustin-Bacon Div.
   b. Victaulic Co. of America.
   c. DryLink
9. Protcective Enclosures:
   a. Hot Box.
   b. HydroCowl, Inc.
10. Drains:
    a. Josam Co.
    b. Watts Industries, Inc.; Ancon Drain Div.
    c. Zurn Industries, Inc.; Hydromechanics Div.
11. Sanitary-Type Yard Hydrants:
    a. Murdock, Inc.
12. Post-Type Yard Hydrants:
    a. Josam Co.
    b. Watts Industries, Inc.; Ancon Drain Div.
    c. Zurn Industries, Inc.; Hydromechanics Div.

2.02 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Tube: ASTM B 88, seamless water tube, annealed temper.

C. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

D. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

E. PE Plastic Pipe: ASTM D 2239, of PE compound and with SIDR required for 160-psig minimum pressure rating. Include marking "NSF-pw" according to NSF 14.

F. PVC Plastic Pipe: PVC, AWWA C900, Class 200, with bell end with gasket and spigot end.

2.03 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

C. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300, as required for system operating pressure.

D. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.

E. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron or cast-iron or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

F. Ductile-Iron, Flanged Fittings: AWWA C110, with cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550. Include gaskets and bolts and nuts.

G. Cast-Iron Flanged Fittings: ASME B16.1, Class 125, unless otherwise indicated.

H. Fittings for PE Plastic Pipe: ASTM D 2609, insert type, made of NP, PP, or PVC plastic; with male, serrated ends matching inside of pipe or threaded ends, as required. Include corrosion-resistant bands or crimp rings.

I. PVC Plastic, Socket Fittings: ASTM D 2466, Schedule 40.

J. PVC Plastic Fittings: UL 1285 and AWWA C900, Class 200. With bell and spigot or double bell ends. Include elastomeric gasket in each bell.

K. Ductile-Iron Fittings for PVC Pipe: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching PVC pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.

2.04 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.

C. Ductile-Iron Piping: The following materials apply:
   1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
   2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
   3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
      a. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated and full-face or ring type, unless otherwise indicated.
      b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Brazing Filler Metals: AWS A5.8, BCuP Series.

E. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E, with 0.10 percent maximum lead content.

F. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.

G. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.

H. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
   1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, malleable iron; or ASTM A 536, ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

I. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.05 PIPING SPECIALTIES

A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
1. Description: Combination of copper alloy and ferrous threaded, solder, plain, and weld-neck end types and matching piping system materials.
2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum pressure to suit system pressures.
4. Dielectric Couplings: Galvanized-steel couplings with inert and non-corrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
5. Dielectric Nipples: Electroplated steel nipples with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F.

2.06 VALVES

A. Non-rising Stem, Metal-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C500, gray- or ductile-iron body and bonnet; with cast-iron or bronze, double-disc gate, bronze gate rings, bronze stem, and stem nut. Include 200-psig minimum working-pressure design; interior coating according to AWWA C550; and mechanical-joint ends, unless otherwise indicated.

B. Non-rising Stem, Resilient-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.

C. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.

D. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.

E. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb-stop and barrel approximately 3 inches in diameter.
1. Provide steel tee-handle shutoff rod with each service box. Include tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting

curb-stop head.

F. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.
   1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.
   2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service-piping material.
   3. Manifold: Copper with 2 to 4 inlets as required, with ends matching corporation stops and outlet matching service piping.

G. Ball Valves AWWA C507, Class 250. Include interior coating according to AWWA C550.

H. Butterfly Valves: UL 1091, with 175-psig working-pressure rating.

I. Check Valves: UL 312, with swing clapper and 175-psig working-pressure rating.

2.07 SPECIALTY VALVES

A. Air-Release Valve AWWA C512, hydromechanical device to automatically release accumulated air. Include 300-psig working-pressure design.

2.08 WATER METERS

A. Water meters will be furnished by utility company.

2.09 WATER-METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter. Include lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.
   1. Option: Base section may be cast-iron, PVC plastic, clay or other pipe.

2.10 BACKFLOW PREVENTERS

A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

B. Working Pressure: 150 psig minimum, unless otherwise indicated.

C. 2-Inch NPS and Smaller: Bronze body with threaded ends.

D. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.

E. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.

F. Interior Components: Corrosion-resistant materials.

G. Strainer on inlet if strainer is indicated.

H. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with non-removable and

manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

I. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.
   1. Pressure Loss: 12 psig maximum through middle third of flow range.

J. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous-pressure application.
   1. Pressure Loss: 5 psig maximum through middle third of flow range.

2.11 YARD HYDRANTS

A. Yard Hydrants, Post Type: Non-freeze. Include 3/4-inch NPS inlet, integral or field-installed vacuum breaker with outlet complying with ASME B1.20.7, 3/4-11.5NH threads for garden hose. Include bronze casing, cast-iron or cast-aluminum-casing guard, tapped drain port in valve housing, and key operation. Include body length required for installing inlet valve below frost line. Furnish 2 keys for each hydrant.

2.12 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.
   1. Cement: ASTM C 150, Type I.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

2.13 IDENTIFICATION

A. Refer to Division 31 Section "Earthwork" paragraph 2.02 for underground warning tape materials.

B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches, with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Refer to Division 31 Section "Earthwork" for excavation, trenching, and backfilling.

B. Refer to Division 32 Section "Hot-Mix Asphalt Paving" for cutting and patching of existing paving.

C. Refer to Division 32 Section "Portland Cement Concrete Paving" for cutting and patching of paving.

3.02 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:

B. Potable Water-Service Piping: Use the following:
1. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and soldered joints.
2. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joint
3. 3/4- to 2-Inch NPS: PE plastic pipe; molded PE plastic fittings; and heat-fusion joints.
4. Option for 2-1/2- to 3-1/2-Inch NPS: 3- or 4-inch NPS; ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
5. 2-1/2- to 3-1/2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joints.
6. 4-Inch NPS: PVC, AWWA Class 200 pipe; PVC, AWWA Class 200 fabricated mechanical-joint, ductile-iron fittings; and gasketed joints.
7. 4-Inch NPS: Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
8. 6-Inch NPS: PVC, AWWA Class 200 pipe; PVC, AWWA Class 200 fabricated mechanical-joint, ductile-iron fittings; and gasketed joints.
9. 6-Inch NPS: Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
10. 8-Inch NPS: PVC, AWWA Class 200 pipe; PVC, AWWA Class 200 fabricated mechanical-joint, ductile-iron fittings; and gasketed joints.
11. 8-Inch NPS: Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Underground Valves, 3-Inch NPS and Larger: AWWA, gate valves, non-rising stem, with valve box.
2. Underground Valves, 4-Inch NPS and Larger: UL/FM, gate valves, non-rising stem, with indicator post.
3. Pit and Aboveground Installation Valves, 3-Inch NPS and Larger: AWWA, OS&Y gate valves.
4. Pit and Aboveground Installation Valves, 2-1/2-Inch NPS and Larger: UL/FM, OS&Y gate valves.
5. Pit and Aboveground Installation Valves, 2-Inch NPS and Smaller: MSS, non-rising stem gate valves.

3.04 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on

Coordination Drawings.

B. Install piping at indicated slope.

C. Install components with pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install fittings for changes in direction and branch connections.

G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
   1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
   2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
   3. Install dielectric fittings to connect piping of dissimilar metals.

3.05 SERVICE ENTRANCE PIPING

A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.
   1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water-piping systems when those systems are installed.

B. Sleeves and mechanical sleeve seals are specified in Section 22 05 17- Sleeves and Sleeve seals for plumbing piping

C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.06 PIPING INSTALLATION

A. Water-Main Connection: Arrange for tap in water main, of size and in location indicated, from water utility.

B. Make connections larger than 2-inch NPS with tapping machine according to the following:
   1. Install tapping sleeve and tapping valve according to manufacturers written instructions.
   2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
   4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

C. Make connections, 2-inch NPS and smaller, with drilling machine according to the following:

1. Install service clamps and corporation stops in size, quantity, and arrangement required by utility company standards and according to manufacturer's written instructions.

D. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

E. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
   1. Under Driveways: With at least 36 inches cover over top.
   2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.

F. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

G. Install detectable warning tape over water service lines and mains, per paragraph 2.13.

3.07 ANCHORAGE INSTALLATION

A. Install anchorage for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorage for the following piping systems:
   1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
   2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.08 VALVE INSTALLATION

A. General Application: Use mechanical-joint-end valves for 3-inch NPS and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use non-rising stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS and smaller installation.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.

C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up and with cast-iron curb box.

3.09 WATER-METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written requirements.

B. Water Meter: Install displacement-type water meters, 2-inch NPS and smaller, in meter boxes with shutoff valve on water-meter inlet. Include valve on water-meter outlet and valved bypass around meter, unless prohibited by authorities having jurisdiction.

C. Water Meter: Install compound-type water meters, 3-inch NPS and larger, in meter pits. Include shutoff valves on water-meter inlet and outlet and valved bypass around meter.

Support meters, valves, and piping on brick or concrete piers.

3.10 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.11 YARD HYDRANT INSTALLATION

A. Install post-type yard hydrants in pavement or with concrete anchor, and provide for drainage into dry well as indicated.

3.12 IDENTIFICATION INSTALLATION

A. Install continuous plastic underground warning tape during back filling of trench for underground water-service piping. Locate 6 to 8 inches below finished grade, directly over piping.

B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

C. Prepare reports for testing activities.

3.14 CLEANING

A. Clean and disinfect water distribution piping as follows:
   1. Purge new water distribution piping and parts of existing piping that have been altered, extended, or repaired before use.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
      a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
      b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
      c. After allowed standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
      d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

333000: SANITARY SEWERAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Adhere to the City of Chattanooga Department of Public Works Engineering Division “Sanitary Sewer System Design & Construction Manual”, WPC 04 0978, latest edition.

B. Adhere to Hamilton County Water and Wastewater Treatment Authority Standard Details and Specifications for the Construction of Sanitary Sewer, latest edition.

B. Adhere to Cleveland Utility District’s Sanitary Sewer Standards and Specifications, latest edition.

B. Adhere to local utility standard specifications and details for construction of sanitary sewer mains and services.

C. Adhere to the City of Chattanooga and Hamilton County Design and Construction Standards, latest edition.

C. Adhere to Hamilton County Health Department and Tennessee Department of Environmental and Conservation (TDEC) Guidelines and/or Specifications for Construction of Septic Systems

D. Adhere to TDEC Rules of Environment and Conservation Division of Ground Water Protection, Chapter 1200-1-6 Regulations to Govern Subsurface Sewage Disposal Systems and Tennessee Codes Annotated (TCA) Section 68-221-401..414 Subsurface Sewage Disposal Systems.

1.02 SUMMARY

A. This Section includes sanitary sewerage outside the building.

B. Related Sections include the following:
1. Division 22 Section “Plumbing piping”.
2. Division 3 Section "Cast-in-Place Concrete" for concrete structures.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene-monomer rubber.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

E. DIP: Ductile Iron Pipe

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non-pressure Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

A. Product Data: For the following:
   1. Backwater valves and clean-outs.
   2. Piping Specifications

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Pre-cast concrete manholes, including frames and covers.
   2. Cast-in-place concrete manholes and other structures, including frames and covers.

C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precuts concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

A. Site Information: Perform site surveys, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without owner's written permission.

D. A Soil Scientist has located and marked in the field the limits of the septic field that have been approved by the Health Department. The contractor shall take necessary measures to ensure that the septic field area has minimal disturbance and to maintain the Soil Scientist flagging. The contractor is responsible for applying to the Hamilton County Health Department for a septic tank permit and paying all applicable fees. The septic tank contractor must be licensed to construct septic systems in Hamilton County, Tennessee and must have at least 10 years experience installing septic systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gray-Iron Backwater Valves and Clean-outs:
   a. Josam Co.
   b. Smith: Jay R. Smith Mfg. Co.
   c. Zurn Industries, Inc. - Hydromechanics Div.
2. PVC Backwater Valves and Clean-outs:
   a. IPS Corp.
   b. NDS, Inc.
   c. Plastic Oddities, Inc.

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.03 PIPES AND FITTINGS

A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, gray iron, for gasketed joints.
   1. Gaskets: ASTM C 564, rubber, compression type, and thickness to match class of pipe.

B. Hubless Cast-Iron Soil Pipe and Fittings: CISPI 301 or ASTM A 888, gray iron, for coupling joints.
   1. Cast-Iron, Heavy-Duty Couplings: ASTM C 1277, assembly with housing of gray iron complying with ASTM A 48, stainless-steel bolts, and rubber sealing gasket complying with ASTM C 564.

C. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
   1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
   2. Gaskets: AWWA C111, rubber.
   3. Coatings: Shall be per Section 2.07 below.

D. PVC Sewer Pipe and Fittings: According to the following:
   1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.
   2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.

E. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794, open and closed profile, bell and spigot for gasketed joints.
   1. Gaskets: ASTM F 477, elastomeric seals.

F Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for gasketed joints.
   1. Gaskets: ASTM C 443, rubber.

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for non-pressure joints.
   1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
   2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
   3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.

4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
5. Bands: Stainless steel at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for non-pressure joints.
1. Material for Concrete Pipe: ASTM C 443, rubber.
2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

2.05 MANHOLES

A. Normal-Traffic Pre-cast Concrete Manholes: ASTM C 478, pre-cast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of pre-cast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness that matches 24-inch-diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic Pre-cast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Ballast: Increase thickness of one or more pre-cast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: Rubber.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness that matches 24-inch-diameter frame and cover.
4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness that matches 24-inch-diameter frame and cover.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to

place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "SANITARY SEWER" cast into cover.

2.06 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4000-psi minimum, with 0.45 maximum water-cementitious materials ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000-psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.

D. Ballast and Pipe Supports: Portland cement design mix, 3000-psi minimum, with 0.58 maximum water-cementitious materials ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.07 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
   1. Concrete Manholes: On exterior surface.
   2. Ductile Iron Pipe: Shall have Ceramic Epoxy Lining per ASTM A716/A746 or Cement lining per AWWA C104/A21.4

2.08 CLEANOUTS

A. Gray-Iron Clean-outs: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, and gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
   1. Light Duty: In earth or grass foot-traffic areas.
   2. Medium Duty: In paved foot-traffic areas.
   3. Heavy Duty: In vehicle-traffic service areas.
   4. Extra-Heavy Duty: In roads.
   5. Sewer PipeFitting and Riser to Clean out: ASTM A 74, Service class, cast-iron soil

pipe and fittings.

B. PVC Clean outs: PVC body with PVC threaded plug. Include PVC sewer pipefitting and riser to clean out of same material as sewer piping.

PART3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.02 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
   1. Use warning tape or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.03 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:
   1. NPS 3: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. NPS 3: Hubless cast-iron soil pipe and fittings, couplings, and coupled joints.
   3. NPS 3: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.
   4. NPS 4 to NPS 6: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   5. NPS 4 to NPS 6: Hubless cast-iron soil pipe and fittings, couplings, and coupled joints.
   6. NPS 4 and NPS 6: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.
   7. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
   8. NPS 4 to NPS 8: Ductile-iron sewer pipe; standard- or compact-pattern, ductile-iron fittings; gaskets; and gasketed joints.
   9. NPS 8 and NPS 10: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   10. NPS 8 and NPS 10: Hubbies cast-iron soil pipe and fittings, couplings, and coupled joints.
   11. NPS 8 and NPS 10: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.
   12. NPS 8 and NPS 10: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
   13. NPS 12 and NPS 15: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
   14. Pipe Sizes NPS 18 to NPS 24: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.

3.04 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
   1. Use the following pipe couplings for non-pressure applications:
      a. Sleeve type to join piping, of same size, or with small difference in OD.
      b. Increaser/reducer-pattern sleeve type to join piping of different sizes.
      c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

   2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.05 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
   1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
   2. Install piping with 36-inch minimum cover.

F. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

G. Install ductile-iron, force-main piping according to AWWA C600.

3.06 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.

C. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of

pipe and fittings.

D. Hubless Cast-Iron Soil Pipe and Fittings: With CISPI-type couplings according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

E. Hubless Cast-Iron Soil Pipe and Fittings: With heavy-duty-type couplings according to CISPI 310, CISPI's "Cast Iron Soil Pipe and Fittings Handbook," and coupling manufacturer's written instructions.

F. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

G. ABS Pipe and Fittings: As follows:
   1. Install according to ASTM D 2321.

H. PE Pipe and Fittings: As follows:
   1. Join pipe, tubing, and gasketed fittings with gaskets for watertight joints according to ASTM D 2321 and manufacturer's written instructions.
   2. Install according to ASTM D 2321 and manufacturer's written instructions.
   3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

I. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

J. PVC Sewer Pipe and Fittings: As follows:
   1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
   2. Join profile sewer pipefittings with gaskets according to ASTM D 2321 and manufacturers written instructions.
   3. Install according to ASTM D 2321.

K. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
   1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.

L. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

M. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

N. Install with top surfaces of components, except piping, flush with finished surface.

3.07 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install pre-cast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

F. Install fiberglass manholes according to manufacturer's written instructions.

3.08 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.09 CLEANOUT INSTALLATION

A. Install clean outs and riser extension from sewer pipe to clean out at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for clean outs and cast-iron soil pipe for riser extensions to clean outs. Install piping so clean outs open in direction of flow in sewer pipe.

B. Set clean out frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set clean out frames and covers in concrete pavement with tops flush with pavement surface.

3.10 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

C. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
   1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
   2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.11 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth

pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:
   1. Remove structure and close open ends of remaining piping.
   2. Backfill to grade according to Division 31 Section "Earthwork."

3.12 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. Place plug in end of incomplete piping at end of day and when work stops.
   2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Re-inspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate reports for each test.
   5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
      a. Sanitary Sewerage: Perform hydrostatic test.
         1) Allowable leakage is a maximum of 50 gal. per inch of nominal pipe size per mile of pipe, during 24-hour period.
         2) Close openings in system and fill with water.
         3) Purge air and refill with water.
         4) Disconnect water supply.
         5) Test and inspect joints for leaks.
         6) Option: Test ductile-iron piping according to AWWA C600, Section "Hydrostatic Testing." Use test pressure of at least 10 psig.
   6. Manholes: Perform hydraulic test according to ASTM C 969.
   7. Leaks and loss in test pressure constitute defects that must be repaired.

8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

334000: STORM DRAINAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Adhere to the City of Chattanooga and Hamilton County Design and Construction Standards, latest edition.

B. Adhere to local utility standard specifications and details.

1.02 SUMMARY

A. This Section includes storm drainage outside the building.

B. Related Sections include the following:
   1. Division 33 Section "Foundation Drainage Systems" for foundation drains connecting to storm drainage.
   2. Division 33 Section "Cast-in-Place Concrete" for concrete structures.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene-monomer rubber.

C. PE or HDPE: Polyethylene plastic, or High Density Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

E. CMP: Corrugated Metal Pipe

F. RCP: Reinforced Concrete Pipe

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Precast concrete manholes and other structures, including frames, covers, and grates.
   2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.

B. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without ownert's written permission.

PART 2 - PRODUCTS

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.03 PIPES AND FITTINGS

A. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
   1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
   2. Gaskets: AWWA C111, rubber.

B. Ductile-Iron Culvert Pipe: ASTM A 716, for push-on joints.
   1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
   2. Gaskets: AWWA C111, rubber.

C. Aluminized Steel Type 2 Pipe: AASHTO M274 or ASTM A929.
   1. Fittings: Fabricated to types indicated and according to same standards as pipe.
   2. Connecting Bands: Coupling bands shall be made of the same base metal and coatings as the pipe to a minimum of 18 gage.
   3. Connecting fasteners will be provided by manufacture.
   4. Pipe shall have manning “n” valve of 0.009

D. HDPE Pipe and Fittings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294.
   1. Soiltight Couplings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.

E. PVC Sewer Pipe and Fittings: According to the following:
   1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.

a. Gaskets: ASTM F 477, elastomeric seals.

2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
   a. Gaskets: ASTM F 477, elastomeric seals.
3. Perforated PVC Subdrain Pipe: ASTM D1785, Schedule 40.
   a. Hole Pattern: ASTM F-758/ ASSHTO M278, Hole Size 3/8", Hole Spacing 3" ±1/4"

F. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for gasketed joints.
   1. Gaskets: ASTM C 443, rubber.

G. HDPE Sewer Pipe and Fittings: Shall be Double Wall, according to the following:
   1. HDPE Sewer Pipe and Fittings, NPS 4 through NPS 60: ASTM F 2648, for solvent-cemented or gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.
      b. Fittings: ASTM F 2306, bell and spigot connections shall utilize a pun-on or welded bell and valley or saddle gasket meeting the soil tight performance requirements of ASTM F 2306.

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
   1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
   2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
   3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
   4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.
   1. Material for Concrete Pipe: ASTM C 443, rubber.
   2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
   3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
   4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

C. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.05 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
   1. Diameter: 48 inches minimum, unless otherwise indicated.
   2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
   3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
   4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
   5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: Rubber.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.06 CATCH BASINS

A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
4. Gaskets: ASTM C 443, rubber.
5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.

6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Gaskets: Rubber.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
4. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Bottom, Walls, and Top: Reinforced concrete.
2. Channels and Benches: Concrete.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.

D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches minimum, unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

F. PVC Surface Inlets: PVC surface drainage inlets shall include the drain basin type as indicated on the contract drawing and referenced within the contract specifications. The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer.

2.07 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Frames and Grates: Heavy-duty frames and grates according to utility standards.

D. Trench Drains: Shall be manufactured by same vendor as frame and grate.
1. Channel shape shall be U
2. Minimum channel slope shall be 0.5%
3. Grate shall be secured to the frame.
4. Channel shall have bottom outlet or trench drain catch basin.
5. Trench drain frame and grates shall be minimum load class “c” unless otherwise noted

2.08 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
1. Include channels and benches in manholes.
a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
1) Invert Slope: 1 percent through manhole.
b. Benches: Concrete, sloped to drain into channel.
1) Slope: 4 percent.
2. Include channels in catch basins.
a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
1) Invert Slope: 1 percent through catch basin.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.02 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 3: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. NPS 3: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and
3. NPS 4 to NPS 6: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
4. NPS 4 to NPS 6: Hubless cast-iron soil pipe and fittings, couplings, and coupled joints.
5. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
6. NPS 8 to NPS 15: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 8 to NPS 12. Use ductile-iron culvert pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 14 to NPS 16.
7. NPS 8 to NPS 15: Corrugated-aluminum pipe and fittings, connecting bands, and banded joints.
8. NPS 8 to NPS 15: Corrugated PE drainage tubing and fittings, soiltight couplings, and coupled joints in NPS 8 and NPS 10. Use corrugated PE pipe and fittings, soiltight couplings, and coupled joints in NPS 12 and NPS 15.
9. NPS 8 to NPS 15: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
10. NPS 8 to NPS 15: NPS 12 and NPS 15 reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints. Do not use nonreinforced pipe instead of reinforced concrete pipe in NPS 8 and NPS 10.
11. NPS 18 to NPS 36: Corrugated-aluminum pipe and fittings, connecting bands, and banded joints.
12. NPS 18 to NPS 36: Corrugated PE pipe and fittings; corrugated, soiltight couplings; and coupled joints.
13. NPS 18 to NPS 36: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
14. NPS 42 to NPS 120: Corrugated-aluminum pipe and fittings; connecting bands; and banded joints.
15. NPS 42 and NPS 48: Similar pattern to corrugated PE pipe and fittings; corrugated, soiltight couplings; and coupled joints.
16. NPS 42 to NPS 144: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
17. NPS 4 to NPS 60: HDPE Sewer Pipe pipe and fittings; corrugated, soiltight couplings; and coupled joints.

3.03 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
   1. Use the following pipe couplings for nonpressure applications:
      a. Sleeve type to join piping, of same size, or with small difference in OD.
      b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
      c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
   2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.04 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
   1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

3.05 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.

C. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of pipe and fittings.

D. Hubless Cast-Iron Soil Pipe and Fittings: With CISPI-type couplings according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

E. Hubless Cast-Iron Soil Pipe and Fittings: With heavy-duty-type couplings according to CISPI 310, CISPI's "Cast Iron Soil Pipe and Fittings Handbook," and coupling manufacturer's written instructions.

F. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

G. Install with top surfaces of components, except piping, flush with finished surface.

H. PE Pipe and Fittings: As follows:
   1. Join pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer's written instructions.
   2. Install according to ASTM D 2321 and manufacturer's written instructions.
   3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

I. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

J. PVC Sewer Pipe and Fittings: As follows:
1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Install according to ASTM D 2321.

K Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.

L. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

M. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.06 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

C. Install precast concrete manhole sections with gaskets according to ASTM C 891.

D. Construct cast-in-place manholes as indicated.

E. Install fiberglass manholes according to manufacturer's written instructions.

3.07 CATCH-BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

C. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick, stone or concrete block will be required to set the grate to the final grade height. For H-20 load rated installations, a concrete ring will be poured under and around the grate and frame. The concrete slab must be designed taking into consideration local soil conditions, traffic loading, and other applicable design factors. For other installation considerations such as migration of fines, ground water, and soft foundations refer to ASTM D2321 guidelines.

3.08 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipators at outlets, as indicated.

3.09 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.10 DRAINAGE SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer's written instructions.

B. Install with top surfaces of components, except piping, flush with finished surface.

C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

E. Fasten grates to channel sections if indicated.

F. Embed trench sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

3.11 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
   2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
   3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
   4. Use extra-heavy-duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.12 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

B. Fasten grates to drains if indicated.

C. Set drain frames and covers with tops flush with pavement surface.

3.13 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
   1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:
   1. Remove structure and close open ends of remaining piping.
   2. Backfill to grade according to Division 31 Section "Earthwork."

3.14 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plug in end of incomplete piping at end of day and when work stops.
   3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

FROM THE OFFICE OF GREGG SIMS, ARCHITECT

APPENDIX A

UL WALL ASSEMBLIES
UL JOINT AND FIRESTOP SYSTEMS

UL DESIGN NO. G256

UL DESIGN NO. U411

UL DESIGN NO. U415

UL DESIGN NO. U465

UL DESIGN NO. U902

UL DESIGN NO. U914

UL SYSTEM NO. F-A-2051

UL SYSTEM NO. HW-D-0001

UL SYSTEM NO. HW-D-0002

UL SYSTEM NO. HW-D-0009

UL SYSTEM NO. HW-D-0040

UL Product iQ®

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States
BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

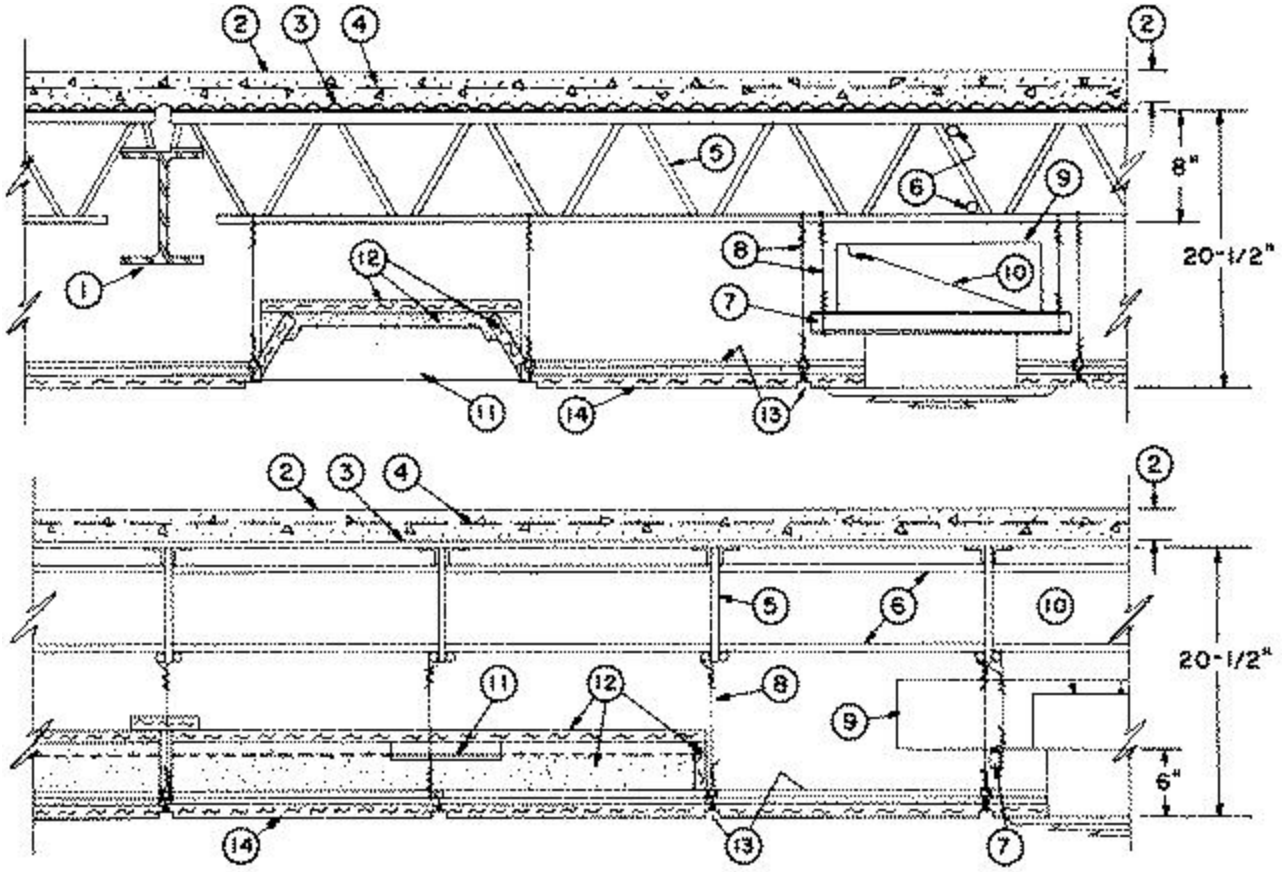
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. G256

September 29, 2021

Restrained Assembly Ratings — 1, 2 and 3 Hr.
(See Items 2, 5, 11B, 13, 13D and 13E)
Unrestrained Assembly Ratings — 1, 2 and 3 Hr.
(See Items 2, 5, 11B, 13, 13D and 13E)
Unrestrained Beam Ratings — 1, 2 and 3 Hr.
(See Items 13, 13D and 13E)
This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Beam —** W6{x}12, min size. As an alternate to beam, steel joist girders of 20 in. min depth, 14 lbs per lin ft min weight with min area of steel of 1.12 sq in. for chord members. Min distance from bottom of the joist girder to bottom of the ceiling is 10 in. For lowering the ceiling, the suggested method of using intermediate supports described under Suspension Systems in the Design Information Section General should be followed.

2. **Normal-Weight Concrete —** Carbonate or siliceous aggregate, 150{+or-}3 pcf unit weight, 3500 psi compressive strength. For the 2 hr Restrained and Unrestrained Assembly Ratings, min concrete topping thickness is 2-1/2 in. For the 3 hr Restrained and Unrestrained Assembly Ratings, min concrete topping thickness is 3-1/2 in. The concrete topping thickness shall be measured from the surface of the concrete to the top plane of the steel deck corrugations.

3. **Steel Form Units —** Min 9/16 in. deep corrugated units, min 28 MSG galv steel. Welded to supports with 1/2 in. puddle welds through welding washers. Welds located at each joist along the side laps and 48 in. OC along the center valley of the units. End overlaps centered on joists and welded to joist a max of 15 in. OC. Adjacent units overlapped one corrugation at the sides and a min of 3 in. at the ends.

4. **Welded Wire Fabric —** 6x6-W1.4xW1.4 or heavier per AISC specifications.

4A. **Fiber Reinforcement* —** As an alternate to Item 4, for 1 or 2 Hr assembly ratings only. Engineered synthetic fibers or steel fibers added to concrete mix to control shrinkage cracks in concrete. See Fiber Reinforcement (CBXQ) Category for rate that fibers are added to concrete mix.
EUCLID CHEMICAL CO — Type Fiberstrand 100

FABPRO ORIENTED POLYMERS INC — Types Monofilament / Multifilament Polypropylene, Fibrillated Polypropylene

FIBERCON INTERNATIONAL INC — Types Fibercon Manufactured Steel Fibers, Matrix CS Steel Fibers, Matrix W2.9 Hybrid Fibers

FORTA CORP — Types Econo-Mono, Mighty-Mono, Stucco-Bond, Econo-Net, Cast-Master, Super-Net, Ultra-Net

HELIX STEEL — Helix 5-25

SIKA CORPORATION — Type FM 1.5, Xorex, Stealth, Novomesh e3

5. **Steel Joists —** Type 8J2 or 10K1 min size, spaced 48 in. OC max, welded to end supports. Type 8H2 min size, may be covered for the 1 and 2 hr Restrained and Unrestrained Assembly Ratings only. As an alternate, any LH-Series steel joist spanning no more than 60 ft may be used. For spans exceeding 60 ft, LH-Series joists, may be used provided that the deflection under published total load shall not be greater than 1/277 of the joist spans. For the 1 and 2 hr ratings only, joist spacing may be increased to 72 in. max.

6. **Bridging —** 1/2 in. diam steel bars, welded to top and bottom chords of each joist.

7. **Cold Rolled Channels —** Min 0.053 in. thick (16 gauge) cold-rolled steel channels, 1-1/2 in. deep with 9/16 in. flanges. Placed on top of the bottom chord of joists and secured with a double strand of 18 SWG galv steel wire. Located as required to provide hanger wire attachment points. For the 1 and 2 hr Ratings only when the joist spacing is greater than 48 in. OC, two cold-rolled channels placed back to back and tied together with double strand of 18 SWG galv steel wire at 24 in. OC are used for support of hanger wires. The double channels are installed perpendicular to the joists and spaced either 24 or 48 in. OC as required. Channels, placed on top of the joists' bottom chord and tied to each joist with a double strand of 18 SWG galv steel wire. Alternately, the channels may be hung from the joists with 12 SWG galv steel wire wrapped around the cold-rolled channels, and with the other end of the wire wrapped around the bottom chord of the joists.

8. **Hanger Wire —** No. 12 SWG galv steel wire twist-tied to steel joists or cold-rolled steel channels. Hanger wires spaced max of 48 in. OC on main runners, adjacent to cross tee intersections. One hanger wire to occur at all four corners of light fixtures, at midspan of cross tees adjacent to 4 ft light fixtures and air duct outlets, and adjacent to each main runner splice.

9. **Air Duct —** Min 0.023 in. thick (24 gauge) min galv steel. Total area of duct openings not to exceed 576 sq in. per each 100 sq ft of ceiling area. Area of individual duct opening not to exceed 576 sq in. Max dimension of opening 30 in.

10. **Damper —** Min 0.056 in. thick (16 gauge) galv steel, sized to overlap duct opening 1 in. min. Protected on both surfaces with 1/16 in. thick ceramic fiber paper and held open with a **Fusible Link** (Bearing the UL Listing Mark). In lieu of the damper described above, Duct Outlet Protection System A, as described in the General Information Section, may be used with steel ducts.

11. **Fixtures, Recessed Light —** (Bearing the UL Listing Mark.) Recessed light fixture with steel housing, 2 by 4 ft size. Fixtures spaced so their area does not exceed 24 sq ft per 100 sq ft of ceiling area. Wired in conformance with the National Electrical Code.

11A. **Fixture Stabilizer —** (Not Shown) — For use with the Type 1650 metal pans (See Item 13A); one min 0.047 in. thick (16 MSG) galv steel channel yoke per light fixture, secured to the web at midspan of cross tee on each side of fixture.

11B. **Fixture, Recessed Light —** (Bearing the UL Listing Mark) — (Not Shown) — As an alternate to Item 11 for 1 or 2 hr assembly ratings only. Incandescent lamp type, steel housing, nom 6-1/2 in. diam by 7-1/2 in. high. A max of two "high hat" fixtures may be substituted for each nominal 2 by 4 ft size light fixture permitted in the ceiling (max six "high hat" fixtures per 100 square ft. of ceiling area). Each fixture provided with a nom 6-1/2 by 10 in. painted steel base screw-attached to the fixture with four steel screws. Short sides of the base provided with adjustable steel hanger bars for fixture support. Two lengths of cold-rolled steel channel (Item 7) are to be suspended above and parallel with the fixture hanger bars to provide hanger wire attachment points for the fixture hanger bars and to support the light fixture protection panel (Item 12A). Wired in conformance with the National Electrical Code.

12. **Fixture Protection* — Acoustical Material —** 5/8 in. thick, cut to form a five sided enclosure, trapezoidal in cross-section, approx 1/2 in. longer and wider and with a min 5/8 in. clearance to the top of the light fixture housing. The fixture protection consists of a 23-3/4 by 47-3/4 in. top piece, two 6-3/4 (or wider) by 47-3/4 in. side pieces, and two 5 (or wider) by 23-3/4 in. end pieces. The top edge of each fixture protection side piece may be provided with a 1 in. deep by max 20 in. long notch near its midpoint.
The side and top pieces are laid in place and the end pieces are held in place with three 8d nails spaced 8 in. OC. When fixtures are installed end to end, no end pieces are used where the fixtures abut. Instead, a 5 by 23-3/4 in. piece is placed on top of and centered over the gap between the top pieces. (S)=Surface perforations.

ARMSTRONG WORLD INDUSTRIES INC — Type 5/8 in. P (S)

12A. **Fixture Protection* — Acoustical Material —** For use with "high hat" light fixtures (Item 11B). Nom 24 by 24 by 5/8 or 3/4 in. piece of the same acoustical material used in the ceiling (Item 14). Panel located max 1 in. above and centered over "high hat" light

fixture with ends resting on cold-rolled steel channels (Item 7).

13. **Steel Framing Members* —** Main runners nom 12 ft long spaced 4 ft OC. Cross tees nom 4 ft long installed perpendicular to main runners and spaced 2 ft OC. When the ceiling is composed of nom 24 by 24 in. lay-in panels, cross tees nom 2 ft long installed perpendicular to 4 ft cross tees and spaced 4 ft OC.

ARMSTRONG WORLD INDUSTRIES INC — Types AFG, AFG-A, AFG-LT, AFG-MX and AFG-PLP. When Type AFG-A steel framing members are used, the Assembly and Beam Ratings are 2 hr. When Type AFG-MX or AFG-PLP steel framing members are used with 24 by 48 in. panels, the assembly and beam ratings are 1-1/2 hr. When Type AFG-MX steel framing members are used with 24 by 24 in. panels, the assembly and beam ratings are 2 hr . Type AFG-LT steel framing members for use with 24 by 24 in. panels for max 2 hr beam and assembly ratings. Type GLBP (consisting of main runners, 4 ft cross tees and steel straps) for use with 24 by 48 in. Type P or PC lay-in panels

BAILEY METAL PRODUCTS LTD — Type BEF

CERTAINTEED CORP — Types FSS2-12-15, FSS4-12-15, FSS12-12-15, RS12-12-15, RS2-12-15, RS4-12-15, FSEZ2-12-12, FSEZ4-12-12, FSEZ12-12-15, FSEZ2-12-20, FSEZ4-12-20, FSEZ12-12-20

ROXUL USA INC. D/B/A ROCKFON — Types 250, 260, 1250, 1260, 1850, 1860. When Type 260, 860, 1260 or 1860 steel framing members are used, the Assembly and Beam Ratings are 2 hr.

13A. **Steel Framing Members* — Main Runners —** 10 or 12 ft long, spaced 4 ft OC. Cross tees - nom 4 ft long, installed perpendicular to main runners, spaced 2 ft OC. When nom 2 by 2 ft lay-in panels are used, nom 2 ft long cross tees installed perpendicular to 4 ft cross tees at midspan, spaced 4 ft OC. Border panels supported at walls by min. 0.016 in thick painted steel angle with 7/8 in legs or min. 0.016 in thick painted steel channel with a 1 by 1-9/16 by 1/2 in profile.

CGC INC — Types DXL, DXLT, DXLTA, DXLZ, SDXL. When DXLT and DXLTA are used the max hourly ratings are 1-1/2 hr

USG INTERIORS LLC — Types DXL, DXLT, DXLTA, DXLZ, SDXL. When DXLT and DXLTA are used the max hourly ratings are 1-1/2 hr

13B. **Steel Framing Members* — Metal Pans —** (Not Shown) — (Optional) — Channel-shaped metal pans in various colors and finishes, installed perpendicular to cross tees or main runners and spaced 4 or 6 in. OC. The flange edges of the metal pans engage and interlock with the vertical tabs of the corresponding grid adapters with tabs 4 or 6 in. OC. (See Item 13B). End laps joints of the metal pans shall occur adjacent to main runners or cross tees. The metal pans shall each be supported by at least two main runners or cross tees.

ROXUL USA INC. D/B/A ROCKFON — Type 1650

13C. **Steel Framing Members* — Grid Adapter —** (Not Shown) — (Optional) — For use with Type 1650 metal pans. (See Item 13A). Angle shaped adapter with a looped return flange; installed parallel to cross tees or main runners by engaging return flange of adapter to the flange of the cross tee or main runner. The 48 or 24 in. long adapters are intended for use with cross tees or main runners, respectively.

ROXUL USA INC. D/B/A ROCKFON — Type 1650

13D. **Steel Framing Members* — Filler Strips —** (Not Shown) — (Optional) — For use with Type 1650 metal pans. Filler strips are 0.018 to 0.024 in. thick, steel or aluminum, 13/32 or 5/8 in. deep by 3/4 in. wide, placed between the metal pans.

13E. **Steel Framing Members* —** 9/16 in. wide narrow flange grid may be used as an alternate to 15/16 in. wide flange grid systems. Main runners, nom 12 ft long spaced 4 ft OC. Cross tees, nom 4 ft long, installed perpendicular to main runners and spaced 2 ft OC. Cross tees, nom 2 ft long, installed perpendicular to 4 ft cross tees and spaced 4 ft OC. For use with Type P, nom 24 by 24 in. square edge or tegular edge lay-in panels. Grid modules containing light fixtures must employ a fixture centering clip at each corner. The 24 gauge electrogalvanized steel clip is nested on the flange of the intersecting grid tees, has two 1-7/16 in. high legs with their sides perpendicular to each other and a U-shaped return at the top of each leg for engaging over the bulb of the intersecting grid tees. When 9/16 in. wide flange grid is used, max Assembly and Beam Ratings are 2 hr.

ARMSTRONG WORLD INDUSTRIES INC — Type FSLK

13F. **Steel Framing Members* —** 9/16 in. wide narrow flange grid may be used as an alternate to 15/16 in. wide flange grid systems. Main runners, nom 12 ft long, spaced 4 ft OC. Cross tees, nom 4 ft long, installed perpendicular to main runners and spaced 2 ft OC.

Cross tees, nom 2 ft long, installed perpendicular to 4 ft cross tees and spaced 4 ft OC. For use with Type P, nom 24 by 24 in. square edge lay-in panels.
ROXUL USA INC. D/B/A ROCKFON — Type 4050 for 1 hr assembly and beam ratings only

14. **Acoustical Material* —** Nom 24 by 24 or 48 in. lay-in panels. Border panels supported by min 0.016 in. thick (26 MSG) painted steel angle with 1 in. legs; or, min 0.016 in. thick (26MSG) painted steel channel, 1-1/2 in. deep with 1 in. bottom flange and 3/4 in. top flange. (S)=Surface perforations.
ARMSTRONG WORLD INDUSTRIES INC — Type 3/4 in. BF(S) or P(S), 24 by 24 in.; Type 5/8 in. P(S), 24 by 24 or 48 in.; Type 5/8 in. PC(S) 24 by 48 in

14A. **Acoustical Materials* — Antenna Panel —** (Optional, Not Shown) — Nom 24 by 24 in. lay-in panel with integral high frequency antennae. Thickness, type and edge detail of antenna panel to match surrounding acoustical ceiling panels. Antenna panel to be installed in accordance with accompanying instructions. A max of one antenna panel may be used per each 100 sq ft of ceiling area.
ARMSTRONG WORLD INDUSTRIES INC

15. **Speaker Assemblies For Fire Resistance* —** (Optional, Not Shown) — The speaker assemblies consist of speakers, speaker enclosures and their accessories. The ceiling penetration from the speaker enclosure shall not exceed 11-7/8 by 11-7/8 in. for the square speaker enclosures and 12 in. in diam for the round speaker enclosures. The speaker assemblies are installed in accordance with the installation instructions provided. A max of two 144 sq in. speaker assemblies per 100 sq ft of ceiling area is allowed.
ATLAS SOUND L P

See **Speaker Assemblies For Fire Resistance** (CHML) for specific Types.

15A. **Speaker Assemblies For Fire Resistance* —** (Optional, Not Shown) — As an alternate to Item 15, speaker panels may be included in the ceiling. Nom 24 by 24 in. metal-framed lay-in speaker panels installed in accordance with the accompanying installation instructions. Hanger wires are required on the main runners and on the nom 4 ft long cross tees at all four corners of the speaker panel. Each speaker panel to be covered with a nom 24 by 24 in. panel of the same acoustical material used in the ceiling. Acoustical material panel to be centered over and supported by the metal "bridge" of the speaker panel. A max of one speaker panel is allowed per 100 sq ft of ceiling area with a min center-to-center spacing of 10 ft between speaker panels.

16. **Hold-Down Clips —** (Not Shown) — No. 24 MSG spring steel, placed over cross tees 2 ft OC.

17. **Discrete Products Installed in Air-handling Spaces* —** Automatic Balancing Valve/Damper (Not Shown - Optional) — For use with item 10. Valve/Damper to be provided with ducted installation with steel duct per damper manufacturer's instructions. Automatic Balancing Valve/Damper shall be installed within duct such that it is not directly above the ceiling radiation damper.
METAL INDUSTRIES INC — Model ABV-4, ABV-5, ABV-6

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2021-09-29

UL Product iQ®

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States
BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

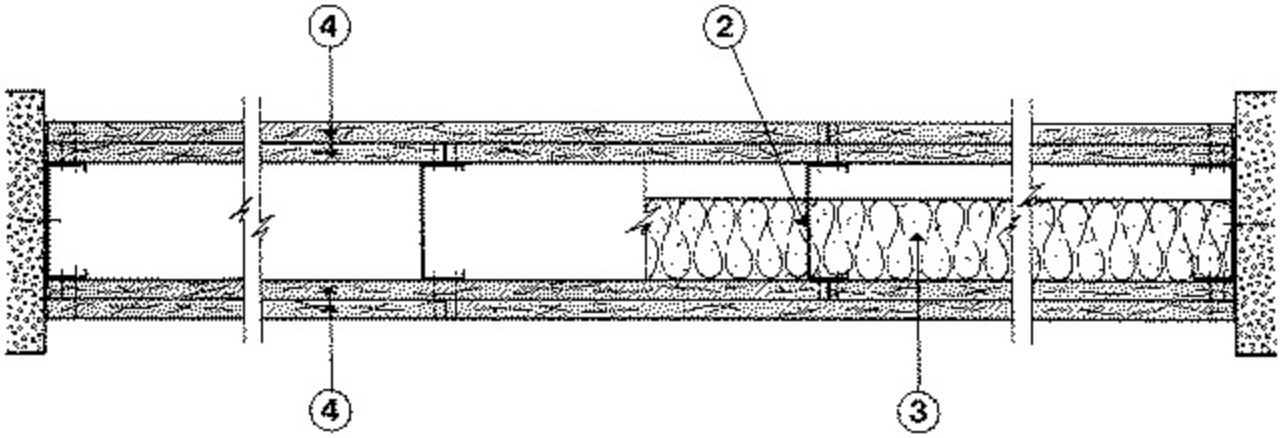
See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. **U411**

August 18, 2023

Nonbearing Wall Rating — 2 Hr.
*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Floor and Ceiling Runner —** (Not Shown) — Min. 25 MSG galv steel, 1 in. return legs, 2-1/2 in. deep (min), attached to floor and ceiling with fasteners 24 in. OC max.

1A. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2A, channel shaped, min 2-1/2 in. deep, attached to floor and ceiling with fasteners 24 in. OC. max.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CEMCO, LLC — Viper20™ Track

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

1B. **Floor and Ceiling Runners —** (Not Shown) — For use with Item 2B- Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, min width to accommodate stud size, with min 1 in. long legs, attached to floor and ceiling with fasteners spaced max 24 in. OC.

1C. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2C, channel shaped, min 2-1/2 in. wide fabricated from min 0.015 in. thick galv steel, attached to floor and ceiling with fasteners 24 in. OC. max.
CLARKDIETRICH BUILDING SYSTEMS — CD ProTRAK

DMFCWBS L L C — ProTRAK

MBA METAL FRAMING — ProTRAK

RAM SALES L L C — Ram ProTRAK

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProTRAK

1D. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2D, channel shaped, min 2-1/2 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners 24 in. OC. max.
TELLING INDUSTRIES L L C — TRUE-TRACK™

1E. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2E, channel shaped, min 2-1/2 in. wide fabricated from min 25 MSG steel, attached to floor and ceiling with fasteners 24 in. OC. max.
KIRII (HONG KONG) LTD — Type KIRII

1F. **Floor and Ceiling Runners —** (Not Shown) — Channel shaped, min width to accommodate stud size, with min 1 in. long legs, for use with studs specified below, attached to floor and ceiling with fasteners spaced max 24 in. OC.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track VT100

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track

1G. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2G, channel shaped, min 2-1/2 in. deep, attached to floor and ceiling with fasteners 24 in. OC. max.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

1H. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2J. Channel shaped, attached to floor and ceiling with fasteners 24 in. OC. max.
BAILEY METAL PRODUCTS LTD — Type PLATINUM PLUS

1I. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2K, channel shaped, min 3-1/2 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners 24 in. OC. max.
RESCUE METAL FRAMING, L L C — AlphaTRAK

1J. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2L. Channel shaped, attached to floor and ceiling with fasteners 24 in. OC. max.
OEG BUILDING MATERIALS — OEG Track

1K. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2M, channel shaped, min 2-1/2 in. deep, formed of min. 25 MSG (0.018 in. min. bare metal thickness), attached to floor and ceiling with fasteners 24 in. OC. max.
CEMCO, LLC — Viper X Track

1L. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 - For use with Item 2N. Channel shaped, min. 2-1/2 in. deep, attached to floor and ceiling with fasteners 24 in. OC. max.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D25

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D25

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D25

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D25

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D25

TELLING INDUSTRIES L L C — Type SUPREME D25

UNITED METAL PRODUCTS INC — Type SUPREME D25

1M. **Floor and Ceiling Runner —** (Not shown) - As an alternate to Item 1, For use with Items 2O and 4O - Min 25 MSG galv steel, 1-5/8 in. deep (min), attached to floor and ceiling with fasteners 24 in. OC. max.

1N. **Framing Members* — Floor and Ceiling Runner —** Not Shown — In lieu of Item 1 – For use with Item 2P, proprietary channel shaped runners, 1-1/4 in. wide by min. 2-1/2 in. deep fabricated from min 0.019 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

PANEL REY S A – SUPRA Track 20EQ/19 mil

2. **Steel Studs —** Min 2-1/2 in. deep, formed of min 25 MSG galv steel max stud spacing 24 in. OC. Studs to be cut 3/4 in. less than assembly height.

2A. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1G, channel shaped studs, min 2-1/2 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CEMCO, LLC — Viper20™

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

IMPERIAL MANUFACTURING GROUP INC — Viper20™

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

2B. **Steel Studs —** (As an alternate to Item 2, For use with Item 4D, 4H, and 4J) — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, 3-1/2 in. min depth, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners. Studs to be cut 5/8 to 3/4 in. less than assembly height.

2C. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1C, channel shaped studs, min 2-1/2 in. wide fabricated from min 0.015 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
CLARKDIETRICH BUILDING SYSTEMS — CD ProSTUD

DMFCWBS L L C — ProSTUD

MBA METAL FRAMING — ProSTUD

RAM SALES L L C — Ram ProSTUD

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProSTUD

2D. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1D, channel shaped studs, min 2-1/2 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
TELLING INDUSTRIES L L C — TRUE-STUD™

2E. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1E, channel shaped studs, min 2-1/2 in. wide fabricated from min 25 MSG steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
KIRII (HONG KONG) LTD — Type KIRII

2F. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1G, channel shaped studs, min 2-1/2 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

2G. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1, channel shaped studs, Min 2-1/2 in. deep, formed of min 25 MSG galv steel max stud spacing 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
EB METAL INC — NITROSTUD

2H. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1, channel shaped studs, Min 2-1/2 in. deep, formed of min 25 MSG galv steel max stud spacing 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
OLMAR SUPPLY INC — PRIMESTUD

2I. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1A (3-5/8 in. wide track), channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, 1-1/4 in. wide by 3-5/8 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — StudRite™

2J. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1H, channel shaped, min 3-5/8 in. wide, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
BAILEY METAL PRODUCTS LTD — Type PLATINUM PLUS

2K. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1I, channel shaped studs, min 3-1/2 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
RESCUE METAL FRAMING, L L C — AlphaSTUD

2L. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1J, channel shaped studs, Min 2-1/2 in. deep, formed of min 25 MSG galv steel max stud spacing 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
OEG BUILDING MATERIALS — OEG Stud

2M. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1K, channel shaped studs, min 2-1/2 in. deep, formed of min. 25 MSG (0.018 in. min. bare metal thickness), spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
CEMCO, LLC — Viper X

2N. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1L, channel shaped studs, min depth 2-1/2 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D25

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D25

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D25

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D25

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D25

TELLING INDUSTRIES L L C — Type SUPREME D25

UNITED METAL PRODUCTS INC — Type SUPREME D25

2O. **Framing Members — Steel Studs —** (As an alternate to Item 2) For use with Items 1M and 4O - channel shaped studs min 1-5/8 in. deep, formed of 25 MSG galv steel, max stud spacing 24 in. OC. Studs cut 3/8 in. to 3/4 in. less than assembly height.

2P. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 – For use with Item 1N, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 2-1/2 in. deep with 1/4 in. return lips fabricated from min 0.019 in. thick galv steel, spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

PANEL REY S A – SUPRA Stud 20EQ/19 mil

3. **Batts and Blankets* —** (Optional) — Mineral wool or glass fiber batts partially or completely filling stud cavity.
See **Batts and Blankets** (BZJZ) category for names of manufacturers

ROCKWOOL — Type AFB, min. density 1.69 pcf / 27.0 kg/m^3

ROCKWOOL MALAYSIA SDN BHD — Type Acoustical Fire Batts

3A. **Fiber, Sprayed* —** As an alternate to Batts and Blankets (Item 3) — (100% Borate Formulation) — Spray applied cellulose material. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product with a nominal dry density of 2.7 lb/ft^3. Alternate Application Method: The fiber is applied without water or adhesive at a nominal dry density of 3.5 lb/ft^3, in accordance with the application instructions supplied with the product.
Applegate Greenfiber Acquisition LLC — Insulmax and SANCTUARY for use with wet or dry application.

3B. **Fiber, Sprayed* —** As an alternate to Batts and Blankets (Item 3) — Spray applied cellulose insulation material. The fiber is applied with water to interior surfaces in accordance with the application instructions supplied with the product. Applied to completely fill the enclosed cavity. Minimum dry density of 4.3 pounds per cubic ft.
NU-WOOL CO INC — Cellulose Insulation

3C. **Fiber, Sprayed* —** As an alternate to Batts and Blankets (Item 3) — Spray applied cellulose fiber. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product. The minimum dry density shall be 4.30 lbs/ft^3.
INTERNATIONAL CELLULOSE CORP — Celbar-RL

3D. Deleted.
3E. **Foamed Plastic*** — As an alternate to Batts and Blankets (Item 3), for use with Item 4Q — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity. When foamed plastic is used, minimum stud depth shall be 3-1/2 in.

CARLISLE SPRAY FOAM INSULATION — Types SealTite ONE, SealTite Pro Closed Cell (CC), SealTite Pro Open Cell (OC), SealTite Pro OCX, SealTite Pro No Trim 21, SealTite Pro One Zero, Foamsulate Closed Cell, Foamsulate OCX, Foamsulate 70, and Foamsulate HFO.

3F. **Foamed Plastic*** — As an alternate to Batts and Blankets (Item 3), for use with Item 4R — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity. When foamed plastic is used, minimum stud depth shall be 3-1/2 in. with min. 20 MSG thickness.

BASF CORP- Enertite® NM, Enertite® G, FE178®, Spraytite® 178, Spraytite® 81206, Walltite® 200, Walltite® US, Walltite® US-N, Walltite® HP+, FE137®, FE158®, Spraytite® 158, Spraytite® SP, Spraytite® 81205, Spraytite® Comfort XL, and Walltite® XL

4. **Gypsum Board* —** 5/8 in. thick, outer layer paper, glass mat or vinyl surfaced. (Laminated System) Gypsum board applied vertically in two layers. Inner layer attached to studs with 1 in. long Type S steel screws spaced 8 in. OC along vertical edges, and 12 in. OC in the field and outer layer laminated to inner layer with joint compound, applied with a notched spreader producing continuous beads of compound about 3/8 in. in diameter, spaced not greater than 2 in. OC. Joints of laminated outer layer offset 12 in. from inner layer joints Outer layer gypsum board attached to floor and ceiling runner track with 1-5/8 in. long Type S steel screws spaced 12 in. OC. Optional, (Direct Attached System), Inner layer attached to studs with 1 in. long Type S steel screws spaced 16 in. OC in the field and along the vertical edges. Outer layer attached to the studs over the inner layer with 1-5/8 in. long Type S steel screws spaced 16 in. OC in the field and along the vertical edges and 12 in. OC to the floor and ceiling runners. Joints of screw-attached outer layer offset from inner layer joints. Joints of outer layer may be taped or untaped.

Nom 3/32 in. thick gypsum veneer plaster may be applied to the entire surface of Classified veneer baseboard. Joints reinforced.

AMERICAN GYPSUM CO — Types AG-C, AGX-1, M-Glass, AGX-11, LightRoc

BEIJING NEW BUILDING MATERIALS PUBLIC LTD CO — Type DBX-1

CABOT MANUFACTURING ULC — Type X, 5/8 Type X, Type Blueglass Exterior Sheathing

CERTAINTEED GYPSUM INC — Types EGRG, GlasRoc, GlasRoc-2, Type X-1, Type C, or 5/8" Easi-Lite Type X, Type LWTX

CGC INC — Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC or WRX

CERTAINTEED GYPSUM INC — Types LGFC2A, LGFC6A, LGFC-C/A, LGFC-WD, LGLLX, CLLX

GEORGIA-PACIFIC GYPSUM L L C — Types 5, 6, 9, C, DAP, DD, DA, DAPC, DGG, DS, GPFS6, LS, TG-C, Type X, Veneer Plaster Base-Type X, Water Rated-Type X, Sheathing Type-X, Soffit-Type X, GreenGlass Type X, Type X ComfortGuard Sound Deadening Gypsum Board, Type LWX, Veneer Plaster Base-Type LWX, Water Rated-Type LWX, Sheathing Type-LWX, Soffit-Type LWX, Type DGLW, Water Rated-Type DGLW, Sheathing Type-DGLW, Soffit-Type DGLW, Type LW2X, Veneer Plaster Base - Type LW2X, Water Rated - Type LW2X, Sheathing - Type LW2X, Soffit - Type LW2X, Type DGL2W, Water Rated - Type DGL2W, Sheathing - Type DGL2W

NATIONAL GYPSUM CO — Types eXP-C, FSK, FSK-C, FSW, FSW-3, FSW-5, FSW-6, FSW-8, FSW-C, FSW-G, FSMR-C, FSL, Type SBWB, RSX.

NATIONAL GYPSUM CO — Riyadh, Saudi Arabia — Type FR, or WR.

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type C, PG-3, PG-5, PG-9, PG-11, PG-C, PGS-WRS, PGI

PANEL REY S A — Types GREX, GRIX, PRX, RHX, MDX, ETX, PRC, PRC2, PRX2

SIAM GYPSUM INDUSTRY (SARABURI) CO LTD — Type EX-1

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

THAI GYPSUM PRODUCTS PCL — Type C, M2Tech Type C andType X

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Types C and SCX

UNITED STATES GYPSUM CO — Type AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULIX, USGX, WRC, WRX

USG BORAL DRYWALL SFZ LLC — Types C, SCX, SGX, USGX

USG MEXICO S A DE C V — Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, USGX, WRC or WRX

4A. **Gypsum Board* —** (As an alternate to Item 4) — Nom 3/4 in. thick, installed as described in Item 4 with 1-1/4 in. long Type S screws for inner layer and 2-1/4 in. long Type S screws for outer layer.

CGC INC — Types AR, IP-AR

UNITED STATES GYPSUM CO — Types AR, IP-AR

USG MEXICO S A DE C V — Types AR, IP-AR

4B. **Gypsum Board* —** (As an alternate to Items 4 and 4A) — 5/8 in. thick, 24 to 54 in. wide, applied horizontally as the outer layer to one side of the assembly. Horizontal joints need not be backed by steel framing. Secured as described in Item 4 for the direct attached system. When used in widths other than 48 in., gypsum panels to be installed horizontally.
CERTAINTEED GYPSUM INC — Type C, Type GlasRoc

CGC INC — Type SHX

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

THAI GYPSUM PRODUCTS PCL — Type X, and Type C, M2Tech Type C

UNITED STATES GYPSUM CO — Type SHX, FRX-G

USG MEXICO S A DE C V — Type SHX

4C. **Gypsum Board* —** (As an alternate to Items 4, 4A and 4B) — Two layers of 5/8 in. thick gypsum board applied horizontally or vertically. Inner layer attached to studs with No. 6 by 1 in. long Type S bugle head screws spaced 24 in. OC along the top and bottom tracks starting 2 in. and then 12 in. from the vertical edge. Inner layer screws spaced 24 in. OC along the studs, starting 2 in. and then 12 in. from the top and bottom of the studs and starting 1-1/4 in. from the horizontal joints when installed horizontally. Outer layer attached to studs with 1-5/8 in. long Type S bugle head screws spaced 16 in. OC along the top and bottom tracks starting 1-3/4 in. from the vertical edge. Outer layer screws spaced 16 in. OC along the studs, starting 1-3/4 in. and then 8 in. from the top and bottom of the studs and starting 1-1/4 in. and then 8 in. from the horizontal joints when installed horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers staggered a min of 12 in. When outer layers are installed horizontally, vinyl or casein, dry or premixed joint compound shall be applied in two coats to joints and screw heads of outer layer. Paper tape, nom 2 in. wide, embedded in first layer of compound over all joints of outer layer panels. Nom 3/32 in. thick gypsum veneer plaster may be applied to the entire surface of Classified veneer baseboard. Joints reinforced.
GEORGIA-PACIFIC GYPSUM L L C — Types 5, 6, 9, C, DAP, DD, DA, DAPC, DGG, DS, GPFS6, LS, TG-C, Type X, Veneer Plaster Base-Type X, Water Rated-Type X, Sheathing Type-X, Soffit-Type X, GreenGlass Type X, Type X ComfortGuard Sound Deadening Gypsum Board, Type LWX, Veneer Plaster Base-Type LWX, Water Rated-Type LWX, Sheathing Type-LWX, Soffit-Type LWX, Type DGLW, Water Rated-Type DGLW, Sheathing Type-DGLW, Soffit-Type DGLW, Type LW2X, Veneer Plaster Base - Type LW2X, Water Rated - Type LW2X, Sheathing - Type LW2X, Soffit - Type LW2X, Type DGL2W, Water Rated - Type DGL2W, Sheathing - Type DGL2W

4D. **Gypsum Board* —** (Not Shown) — (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2B) — Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field.
RAY-BAR ENGINEERING CORP — Type RB-LBG

4E. **Gypsum Board* —** (As an alternate to Items 4 through 4D) — Nominal 5/8 in. thick, 4 ft wide panels, applied vertically and secured as described in Item 4.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Types QuietRock ES

4F. **Gypsum Board* —** (As an alternate to Items 4 through 4E) —5/8 in. thick, applied vertically or horizontally as the outer layer to one side of the assembly. Horizontal joints need not be backed by steel framing. Secured as described in Item 4 for the direct attached system. When used in widths other than 48 in., gypsum panels to be installed horizontally.
CERTAINTEED GYPSUM INC — Type SilentFX

4G. **Gypsum Board* —** As an alternate to Item 4 — Nom. 5/8 in. thick, inner layer attached vertically to studs with 1 in. long Type S steel screws spaced 16 in. OC in the field and along the vertical edges. Outer layer attached to the studs horizontally over the inner layer with 1-5/8 in. long Type S steel screws spaced 16 in. OC in the field and along the vertical edges and 12 in. OC to the floor and ceiling runners. Joints of outer layer must be taped. Nom 3/32 in. thick gypsum veneer plaster may be applied to the entire surface of Classified veneer baseboard.
CABOT MANUFACTURING ULC — Type Blueglass Exterior Sheathing

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Types C, PG-11, PGS-WRS

4H. **Gypsum Board* —** (Not Shown) — (As an alternate to Items 4. For direct attachment only to steel studs Item 2B) — For Direct Application to Studs Only- For use as the base layer on one or both sides of the wall. Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-5/8 in. long Type S 12 steel screws spaced 8 in. OC at perimeter and 12 in OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Fasteners for face layer gypsum panels when installed over lead backed board to be min 2-1/2 in. Type S-12 bugle head steel screws spaced as described in Item 4. To be used with Lead Batten Strips (see Item 5A) or Lead Discs (see Item 6A).
MAYCO INDUSTRIES INC — Type X-Ray Shielded Gypsum

4I. **Gypsum Board* —** (As an alternate to Item 4, not for use with Items 1C and 2C or 1L and 2N) — Nom. 5/8 in. thick gypsum panels with beveled, square or tapered edges installed as described in Item 4.
CGC INC — Type ULX

UNITED STATES GYPSUM CO — Type ULX

USG MEXICO S A DE C V — Type ULX

4J. **Gypsum Board* —** (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2B) — Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws gypsum panel steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 8 ft long with a max thickness of 0.14 in. placed on the face of studs and attached to the stud with construction adhesive and two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead discs, nominal 3/8 in. diam by max 0.085 in. thick. Compression fitted or adhered over the screw heads. Lead batten strips and discs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".
RADIATION PROTECTION PRODUCTS INC — Type RPP - Lead Lined Drywall

4K. **Gypsum Board —** (As an alternate to Items 4 through 4J, not for use with Items 1C and 2C.) — Two layers of nominal 15 mm thick gypsum board applied vertically. Inner layer attached to studs with No. 3.5 x 1-3/8 in. long bugle head, self-drilling screws spaced 23-5/8 in. OC in the field and 15-3/4 in. OC in the perimeter, with the first screw 2 in. from the edge. Outer layer attached to the studs over the inner layer with No. 3.5 x 1-3/4 in. long bugle head, self-drilling screws spaced 11-13/16 in. OC in the field and 7-7/8 in. OC in the perimeter, with the first screw 3/4 in. from the edge. Outer layer screws staggered from inner layer screws. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layer staggered one stud cavity. Self-adhesive fiberglass mesh (9x9 mesh) tape, nom 2 in. wide, applied over all joints of outer layer panels. Dry or premixed joint compound applied in two coats to joints over the mesh tape and screw heads of outer layer.
GYPSEMNA CO LLC — Types MRFW, FW, TF

4L. **Gypsum Board* —** (As an alternate to Items 4 through 4K) — Two layers of 5/8 in. thick gypsum board applied vertically or horizontally. Inner layer attached to studs with #6 x 1 in. long bugle head screws spaced 12 in. OC along the top and bottom tracks and 16 in. OC in the field and along the vertical edges. Outer layer attached to studs with #6 x 1-5/8 in. long bugle head screws spaced 12 in. OC along the top and bottom tracks and 16 in. OC in the field and along the vertical edges. Vertical joints are centered over studs and staggered between layers and on opposite sides of the wall. Horizontal joints on the face layer are staggered 12 in. from the base layer. Horizontal joints need not to be backed by steel framing.
CERTAINTEED GYPSUM INC — Types LGFC2A, LGFC6A, LGFC-C/A, LGFC-WD

4M. **Wall and Partition Facings and Accessories* —** (As an alternate to Items 4 through 4L) — Nominal 5/8 in. thick, 4 ft wide panels, applied vertically and secured as described in Item 4.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock 527.

4N. **Gypsum Board* —** (As an alternate to Item 4 through 4M) — For direct application to studs only - Four layers nom. 5/16 in. thick gypsum panels applied vertically or horizontally. When applied horizontally, base layer secured to studs with 1 in. Type S screws spaced 24 in. OC. Second layer installed with joints offset 12 in. from base layer and secured with 1 in. Type S screws spaced 24 in. OC. Third layer installed with joints in line with base layer and secured with 1-1/2 in. Type S screws spaced 16 in. OC. Fourth layer installed with joints in line with second layer and secured with 1-5/8 in. Type S screws spaced 12 in. OC. For all layers, screws offset 4 in. from previous layer. When applied vertically, base layer secured with 1 in. Type S screws spaced 24 in. OC. Second layer secured with joints offset one stud cavity and secured with 1 in. Type S screws spaced 24 in. OC. Third layer installed with joints in line with base layer and secured with 1-1/2 in. Type S screws spaced 12 in. OC. Fourth layer secured with joints in line with second layer and secured with 1-5/8 in. Type S screws spaced 8 in. OC along vertical edges and 12 in. OC in the field. For all layers, screws offset 4 in. from previous layer.
NATIONAL GYPSUM CO — Type FSW

4O. **Gypsum Board* —** (As an alternate to Items 4 through 4N) — Two layers of 5/8 in. thick gypsum board applied vertically or horizontally. Inner layer attached to studs with 1 in. long Type S screws spaced 16 in. OC in the field and vertical edges and along top and bottom tracks. Outer layer attached to studs with 1-5/8 in. long Type S screws spaced 16 in. OC in the field and vertical edges and along the top and bottom tracks. Vertical joints are centered over studs and staggered between layers and on opposite sides of studs. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Horizontal edge joints and horizontal butt joints in adjacent layers need not be staggered.
NATIONAL GYPSUM CO — Type FSLX

4P. **Wall and Partition Facings and Accessories* —** (As an alternate to Item 4) — Nominal 1-3/8 in. thick, 4 ft wide panels, applied vertically or horizontally. Fastened with #6 x 2 in. long drywall screws spaced 8 in. OC along the perimeter and 12 in. OC in the field.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock 545

4Q. **Gypsum Board*—** (As an alternate to Item 5 when Foam Plastic insulation (Item 3E) is used) **—** Any 5/8 in. thick, 4 ft. wide, Gypsum Board listed in Item 5 above. Applied vertically with vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Gypsum panels secured to studs with 1 in. long Type S steel screws spaced 8 in. OC at perimeter and in the field. For 2 layer assemblies outer layer will be attached to studs over inner layer with the 1-5/8 in. long steel screws spaced 8 in. OC.

4R. **Gypsum Board*—** (As an alternate to Item 5 when Foam Plastic insulation (Item 3F) is used) **—** Any 5/8 in. thick, 4 ft. wide, Gypsum Board listed in Item 5 above. Applied vertically with vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Gypsum panels secured to studs with 1-1/4 in. long Type S steel screws spaced 8 in. OC at perimeter and in the field. For 2 layer assemblies outer layer will be attached to studs over inner layer with the 1-7/8 in. long steel screws spaced 8 in. OC.

5. **Lead Batten Strips —** (Not Shown, For Use With Item 4D) — Lead batten strips, min 1-1/2 in. wide, max 10 ft long with a max thickness of 0.125 in. Strips placed on the interior face of studs and attached from the exterior face of the stud with two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum board (Item 4D) and optional at remaining stud locations. Required behind vertical joints.

5A. **Lead Batten Strips —** (Not Shown, for use with Item 4H) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of0.140 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.5% meeting the Federal specification QQ-L-201f, Grades "B, C or D". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 6) and optional at remaining stud locations.

6. **Lead Discs or Tabs —** (Not Shown, For Use With Item 4D) — Used in lieu of or in addition to the lead batten strips (Item 5) or optional at other locations - Max 3/4 in. diam by max 0.125 in. thick lead discs compression fitted or adhered over steel screw heads or max 1/2 in. by 1-1/4 in. by max 0.125 in. thick lead tabs placed on gypsum boards (Item 4D) underneath screw locations prior to the installation of the screws. Lead discs or tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

6A. **Lead Discs —** (Not Shown, for use with Item 4H) — Max 5/16 in. diam by max0.140 in. thick lead discs compression fitted or adhered over steel screw heads. Lead discs to have a purity of 99.5% meeting the Federal Specification QQ-L-201f, Grades "B, C or D".

7. **Mineral and Fiber Board* —** (Optional, Not Shown) — For optional use as an additional layer on one side of wall. Nom 1/2 in. thick, 4 ft wide with long dimension parallel and centered over studs. Attached to studs and floor and ceiling runners with 1-5/8 in. long Type S steel screws, spaced 12 in. OC. The required UL Classified gypsum board layer(s) is/are to be installed as indicated as to fastener type and spacing, except that the required fastener length shall be increased by a minimum of 1/2 in. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.
HOMASOTE CO — Homasote Type 440-32

7A. **Mineral and Fiber Board —** (Optional, Not Shown) — For optional use as an additional layer on one side of wall - Nom 1/2 in. thick, 4 ft wide, square edge fiber boards applied vertically to studs on one side of the wall in between the wood studs and the UL Classified Gypsum Board (Item 4). Fiber boards installed with 1-1/4 in. long, Type S steel screws spaced 12 in. OC max, with the last screws spaced 2 in. and 6 in. from edge of board. Gypsum board (Item 4) installed as indicated as to fastener type and spacing, except that the required fastener length shall be increased by a minimum of 1/2 in. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.
BLUE RIDGE FIBERBOARD INC — SoundStop

8. **Furring Channels —** (Optional, Not Shown — not for use with Items 4D, 4H, 4J, or 4N) — Resilient furring channels fabricated from min 25 MSG corrosion-protected steel, spaced vertically a max of 24 in. OC. Flange portion attached to each intersecting stud with 1/2 in. long Type S-12 steel screws.

8A. **Framing Members* —** (Optional on one or both sides, Not Shown — not for use with Items 4D, 4H, 4J, or 4N) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b.

b. **Steel Framing Members* —** Used to attach furring channels (Item 8Aa) to studs. Clips spaced max. 48 in. OC. RSIC-1 and RSIC-1 (2.75) clips secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. RSIC-V and RSIC-V (2.75) clips secured to studs with No. 8 x 9/16 in. minimum self-drilling, S-12 steel screw through the center hole. Furring channels are friction fitted into clips. RSIC-1 and RSIC-V clips for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) and RSIC-V (2.75) clips for use with 2-23/32 in. wide furring channels.
PAC INTERNATIONAL L L C — Types RSIC-1, RSIC-V, RSIC-1 (2.75), RSIC-V (2.75)

8B. **Framing Members* —** (Optional on one or both sides, Not Shown — Not for use with Items 4D, 4H, 4J, or 4N) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.Gypsum board attached to furring channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach furring channels (Item a) to studs. Clips spaced 48 in. OC., and secured to studs with 2 in. coarse drywall screw with 1 in. diam washer through the center hole. Furring channels are friction fitted into clips.
STUDCO BUILDING SYSTEMS — RESILMOUNT Sound Isolation Clips - Type A237R

8C. **Steel Framing Members* —** (Optional on one or both sides, Not Shown — Not for use with Items 4D, 4H, 4J, or 4N) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item 8Cb. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire. Gypsum board attached to furring channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach furring channels (Item 8Ca) to studs. Clips spaced 48 in. OC, and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Furring channels are friction fitted into clips.
REGUPOL AMERICA — Type SonusClip

8D. **Steel Framing Members* —** (Optional on one or both sides, Not Shown — Not for use with Items 4D, 4H, 4J, or 4N) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a. **Resilient Channels —** Formed of No. 25 MSG galv steel, spaced 24 in. OC, and perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and secured in place with two No. 8 15 x 1/2 in. Philips Modified Truss screws spaced 2-1/2 in. from the center of the overlap. Gypsum board attached to resilient channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach resilient channels (Item 8Da) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Resilient channels are secured to clips with one No. 10 x 1/2 in. pan-head self-drilling screw.
KEENE BUILDING PRODUCTS CO INC — Type RC+ Assurance Clip

8E. **Steel Framing Members* —** (Optional on one or both sides, Not Shown — Not for use with Items 4D, 4H, 4J, or 4N) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire. Gypsum board attached to furring channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach furring channels (Item 8Ea) to studs. Clips spaced 48 in. OC., and secured to studs with No. 10 x 2 in. screw through the center hole. Furring channels are friction fit into clips.
MASON INDUSTRIES INC — Type CWC-50

8F **Steel Framing Members* —** (Optional on one or both sides, Not Shown — Not for use with Items 4D, 4H, 4J, or 4N) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a **Furring Channels —** Formed of No. 25 MSG galv steel. 2-23/32 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping #6 framing screws, min. 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Gypsum board attached to furring channels as described in Item 4.

b **Steel Framing Members* —** Used to attach furring channels (Item 8Fa) to studs. Clips spaced maximum 48 in. OC. Clips secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center grommet. Furring channels are friction fitted into clips.

CLARKDIETRICH BUILDING SYSTEMS — Type ClarkDietrich Sound Clip

9. **Barrier Mesh —** (Optional, Not Shown) - Attached to steel studs on one or both sides of the wall using Barrier Mesh Clips spaced at maximum 12 inches on center vertically, using a flat head type screw penetrating through the steel at least 3/8 of an inch. For Steel Studs less than 0.033 inches in thickness, use self-piercing screws. For Steel Studs equal to or greater than 0.033 inches in thickness, use steel drill screws (self-tapping). Gypsum Board (Item 4) to be installed directly over the Barrier Mesh using prescribed screw patterns with lengths increased by a minimum 1/8 in. Barrier Mesh may be installed with the long dimension of the diamond pattern positioned vertically or horizontally. Barrier Mesh joints may occur as butt joints at the framing members and secured using the Barrier Mesh Clips or occur in between framing members as overlapping joints secured using 18 SWG wire ties spaced a maximum 12 in. on center.
CLARKDIETRICH BUILDING SYSTEMS — Barrier Mesh, Barrier Mesh Clips

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2023-08-18

UL Product iQ®

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States
BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

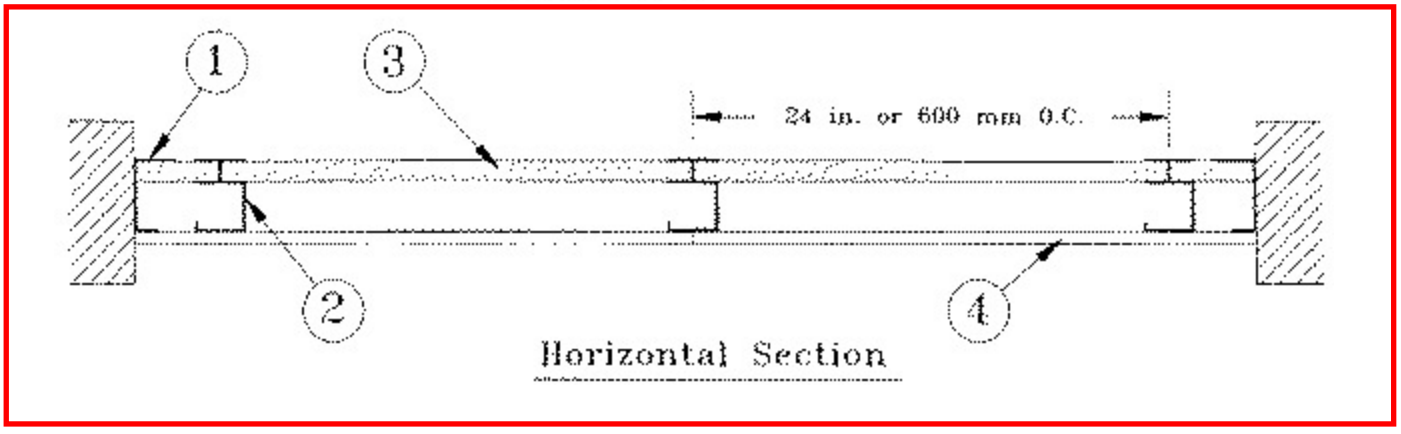
Design No. **U415**

February 14, 2022

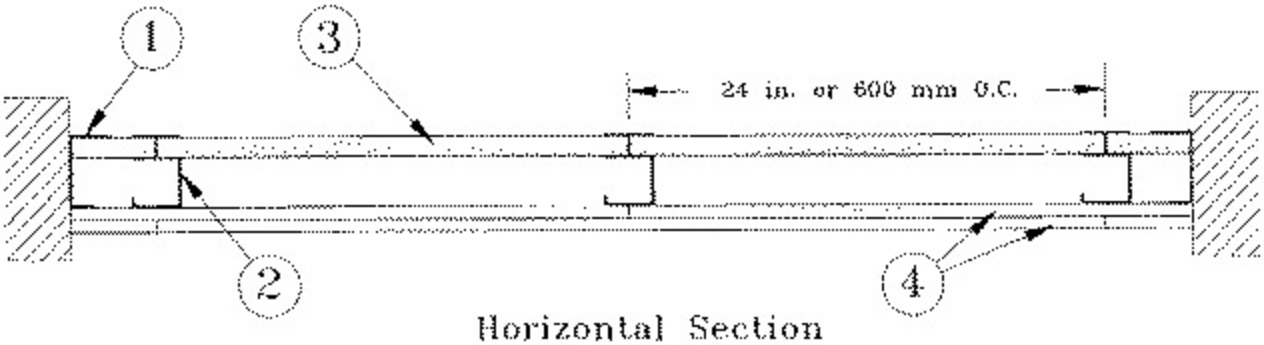
Nonbearing Wall Ratings — 1, 2, 3 or 4 Hr

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

System A — 1 Hr.

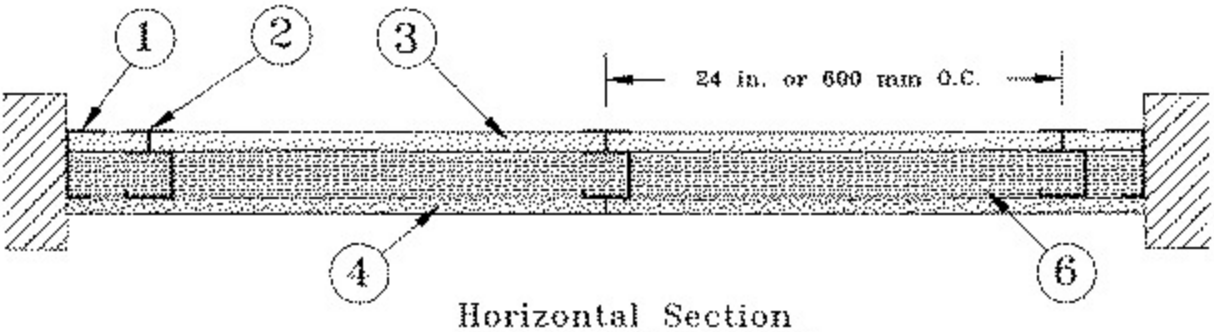


System B – 2 Hr.



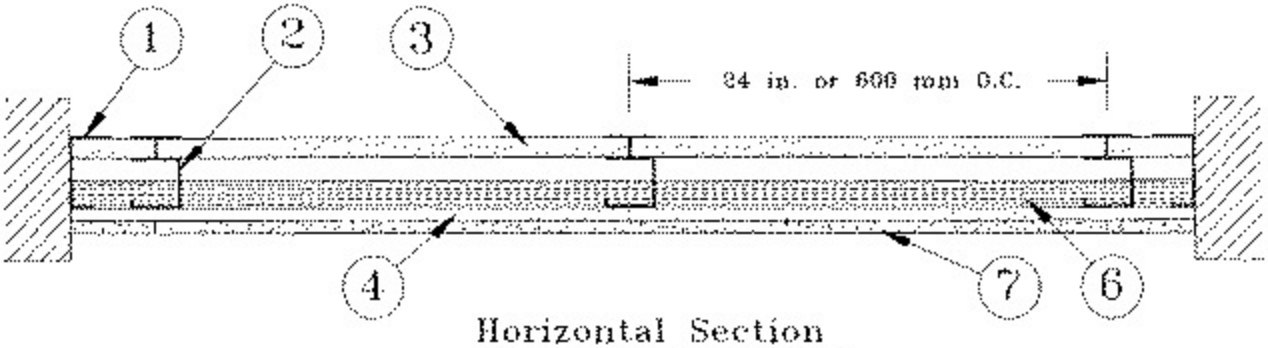
Horizontal Section

System C – 2 Hr.



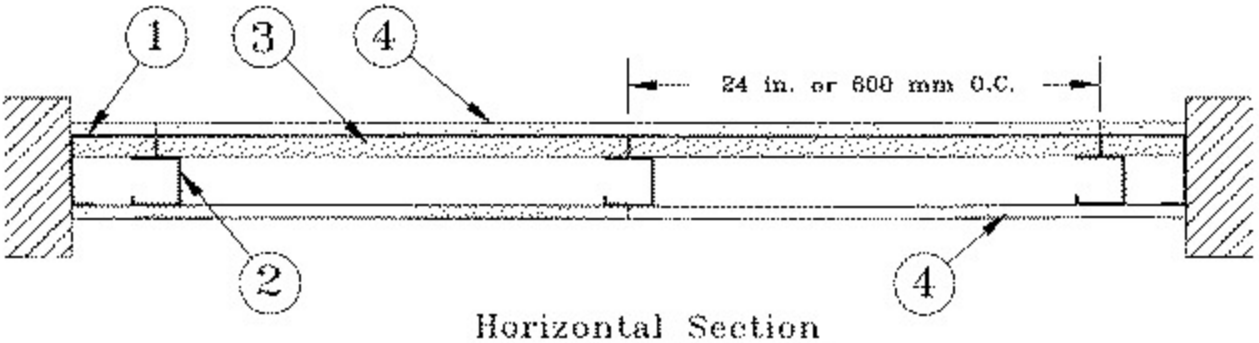
Horizontal Section

System D – 2 Hr.



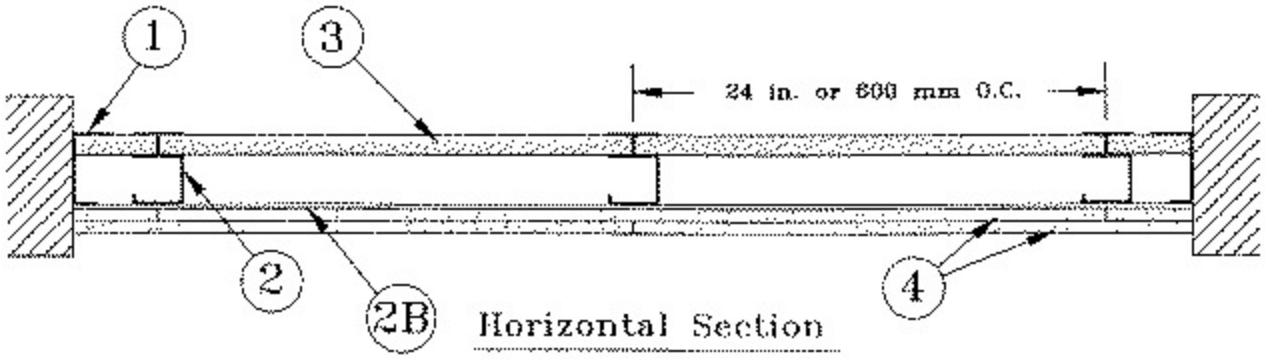
Horizontal Section

System E – 2 Hr.



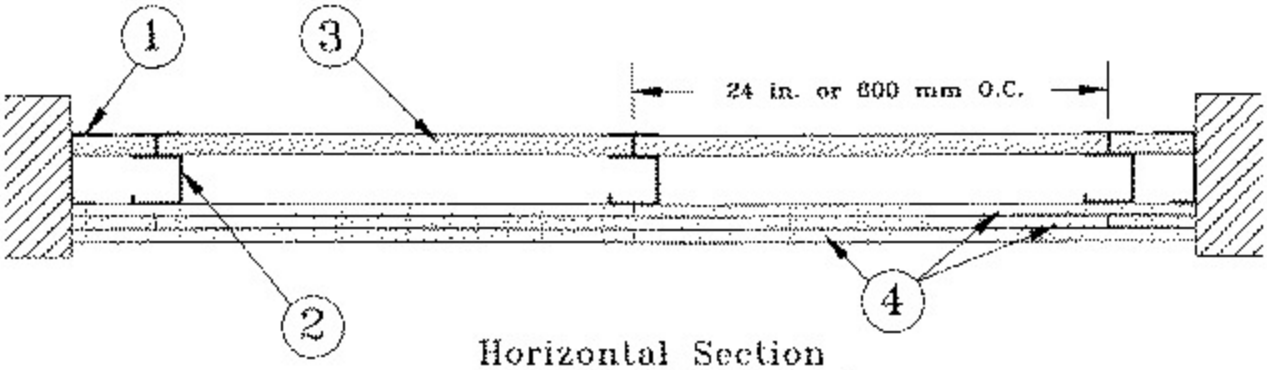
Horizontal Section

System F – 2 Hr.



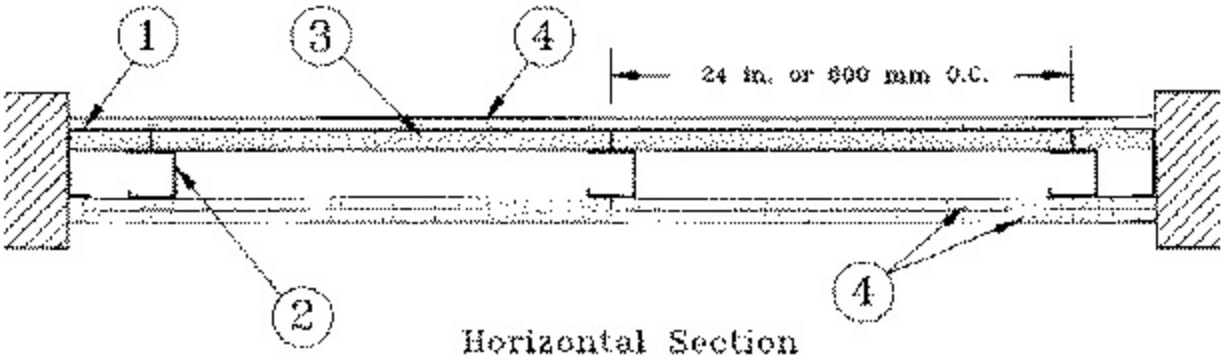
Horizontal Section

System G – 3 Hr.



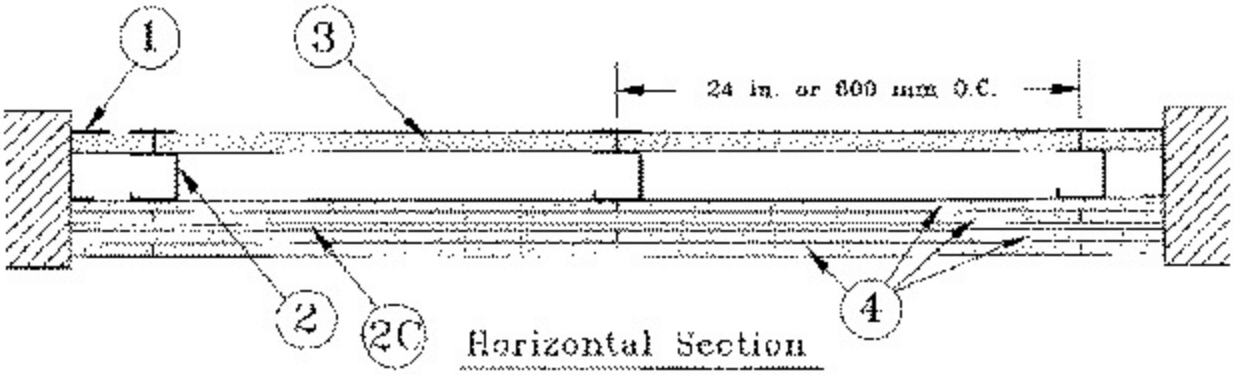
Horizontal Section

System H – 3 Hr.



Horizontal Section

System I – 4 Hr.



Horizontal Section

1. **Floor, Side and Ceiling Runners —** "J" - shaped runner, min 2-1/2 in. deep (min 4 in. deep when System C is used), with unequal legs of 1 in. and 2 in., fabricated from min 24 MSG (min 20 MSG when Item 4A, 4B, 4C, 4D or 7 are used) galv steel. Runners positioned

with short leg toward finished side of wall. Runners attached to structural supports with steel fasteners located not greater than 2 in. from ends and not greater than 24 in. OC. "E" - shaped studs (Item 2A) may be used as side runners in place of "J" - shaped runners.

2. **Steel Studs —** "C-H" - shaped studs, min 2-1/2 in. deep (min 4 in. deep when System C is used), fabricated from min 25 MSG (min 20 MSG when Items 2D, 4A, 4B, 4C, 4D or 7 is used) galv steel. Cut to lengths 3/8 to 1/2 in. less than floor-to-ceiling height and spaced 24 in. or 600 mm OC (max 16 in. OC when Items 4A, 4B, 4C, or 4D are used).

2A. **Steel Studs —** (Not Shown) — "E" - shaped studs installed back to back in place of "C-H" - shaped studs (Item 2) "E" - shaped studs secured together with steel screws spaced a maximum 12 in. OC. Fabricated from min 25 MSG (min 20 MSG when Item 2D, 4A, 4B or 7 is used) galv steel, min 2-1/2 in. deep (min 4 in. deep when System C is used), with one leg 1 in. long and two legs 3/4 in. long. Shorter legs 1 in. apart to engage gypsum liner panels. Cut to lengths 3/8 to 1/2 in. less than floor to ceiling heights.

2B. **Furring Channels —** (Optional, Not Shown) — For use with single or double layer systems. Resilient furring channels fabricated from min 25MSG corrosion protected steel, installed horizontally, and spaced vertically a max 24 in. OC. Flange portion of channel attached to each intersecting "C-H" or "E" stud on side of stud opposite the 1 in. liner panels with 1/2 in. long Type S or S-12 pan-head steel screws. When furring channels are used, wallboard to be installed vertically only. . Not to be used with Type FRX-G gypsum board, lead backed gypsum boards (Items 4A-4D), or cementitious backer units (Item 7).

2C. **Furring Channels —** For use with System I - "Hat" - shaped, 25 MSG galv steel furring channels attached directly over the inner layers of wallboard to each stud with 2 in. long Type S pan head steel screws. Screws alternate from top flange to bottom flange at each stud intersection. Furring channels spaced vertically max 24 in. OC.

2D. **Steel Framing Members* —** (Optional, Not Shown) — For use with single or double layer systems. Furring channels and Steel Framing Members as described below. Not to be used with Type FRX-G gypsum board, lead backed gypsum boards (Items 4A-4D), or cementitious backer units (Item 7).
a. **Furring Channels —** Formed of No. 25 MSG galv steel. 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board installed vertically only and attached to furring channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach furring channels (Item 2Da) to studs (Item 2 or 2A). Clips spaced max. 24 in. OC., and secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips. RSIC-1 clip for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) clip for use with 2-23/32 in. wide furring channels.
PAC INTERNATIONAL L L C — Types RSIC-1, RSIC-1 (2.75)

2E. **Steel Framing Members* —** (Optional, Not Shown) — Furring channels and Steel Framing Members as described below. . Not to be used with Type FRX-G gypsum board, lead backed gypsum boards (Items 4A-4D), or cementitious backer units (Item 7).
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.Gypsum board attached to furring channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach furring channels (Item 2Ea) to studs. Clips spaced 24 in. OC., and secured to studs with 2 in. coarse drywall screw with 1 in. diam washer through the center hole. Furring channels are friction fitted into clips.
STUDCO BUILDING SYSTEMS — RESILMOUNT Sound Isolation Clips - Type A237R

2F. **Steel Framing Members* —** (Optional, Not Shown) — For use with single or double layer systems. Furring channels and Steel Framing Members as described below. Not to be used with Type FRX-G gypsum board, lead backed gypsum boards (Items 4A-4D), or cementitious backer units (Item 7).
a. **Furring Channels —** Formed of No. 25 MSG galv steel. 2-3/8 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board installed vertically only and attached to furring channels as described in Item 3.

b. **Steel Framing Members* —** Used to attach furring channels (Item 2Da) to studs (Item 2 or 2A). Clips spaced max. 24 in. OC. GENIECLIPS secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.

PLITEQ INC — Type GENIECLIP

2G. **Steel Framing Members* —** (Optional, Not Shown) — Furring channels and Steel Framing Members as described below. Not to be used with Type FRX-G gypsum board, lead backed gypsum boards (Items 4A-4D), or cementitious backer units (Item 7).
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item 2Gb. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire. Gypsum board attached to furring channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach furring channels (Item 2Ga) to studs. Clips spaced 24 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Furring channels are friction fitted into clips.
REGUPOL AMERICA — Type SonusClip

2H. **Steel Framing Members* —** (Optional, Not Shown) — Resilient channels and Steel Framing Members as described below. Not to be used with Type FRX-G gypsum board, lead backed gypsum boards (Items 4A-4D), or cementitious backer units (Item 7).
a. **Resilient Channels —** Formed of No. 25 MSG galv steel, spaced 24 in. OC, and perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and secured in place with two No. 8 15 x 1/2 in. Philips Modified Truss screws spaced 2-1/2 in. from the center of the overlap. Gypsum board attached to resilient channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach resilient channels (Item 2Ha) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Resilient channels are secured to clips with one No. 10 x 1/2 in. pan-head self-drilling screw.
KEENE BUILDING PRODUCTS CO INC — Type RC+ Assurance Clip

2I. **Steel Framing Members* —** (Optional, Not Shown) — For use with single or double layer systems. Furring channels and Steel Framing Members as described below. Not to be used with Type FRX-G gypsum board, lead backed gypsum boards (Items 4A-4D), or cementitious backer units (Item 7).
a. **Furring Channels —** Formed of No. 25 MSG galv steel. 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board installed vertically only and attached to furring channels as described in Item 4.

b. **Steel Framing Members* —** Used to attach furring channels (Item 2Ia) to studs (Item 2 or 2A). Clips spaced max. 24 in. OC., and secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.
CLARKDIETRICH BUILDING SYSTEMS — Type ClarkDietrich Sound Clip

3. **Gypsum Board* —** Gypsum liner panels, nom 1 in. thick, 24 in. or 600 mm (for metric spacing) wide. Panels cut 1 in. less in length than floor to ceiling height. Vertical edges inserted in "H" portion of "C-H" studs or the gap between the two 3/4 in. legs of the "E" studs. Free edge of end panels attached to long leg of vertical "J" - runners with 1-5/8 in. long Type S steel screws spaced not greater than 12 in. OC. When wall height exceeds liner panel length, liner panel may be butted to extend to the full height of the wall. Horizontal joints need not be backed by steel framing. In System I, butt joints in liner panels are staggered min 36 in. Butt joints backed with 6 in. by 22 in. strips of 3/4 in. thick gypsum wallboard (Item 4). Wallboard strips centered over butt joints and secured to liner panels with six 1-1/2 in. long Type G steel screws, three screws along the 22 in. dimension at the top and bottom of the strips.
CGC INC — Type SLX

UNITED STATES GYPSUM CO — Type SLX

USG BORAL DRYWALL SFZ LLC — Type SLX

USG MEXICO S A DE C V — Type SLX

4. **Gypsum Board* —**

System A — 1 Hr

Gypsum panels, with beveled, square or tapered edges, nom 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally, attached to studs with 1 in. long Type S steel screws spaced 12 in. when installed vertically or 8 in OC when installed horizontally. Horizontal joints need not be backed by steel framing.

CGC INC — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, ULX, USGX, WRC, WRX

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Types C and SCX

UNITED STATES GYPSUM CO — Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULIX, ULX, WRC, WRX, USGX.

USG BORAL DRYWALL SFZ LLC — Types C, SCX, SGX, USGX

USG MEXICO S A DE C V — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

System B — 2 Hr

Gypsum panels, with beveled, square or tapered edges, nom 1/2 in. or 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally in two layers. Inner or base layer attached to studs with 1 in. long Type S steel screws spaced 24 in. OC when installed vertically or 16 in. OC when installed horizontally. Outer or face layer attached to studs with 1-5/8 in. long Type S steel screws spaced 12 in. OC when installed vertically and staggered 12 in. from base layer screws or 8 in. OC when installed horizontally and staggered 8 in. from base layer screws. Horizontal joints between inner and outer layers staggered a min of 12 in. Horizontal joints need not be backed by steel framing. Vertical joints centered over studs and staggered 24 in.

CGC INC — 1/2 in. Type C, IP-X2, IPC-AR or WRC; 5/8 in. Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Types C and SCX

UNITED STATES GYPSUM CO — 1/2 in. Types C, IP-X2, IPC-AR, or WRC; 5/8 in. Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULIX, ULX, USGX, WRC, WRX.

USG BORAL DRYWALL SFZ LLC — 1/2 in. Type C; 5/8 in. Types C, SCX, SGX, USGX

USG MEXICO S A DE C V — 1/2 in. Types C, IP-X2, IPC-AR or WRC; 5/8 in. Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

System C — 2 Hr

Gypsum panels, with beveled, square or tapered edges, nom 3/4 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally, secured with 1-1/4 in. long Type S steel screws spaced 8 in. OC along vertical edges and 12 in. OC in the field when installed vertically or 8 in. OC along the vertical edges and in the field when installed horizontally. Horizontal joints need not be backed by steel framing. Screws along side joints offset 4 in. Requires min 4 in. deep framing per Items 1, 2 and 3. Requires min 3 in. thick mineral wool batts per Item 6.

CGC INC — Types IP-X3 or ULTRACODE

UNITED STATES GYPSUM CO — Types IP-X3 or ULTRACODE

USG BORAL DRYWALL SFZ LLC — Type ULTRACODE

USG MEXICO S A DE C V — Types IP-X3 or ULTRACODE

System D — 2 Hr

Gypsum panels, with beveled, square or tapered edges, nom 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally, attached directly to studs with 1 in. long Type S steel screws spaced 24 in. when installed vertically or 16 in. OC when installed horizontally. Horizontal joints need not be backed by steel framing. Requires face layer of 1/2 or 5/8 in. thick cementitious backer units per Item 7 and min 1-1/2 in. thick mineral wool batts per Item 6.

CGC INC — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Types C and SCX

UNITED STATES GYPSUM CO — Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULIX, ULX, USGX, WRC, WRX.

USG BORAL DRYWALL SFZ LLC — Types C, SCX, SGX, USGX

USG MEXICO S A DE C V — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

System E — 2 Hr

Gypsum panels, with beveled, square or tapered edges, nom 1/2 in. or 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally, attached to studs with 1 in. long Type S steel screws spaced 12 in. OC when installed vertically or 8 in. when installed horizontally. Horizontal joints need not be backed by steel framing.

CGC INC — 1/2 in. Types C, IP-X2, IPC-AR; 5/8 in. Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Types C and SCX

UNITED STATES GYPSUM CO — 1/2 in. Types C, IP-X2, IPC-AR; 5/8 in. Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULIX, ULX, USGX, WRC, WRX.

USG BORAL DRYWALL SFZ LLC — 1/2 in. Type C; 5/8 in. Types C, SCX, SGX, USGX

USG MEXICO S A DE C V — 1/2 in. Types C, IP-X2, IPC-AR; 5/8 in. Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

System F — 2 Hr

Gypsum panels, with beveled, square or tapered edges, nom 1/2 in. or 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically in two layers. Inner or base layer attached to resilient furring channels (Item 2B) with 1 in. long Type S steel screws spaced 24 in. Outer or face layer attached to resilient furring channels (Item 2B) with 1-5/8 in. long Type S steel screws spaced 12 in. OC and staggered 12 in. from base layer screws. Joints between inner and outer layers staggered 24 in.

CGC INC — 1/2 in. Type C, IP-X2, IPC-AR or WRC; 5/8 in. Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Types C and SCX

UNITED STATES GYPSUM CO — 1/2 in. Type C, IP-X2, IPC-AR or WRC; 5/8 in. Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULIX, ULX, USGX, WRC, WRX.

USG BORAL DRYWALL SFZ LLC — 1/2 in. Type C; 5/8 in. Types C, SCX

USG MEXICO S A DE C V — 1/2 in. Types C, IP-X2, IPC-AR or WRC; 5/8 in. Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

System G — 3 Hr

Gypsum panels, with beveled, square or tapered edges, nom 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally in three layers. Inner or base layer attached to studs with 1 in. long Type S steel screws spaced 24 in. OC when installed vertically or 16 in OC when installed horizontally. Middle layer attached to studs with 1-5/8 in. long Type S steel screws spaced 24 in. when installed vertically or 16 in. OC when installed horizontally. Outer or face layer attached to studs with 2-1/4 in. long Type S steel screws spaced 16 in. when installed vertically or 12 in. OC when installed horizontally. Screws offset 6 in. from layer below. Horizontal joints on adjacent layers staggered a min of 12 in. . Horizontal joints need not be backed by steel framing. Vertical joints centered over studs and staggered 24 in. on adjacent layers.

CGC INC — Types C, IP-X2, IPC-AR, ULIX, WRC

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Type C

UNITED STATES GYPSUM CO — Types C, IP-X2, IPC-AR, ULIX, WRC

USG BORAL DRYWALL SFZ LLC — Type C

USG MEXICO S A DE C V — Types C, IP-X2, IPC-AR, WRC

System H — 3 Hr

Gypsum panels, with beveled, square or tapered edges, nom 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally, two layers over the flange of the "C" section of the studs, one layer over the flange of the "H" section of the studs. Inner or base layer attached to studs with 1 in. long Type S steel screws spaced 24 in. OC when installed vertically or 16 in. OC when installed horizontally. Face layer attached to studs with 1-5/8 in. long Type S steel screws spaced 16 in. when installed vertically or 12 in. OC when installed horizontally. Screws offset 6 in. from layer below. Horizontal joints on adjacent layers staggered a min of 12 in. Horizontal joints need not be backed by steel framing. Vertical joints centered over studs and staggered 24 in. on adjacent layers.

CGC INC — Types C, IP-X2, IPC-AR, ULIX, WRC

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Type C

UNITED STATES GYPSUM CO — Types C, IP-X2, IPC-AR, ULIX, WRC

USG BORAL DRYWALL SFZ LLC — Type C

USG MEXICO S A DE C V — Types C, IP-X2, IPC-AR, WRC

System I — 4 Hr

Gypsum panels, with beveled, square or tapered edges, nom 3/4 in. thick, 4 ft wide (or 1200 mm for metric spacing) wallboard with square or tapered edges. Total of four layers to be used. First and second (inner) layers applied vertically or horizontally over the steel studs. Horizontal joints need not be backed by steel framing. When applied vertically, joints centered over studs and staggered min 24 in., otherwise all joints staggered min 12 in. First layer secured to studs with 1-1/4 in. long Type S self-drilling, self-tapping bugle-head steel screws spaced 24 in. OC. Second layer secured to studs with 2-1/4 in. long Type S self-drilling, self-tapping bugle-head steel screws spaced 12 in. OC. Third layer applied vertically over the furring channels (Item 2C) with a 1-1/4 in. long Type S self-drilling, self-tapping bugle-head steel screws spaced 12 in. OC. Fourth layer applied vertically or horizontally with 2-1/4 in. long Type S self-drilling, self-tapping bugle-head steel screws spaced 12 in. OC. When applied vertically, joints to be staggered min 24 in. from third layer, otherwise all joints staggered min 12 in.

CGC INC — Types IP-X3 or ULTRACODE

UNITED STATES GYPSUM CO — Types IP-X3 or ULTRACODE

USG BORAL DRYWALL SFZ LLC — Type ULTRACODE

USG MEXICO S A DE C V — Types IP-X3 or ULTRACODE

4A. **Gypsum Board* —** (As an alternate to Item 4 Systems A, B, C, D, E, G, H, and I when used as the base layer, For direct attachment only) — Nom 5/8 in. or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over 20 MSG steel studs and staggered min 1 stud cavity on opposite sides of studs. See Items 1, 2, 2A, 2B and 2D. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. For Joint Compound see Item 5. To be used with Lead Batten Strips (see Item 9) or Lead Discs or Tabs (see Item 10).
RAY-BAR ENGINEERING CORP — Type RB-LBG

4B. **Gypsum Board* —** (As an alternate to Item 4 Systems A, B, C, D, E, G, H, and I when used as the base layer, For direct attachment only) — Nominal 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints

centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 (or #6 by 1-1/4 in. long bugle head fine driller) steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field.
NEW ENGLAND LEAD BURNING CO INC, DBA NELCO — Type Nelco

4C. **Gypsum Board* —** (As an alternate to Item 4 Systems A, B, C, D, E, G, H, and I when used as the base layer, For direct attachment only) — Nom 5/8 or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over 20 MSG steel studs and staggered min 1 stud cavity on opposite sides of studs. See Items 1, 2, 2A, 2B and 2D. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. For Joint Compound see Item 5. To be used with Lead Batten Strips (see Item 9A) or Lead Discs (see Item 10A). Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 10 ft long with a max thickness of 0.140 in. placed on the face of studs and attached to the stud with two 1 in. long Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip.
MAYCO INDUSTRIES INC — Type X-Ray Shielded Gypsum

4D. **Gypsum Board* —** (As an alternate to Item 4 Systems A, B, C, D, E, G, H, and I when used as the base layer, For direct attachment only) — Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws gypsum panel steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 8 ft long with a max thickness of 0.14 in. placed on the face of studs and attached to the stud with construction adhesive and two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead discs, nominal 3/8 in. diam by max 0.085 in. thick. Compression fitted or adhered over the screw heads. Lead batten strips and discs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".
RADIATION PROTECTION PRODUCTS INC — Type RPP - Lead Lined Drywall

5. **Joint Tape and Compound —** (Not Shown)

Systems A, B, C, E, F, G, H, I

Joints on outer layers of gypsum boards (Item 4 and 4A) covered with paper tape and joint compound. Paper tape and joint compound may be omitted when gypsum boards are supplied with square edges. Exposed screw heads covered with joint compound.

6. **Batts and Blankets* —**

Systems A, B, E, F, G, H, I

(Optional) — Mineral wool or glass fiber batts partially or completely filling stud cavity. Any mineral wool or glass fiber batt mineral bearing the UL Classification Marking as to Fire Resistance.

Systems C & D

Min 3 in. (System C) and min 1-1/2 in. (System D) thick mineral wool batts, friction fitted between the studs and floor and ceiling runners.

ROCKWOOL — Type AFB, min. density 1.8 pcf / 28.8 kg/m^3

THERMAFIBER INC — Type SAFB, SAFB FF

7. **Cementitious Backer Units* —** (System D) — Nom 1/2 or 5/8 in. thick panels, square edge, attached to studs over gypsum wallboard with 1-5/8 in. long, Type S-12, corrosion resistant steel screws spaced 8 in. OC and staggered 8 in. from gypsum wall board screws. Joints covered with glass fiber mesh tape. Vertical joints staggered one stud cavity from gypsum wallboard joints. Horizontal joints staggered a min of 12 in. from the gypsum wallboard joints.
UNITED STATES GYPSUM CO — Type DCB

8. **Laminating Adhesive* —** (Optional, Not Shown) — Used to bond outer layer of Cementitious Backer Units (Item 7) to inner layers of Gypsum Board (Item 4) in System D. ANSI A136.1 Type 1 organic adhesive applied with 1/4 in. square notched trowel. See Adhesives (BYWR) in the Fire Resistance Directory or Adhesives (BJLZ) in the Building Materials Directory for names of Classified companies.

9. **Lead Batten Strips —** (Not Shown, For Use With Item 4A) — Lead batten strips, min 1-1/2 in. wide, max 10 ft long with a max thickness of 0.125 in. Strips placed on the interior face of studs and attached from the exterior face of the stud with two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead batten strips to have a purity of 99.9%

meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 4A) and optional at remaining stud locations. Required behind vertical joints.

9A. **Lead Batten Strips —** (Not Shown, for use with Item 4C) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.140 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.5% meeting the Federal specification QQ-L-201f, Grades "B, C or D".. Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 6) and optional at remaining stud locations.

10. **Lead Discs or Tabs —** (Not Shown, For Use With Item 4A) — Used in lieu of or in addition to the lead batten strips (Item 9) or optional at other locations - Max 3/4 in. diam by max 0.125 in. thick lead discs compression fitted or adhered over steel screw heads or max 1/2 in. by 1-1/4 in. by max 0.125 in. thick lead tabs placed on gypsum boards (Item 4A) underneath screw locations prior to the installation of the screws. Lead discs or tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

10A. **Lead Discs —** (Not Shown, for use with Item 4C) — Max 5/16 in. diam by max 0.140 in. thick lead discs compression fitted or adhered over steel screw heads. Lead discs to have a purity of 99.5% meeting the Federal Specification QQ-L-201f, Grades "B, C or D".

11. **Lead Batten Strips —** (Not Shown, For Use With Item 4B) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.142 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 4B) and optional at remaining stud locations.

12. **Lead Tabs —** (Not Shown, For Use With Item 4B) — 2 in. wide, 5 in. long with a max thickness of 0.142 in. Tabs friction-fit around front face of stud, the stud folded back flange, and the back face of the stud. Tabs required at each location where a screw (that secures the gypsum boards, Item 4B) will penetrate the steel stud. Lead tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead tabs may be held in place with standard adhesive tape if necessary.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2022-02-14

UL Product iQ®

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States
BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

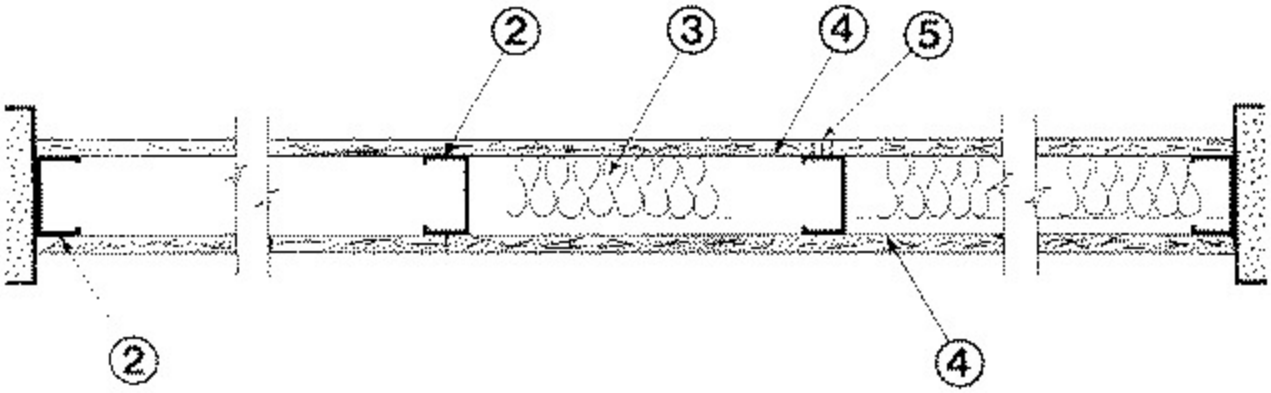
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. **U465**

December 1, 2023

Nonbearing Wall Rating — 1 HR.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Floor and Ceiling Runners —** (Not Shown) — Channel shaped runners, 3-5/8 in. deep (min), 1-1/4 in. legs, formed from min No. 25 MSG galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

1A. **Framing Members* — Floor and Ceiling Runners —** (Not Shown) — As an alternate to Item 1 — Channel shaped, min 3-5/8 in. deep, attached to floor and ceiling with fasteners 24 in. OC. max.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

1B. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Item 1 — For use with Item 2B, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
CEMCO, LLC — Viper20™ Track

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track

1C. **Floor and Ceiling Runners —** (Not Shown) — For use with Item 2C — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, min depth to accommodate stud size, with min 1 in. long legs, attached to floor and ceiling with fasteners spaced max 24 in. OC.

1D. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Items 1 through 1C — For use with Item 2D and 4G only, proprietary channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
CLARKDIETRICH BUILDING SYSTEMS — CD ProTRAK

DMFCWBS L L C — ProTRAK

MBA METAL FRAMING — ProTRAK

RAM SALES L L C — Ram ProTRAK

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProTRAK

1E. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Items 1 through 1D — For use with Item 2E and 4I only, proprietary channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
TELLING INDUSTRIES L L C — TRUE-TRACK™

1F. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Items 1 through 1E — For use with Item 2, channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 25 MSG steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
KIRII (HONG KONG) LTD — Type KIRII

1G. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Items 1 through 1F — For use with Item 2, channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide, attached to floor and ceiling with fasteners spaced 24 in. OC max.
STUDCO BUILDING SYSTEMS — CROCSTUD Track

1H. **Floor and Ceiling Runners —** (Not Shown) — Channel shaped, fabricated from min 0.02 in. galv steel, min width to accommodate stud size, with min 1 in. long legs, for use with studs specified below and fabricated from min 0.02 in. galv steel or thicker, attached to floor and ceiling with fasteners spaced max 24 in. OC.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track VT100

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track VT100

1I. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Item 1 — For use with Item 2H, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

1J. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Items 1 — For use with Item 2 L, proprietary channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
RESCUE METAL FRAMING, L L C — AlphaTRAK

1K. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Item 1 — For use with Item 2M, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep, fabricated from min 25 MSG (0.018 in. min. bare metal thickness), attached to floor and ceiling with fasteners spaced 24 in. OC max.
CEMCO, LLC — Viper X Track

1L. **Framing Members* — Floor and Ceiling Runners —** Not Shown — In lieu of Item 1 — For use with Item 2N, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
CRACO MFG INC — SmartTrack20™

1M. **Framing Members* - Floor and Ceiling Runners –** Not shown – In lieu of Items 1 through 1L – For use with Item 2O, proprietary channel shaped runners, min 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 20 MSG galv steel (0.0329 in. min bare metal thickness), attached to floor and ceiling with fasteners spaced 24 in. OC max.

PANEL REY S A – SUPRA Track 20/33 mil

1N. **Framing Members* — Floor and Ceiling Runner —** Not Shown — In lieu of Item 1 – For use with Item 2P, proprietary channel shaped runners, 1-1/4 in. wide by min. 3-5/8 in. deep fabricated from min 0.019 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

PANEL REY S A – SUPRA Track 20EQ/19 mil

1O. **Framing Members* — Floor and Ceiling Runner —** (Not Shown — Alternate to Item 1) — For use with Item 2Q, channel shaped runners pre-equipped with proprietary attachment clips. Min. 3-5/8 in. wide. Legs of top runners minimum 3-1/4 in. wide. Legs of bottom runners minimum 1-1/2 in. wide. Runners attached to floor and ceiling with fasteners 24 in. OC max.

HYPERFRAME INC - Hypertrack

1P. **Framing Members* — Floor and Ceiling Runner —** Not Shown — In lieu of Item 1 – For use with Item 2R, proprietary channel shaped runners, 1-1/4 in. wide by min. 3-5/8 in. deep fabricated from min. 20 EQ/22 mils. (min. 0.0221 in. thick) galvanized steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

JJC INTERNATIONAL DISTRIBUTORS — Non-structural Tracks 3-5/8″ and 6″.

2. **Steel Studs —** Channel shaped, 3-5/8 in. deep (min), formed from min No. 25 MSG galv steel spaced 24 in. OC max. Studs to be cut 3/4 in. less than assembly height.

2A. **Framing Members* — Steel Studs —** As an alternate to Item 2 — Channel shaped studs, min 3-5/8 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

2B. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 — For use with Item 1B, proprietary channel shaped steel studs, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel. Studs cut 3/4 in. less in length than assembly height.
CEMCO, LLC — Viper20™

CRACO MFG INC — SmartStud20™

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

IMPERIAL MANUFACTURING GROUP INC — Viper20™

2C. **Steel Studs —** (As an alternate to Item 2, For use with Item 1C) — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, 3-1/2 in. min depth, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners. Studs to be cut 5/8 to 3/4 in. less than assembly height. See materials in Item(s) 4 that require Item 2C studs.

2D. **Framing Members* — Steel Studs —** As an alternate to Items 2 through 2C — For use with Item 1D and 4G only, channel shaped studs, min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 1/2 in. less than assembly height.
CLARKDIETRICH BUILDING SYSTEMS — CD ProSTUD

DMFCWBS L L C — ProSTUD

MBA METAL FRAMING — ProSTUD

RAM SALES L L C — Ram ProSTUD

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProSTUD

2E. **Framing Members* — Steel Studs —** As an alternate to Items 2 through 2D — For use with Item 1E and 4I only, channel shaped studs, min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 1/2 in. less than assembly height.
TELLING INDUSTRIES L L C — TRUE-STUD™

2F. **Framing Members* — Steel Studs —** As an alternate to Items 2 through 2E — For use with Item 1F, channel shaped studs, min 3-5/8 in. wide fabricated from min 25 MSG steel, spaced a max of 24 in. OC. Studs to be cut 1/2 in. less than assembly height.
KIRII (HONG KONG) LTD — Type KIRII

2G. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 through 2F — For use with Item 1G. Proprietary channel shaped studs, minimum 3-5/8 in. wide, Studs to be cut 1/2 in. less than the assembly height.
STUDCO BUILDING SYSTEMS — CROCSTUD

2H. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 — For use with Item 1I, proprietary channel shaped steel studs, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel. Studs cut 3/4 in. less in length than assembly height.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

2I. **Framing Members* — Steel Studs —** In lieu of Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, 3-5/8 in. deep (min), spaced 24 in. OC max. Studs to be cut 3/4 in. less than assembly height.
EB METAL INC — NITROSTUD

2J. **Framing Members* — Steel Studs —** In lieu of Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, 3-5/8 in. deep (min), spaced 24 in. OC max. Studs to be cut 3/4 in. less than assembly height.
OLMAR SUPPLY INC — PRIMESTUD

2K. **Framing Members* — Steel Studs —** As an alternate to Item 2 — For use with Item 1B (3-5/8 in. wide track), channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, 1-1/4 in. wide by 3-5/8 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — StudRite™

2L. **Framing Members* — Steel Studs —** As an alternate to Items 2 — For use with Item 1J, channel shaped studs, min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
RESCUE METAL FRAMING, L L C — AlphaSTUD

2M. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 — For use with Item 1K, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 3-5/8 in. deep, fabricated from min 25 MSG (0.018 in. min. bare metal thickness). Studs cut 3/4 in. less in length than assembly height.
CEMCO, LLC — Viper X

2N. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 — For use with Item 1L, proprietary channel shaped steel studs, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel. Studs cut 3/4 in. less in length than assembly height.
CRACO MFG INC — SmartStud20™

2O. **Framing Members* - Steel Studs –** Not Shown – In lieu of Items 2 through 2N – For use with Item 1M, proprietary channel shaped steel studs, min 1-5/8 in. wide by min 3-5/8 in. deep fabricated from min 20 MSG galv steel (0.0329 in. min bare metal thickness) spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

PANEL REY S A – SUPRA Stud 20/33 mil

2P. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 – For use with Item 1N, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 3-5/8 in. deep with 1/4 in. return lips fabricated from min 0.019 in. thick galv steel, spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

PANEL REY S A – SUPRA Stud 20EQ/19 mil

2Q. **Framing Members* — Steel Studs —** (Not Shown — Alternate to Item 2, For use with Item 1O) — Channel shaped steel studs with attachment clips at top and bottom, min 3-5/8 in. depth, spaced a max of 24 in. OC. Studs clipped into floor and ceiling runners (Item 1O). Max 2-3/8 in. extension reveal from top of stud to inside of ceiling runner.

HYPERFRAME INC— Hyperstud

2R. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 – For use with Item 1P, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min. 20 EQ/22 mils. (min. 0.0221 in. thick) galvanized steel, spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

JJC INTERNATIONAL DISTRIBUTORS — Non-structural Studs 3-5/8" and 6".

3. **Batts and Blankets* —** (Optional) — Mineral wool or glass fiber batts partially or completely filling stud cavity.
See **Batts and Blankets** (BZJZ) category for names of Classified companies.

ROCKWOOL — Type AFB, min. density 1.69 pcf / 27.0 kg/m^3

ROCKWOOL MALAYSIA SDN BHD — Type Acoustical Fire Batts

3A. **Fiber, Sprayed* —** As an alternate to Batts and Blankets (Item 3) — (100% Borate Formulation) — Spray applied cellulose material. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product with a nominal dry density of 2.7 lb/ft^3. Alternate Application Method: The fiber is applied without water or adhesive at a nominal dry density of 3.5 lb/ft^3, in accordance with the application instructions supplied with the product.
Applegate Greenfiber Acquisition LLC — Insulmax and SANCTUARY for use with wet or dry application.

3B. **Fiber, Sprayed* —** As an alternate to Batts and Blankets (Item 3) — Spray applied cellulose insulation material. The fiber is applied with water to interior surfaces in accordance with the application instructions supplied with the product. Applied to completely fill the enclosed cavity. Minimum dry density of 4.3 pounds per cubic ft.
NU-WOOL CO INC — Cellulose Insulation

3C. **Fiber, Sprayed* —** As an alternate to Batts and Blankets (Item 3) — Spray applied cellulose fiber. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product. The minimum dry density shall be 4.30 lbs/ft^3.
INTERNATIONAL CELLULOSE CORP — Celbar-RL

3D. **Batts and Blankets* —** For use with Item 8. Nom 3 in. thick, minimum 3.4 pcf mineral wool batts, friction fit between the studs and floor and ceiling runners.
See **Batts and Blankets** (BZJZ) category for names of manufacturers.

3E. **Batts and Blankets* —** For use with Item 4R and 4S. Placed in stud cavities, any min. 3-1/2 in. thick glass fiber insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance.
See **Batts and Blankets** (BKNV or BZJZ) Categories for names of Classified companies.

3F. Deleted.

3G. **Foamed Plastic*** — As an alternate to Batts and Blankets (Item 3), for use with Item 4U — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity. When foamed plastic is used, minimum stud depth shall be 3-1/2 in.

CARLISLE SPRAY FOAM INSULATION — Types SealTite ONE, SealTite Pro Closed Cell (CC), SealTite Pro Open Cell (OC), SealTite Pro OCX, SealTite Pro No Trim 21, SealTite Pro One Zero, Foamsulate Closed Cell, Foamsulate OCX, Foamsulate 70, and Foamsulate HFO.

3H. **Foamed Plastic*** — As an alternate to Batts and Blankets (Item 3), for use with Item 4W — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity. When foamed plastic is used, minimum stud depth shall be 3-1/2 in. with min. 20 MSG thickness.

BASF CORP - Enertite® NM, Enertite® G, FE178®, Spraytite® 178, Spraytite® 81206, Walltite® 200, Walltite® US, Walltite® US-N, Walltite® HP+, FE137®, FE158®, Spraytite® 158, Spraytite® SP, Spraytite® 81205, Spraytite® Comfort XL, and Walltite® XL

4. **Gypsum Board* —** 5/8 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track with 1 in. long, Type S steel screws spaced 8 in. OC. along edges of board and 12 in. OC in the field of the board. Joints oriented vertically and staggered on opposite sides of the assembly. When Steel Framing Members* (Item 6 or any alternate clips) are used, gypsum board is screw attached to furring channels with 1 in. long, Type S steel screws spaced 12 in. OC.

AMERICAN GYPSUM CO — Types AG-C, AGX-1, M-Glass, LightRoc

BEIJING NEW BUILDING MATERIALS PUBLIC LTD CO — Type DBX-1

CABOT MANUFACTURING ULC — Type X, 5/8 Type X, Type Blueglass Exterior Sheathing

CGC INC — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

CERTAINTEED GYPSUM INC — Types EGRG, GlasRoc, Type X-1, Type C, 5/8" Easi-Lite Type X, Easi-Lite Type X-2, Type LWTX

CERTAINTEED GYPSUM INC — Types LGFC2A, LGFC6A, LGFC-C/A, LGFC-WD, LGLLX

GEORGIA-PACIFIC GYPSUM L L C — Types 5, 6, 9, C, DAP, DD, DA, DAPC, DGG, DS, GPFS6, LS, Type X, Veneer Plaster Base - Type X, Water Rated - Type X, Sheathing - Type X, Soffit - Type X, TG-C, GreenGlass Type X, Type X ComfortGuard Sound Deadening Gypsum Board, Type LWX, Veneer Plaster Base-Type LWX, Water Rated-Type LWX, Sheathing Type-LWX, Soffit-Type LWX, Type DGLW, Water Rated-Type DGLW, Sheathing Type-DGLW, Soffit-Type DGLW, Type LW2X, Veneer Plaster Base - Type LW2X, Water Rated - Type LW2X, Sheathing - Type LW2X, Soffit - Type LW2X, Type DGL2W, Water Rated - Type DGL2W, Sheathing - Type DGL2W

NATIONAL GYPSUM CO — Types eXP-C, FSK, FSK-C, FSK-G, FSMR-C, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, FSW-8, FSL, RSX.

NATIONAL GYPSUM CO — Riyadh, Saudi Arabia — Type FR, or WR

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Types PG-C, PG-9, PG-11, PGS-WRS, PGI

PANEL REY S A — Types GREX, GRIX, PRC, PRC2, PRX, RHX, MDX, ETX, PRX2

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

SIAM GYPSUM INDUSTRY (SARABURI) CO LTD — Type EX-1

THAI GYPSUM PRODUCTS PCL — Type X and Type C, M2Tech Type C

UNITED STATES GYPSUM CO — Type AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC, WRX, (Joint tape and compound, Item 5, optional for use with Type USGX)

USG BORAL DRYWALL SFZ LLC — Types C, SCX, USGX (Joint tape and compound, Item 5, optional for use with Type USGX)

USG MEXICO S A DE C V — Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

4A. **Gypsum Board* —** (As alternate to Item 4) — Nom 5/8 in. thick gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Panels attached to steel studs and floor runner with 1 in. long Type S steel screws spaced 8 in. OC when applied horizontally, or 8 in. OC along vertical and bottom edges and 12 in. OC in the field when panels are applied vertically. When used in widths other than 48 in., gypsum panels to be installed horizontally. When using ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter.
CERTAINTEED GYPSUM INC — Type X-1, Type C, Type EGRG/ GlasRoc, GlasRoc-2, Type SilentFX, Easi-Lite Type X-2

CGC INC — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

CERTAINTEED GYPSUM INC — Types LGFC2A, LGFC6A, LGFC-C/A, LGFC-WD

GEORGIA-PACIFIC GYPSUM L L C — Types DAP, DAPC, DGG, DS

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

THAI GYPSUM PRODUCTS PCL — Type X and Type C, M2Tech Type C

UNITED STATES GYPSUM CO — Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC, WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

USG BORAL DRYWALL SFZ LLC — Types C, SCX, USGX (Joint tape and compound, Item 5, optional for use with Type USGX)

USG MEXICO S A DE C V — Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

4B. **Gypsum Board* —** (As an alternate to Items 4 or 4A) — Nom 3/4 in. thick, 4 ft wide, installed as described in Item 4A with screw length increased to 1-1/4 in.
CGC INC — Types AR, IP-AR

UNITED STATES GYPSUM CO — Types AR, IP-AR

USG MEXICO S A DE C V — Types AR, IP-AR

4C. **Gypsum Board* —** As an alternate to Items 4, 4A, and 4B — Nom. 5/8 in. thick gypsum panels, with square edges, applied horizontally. Gypsum panels fastened to framing with 1 in. long bugle head steel screws spaced a max 8 in. OC, with last 2 screws 3/4 in. and 4 in. from each edge of board. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs on interior walls need not be staggered or backed by steel framing.
GEORGIA-PACIFIC GYPSUM L L C — Type DGG, GreenGlass Type X

4D. **Gypsum Board* —** As an alternate to Items 4, 4A, 4B, 4C, 4G — Nom. 5/8 in. thick gypsum panels applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Gypsum panels fastened to framing with 1 in. long Type S steel screws 12 in. OC along vertical edges and in the field, and12 in. along the top and bottom of the wall. When used in widths other than 48 in., gypsum panels to be installed horizontally. When studs (Item 2) spaced a max 16 in. OC, 5/8 in. thick gypsum panels applied vertically or horizontally, 1 in. long spaced 16 in. OC along vertical edges and in the field, and 16 in. OC along top and bottom of wall.
NATIONAL GYPSUM CO — Types eXP-C, FSK, FSK-C, FSK-G, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, FSMR-C

4E. **Gypsum Board* —** (As an Alternate to Items 4 through 4D) – Installed as described in item 4. 5/8 in. thick, 4 ft wide, applied vertically only and fastened to the studs and plates with 1 in. long Type S steel screws spaced 12 in. OC. When studs (Item 2) spaced a max 16 in. OC, 5/8" in. thick gypsum panels applied vertically or horizontally with 1 in. long Type S steel screws spaced 16 in. OC along vertical edges and in the field, and 16 in. OC along top and bottom of wall.
NATIONAL GYPSUM CO — Type SBWB

4F. **Gypsum Board* —** (Not Shown) — (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2C) - Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field.
RAY-BAR ENGINEERING CORP — Type RB-LBG

4G. **Gypsum Board* —** (As an alternate to Items 4 through 4F) — For use with Items 1D and 2D only, 5/8 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track with 1 in. long, Type S steel screws spaced 8 in. OC. along edges of board and 12 in. OC in the field of the board. Joints oriented vertically and staggered on opposite sides of the assembly. When using Types eXP-C, FSK, FSK-C, FSK-G, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, FSMR-C and ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter.
CGC INC — Type SCX, ULIX

CERTAINTEED GYPSUM INC — Type LGFC6A, LGFC-C/A

NATIONAL GYPSUM CO — Types eXP-C, FSK, FSK-C, FSK-G, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, and FSMR-C

UNITED STATES GYPSUM CO — Type SCX, ULIX

USG BORAL DRYWALL SFZ LLC — Type SCX

4H. **Gypsum Board* —** (As an alternate to Items 4 through 4G) — Nominal 5/8 in. thick, 4 ft wide panels, applied vertically and secured as described in Item 4.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock ES

4I. **Gypsum Board* —** (As an alternate to Items 4 through 4F) — 5/8 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track with 1 in. long, Type S steel screws spaced 8 in. OC. along edges of board and 12 in. OC in the field of the board. Joints oriented vertically and staggered on opposite sides of the assembly. When using ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter. When using ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter.
CGC INC — Types SCX, ULIX

UNITED STATES GYPSUM CO — Types SCX, ULIX

USG BORAL DRYWALL SFZ LLC — Type SCX

4J. **Gypsum Board* —** (Not Shown) — (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2C) — Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. To be used with Lead Batten Strips (see Item 9A) or Lead Discs (see Item 10A).
MAYCO INDUSTRIES INC — Type X-Ray Shielded Gypsum

4K. **Gypsum Board* —** (As an alternate to Item 4 and 4A, not for use with Items 1D, 1E, 2D and 2E) — Nom. 5/8 in. thick gypsum panels with beveled, square or tapered edges installed as described in Item 4 and 4A.
CGC INC — Type ULX

UNITED STATES GYPSUM CO — Type ULX

USG MEXICO S A DE C V — Type ULX

4L. **Gypsum Board* —** (Not Shown) — (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2C). Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws gypsum panel steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 8 ft long with a max thickness of 0.14 in. placed on the face of studs and attached to the stud with construction adhesive and two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead discs, nominal 3/8 in. diam by max 0.085 in. thick. Compression fitted or adhered over the screw heads. Lead batten strips and discs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".
RADIATION PROTECTION PRODUCTS INC — Type RPP - Lead Lined Drywall

4M. **Gypsum Board* —** (For use with Item 8) — 5/8 in. thick, 4 ft wide, applied vertically over Mineral and Fiber Board (Item 8) with vertical joints located anywhere over stud cavities. Secured to mineral and fiber boards with 1-1/2 in. Type G Screws spaced 8 in. OC along edges of each vertical joint and 12 in. OC in intermediate field of the Mineral and Fiber Board (Item 8). Secured to outermost studs and floor and ceiling runners with 2 in. long Type S screws spaced 8 in. OC. Gypsum Board joints covered with paper tape and joint compound. Screw heads covered with joint compound.
AMERICAN GYPSUM CO — Type AG-C

CERTAINTEED GYPSUM INC — Type C

CGC INC — Types C, IP-X2, IPC-AR

CERTAINTEED GYPSUM INC — Type LGFC-C/A

GEORGIA-PACIFIC GYPSUM L L C — Types 5, DAPC, TG-C

NATIONAL GYPSUM CO — Types eXP-C, FSK-C, FSW-C

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type PG-C

PANEL REY S A — Types PRC, PRC2

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

THAI GYPSUM PRODUCTS PCL — Type C, M2Tech Type C

UNITED STATES GYPSUM CO — Types C, IP-X2, IPC-AR, ULIX

USG BORAL DRYWALL SFZ LLC — Type C

USG MEXICO S A DE C V — Types C, IP-X2, IPC-AR

4N. **Wall and Partition Facings and Accessories* —** (As an alternate to Item 4) — Nominal 5/8 in. thick, 4 ft wide panels, applied vertically and secured as described in Item 4.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock 527

4O. **Gypsum Board* —** As an alternate to Items 4, 4A, 4B, and 4C — Two layers Nom. 5/16 in. thick gypsum panels applied vertically or horizontally. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel

framing. Horizontal joints on the same side need not be staggered. When applied horizontally, both layers of gypsum board fastened to each side of framing with 1 in. long Type S steel screws spaced 8 in. OC and staggered 4 in. OC between layers. When applied vertically, both layers of gypsum board fastened to each side of framing with 1 in. long Type S steel screws spaced 8 in. OC along vertical edges and 12 in. OC in the field, staggered 4 in. OC between layers. Screws spaced a max 12 in. along the top and bottom edges of the wall.
NATIONAL GYPSUM CO — Type FSW

4P. **Gypsum Board* —** As an alternate to Item 4. Nom 5/8 in. thick, 4 ft wide, Nom 5/8 in. thick gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Panels attached to steel studs and runners with 1 in. long Type S steel screws spaced 12 in. OC when applied horizontally or vertically. When used in widths other than 48 in., gypsum panels to be installed horizontally.
CGC INC — Type ULIX

UNITED STATES GYPSUM CO — Types ULIX

4Q. **Gypsum Board* —** 3/4 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track as described in Item 4 with screw length increased to min. 1- 1/8 in.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type PG-13

4R. **Gypsum Board* —** As an alternate to Item 4D. For use with Item 3E, **Batts and Blankets*** — 5/8 in. thick, 4 ft wide, installed as described in Item 4. When studs (Item 2) spaced a max 16 in. OC, 5/8 in. thick gypsum panels applied vertically or horizontally, 1 in. long spaced 16 in. OC along vertical edges and in the field, and 16 in. OC along top and bottom of wall.
NATIONAL GYPSUM CO — Type FSLX.

4S. **Gypsum Board* —** As an alternate to Item 4. For use with Item 3E, **Batts and Blankets*** — 5/8 in. thick, 4 ft wide, installed as described in Item 4A.
CERTAINTEED GYPSUM INC — Type CLLX.

4T. **Wall and Partition Facings and Accessories* —** (As an alternate to 5/8 in. thick board as outlined in Item 4) — Nominal 1-3/8 in. thick, 4 ft wide panels, applied vertically or horizontally. Fastened with #6 x 2 in. long drywall screws spaced 8 in. OC along the perimeter and 12 in. OC in the field.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock 545

4U. **Gypsum Board*—** (As an alternate to Item 4 when Foam Plastic insulation Item 3G is used) — Any 5/8 in. thick, 4 ft. wide, Gypsum Board listed in Item 4 above. Applied vertically with vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Gypsum panels secured to studs with 1 in. long Type S steel screws spaced 8 in. OC at perimeter and in the field. For 2 layer assemblies outer layer will be attached to studs over inner layer with the 1-5/8 in. long steel screws spaced 8 in. OC.

4V. **Gypsum Board* —** (As an alternate to Item 4, for 1 hr. rating) — Nom. 5/8 in. thick gypsum panels applied vertically or horizontally. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Gypsum panels fastened to framing with 1 in. long Type S steel screws 12 in. OC along vertical edges and in the field. Screws spaced a max 12 in. along the top and bottom edges of the wall for both vertical and horizontal applications.

CERTAINTEED GYPSUM INC — Type X-1, SilentFX, GlasRoc, Type C

4W. **Gypsum Board*—** (As an alternate to Item 4 when Foam Plastic insulation Item 3H is used) — Any 5/8 in. thick, 4 ft. wide, Gypsum Board listed in Item 4 above. Applied vertically with vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Gypsum panels secured to studs with 1-1/4 in. long Type S steel screws spaced 8 in. OC at perimeter and in the field.

5. **Joint Tape and Compound —** Vinyl, dry or premixed joint compound, applied in two coats to joints and screw heads; paper tape, 2 in. wide, embedded in first layer of compound over all joints. As an alternate, nominal 3/32 in. thick gypsum veneer plaster may be applied to the entire surface of Classified veneer baseboard. Joints reinforced. Paper tape and joint compound may be omitted when gypsum boards are supplied with square edges.

6. **Resilient Channel —** (Optional — Not Shown) — 25 MSG galv steel resilient channels spaced vertically max 24 in. OC, flange portion attached to each intersecting stud with 1/2 in. long type S-12 pan head steel screws. May not be used with Item 4F, 4J or 4L.

6A. **Steel Framing Members* —** (Optional, Not Shown, As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping No. 6 framing screws, min 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Not for use with Items 4F, 4J, or 4L.

b. **Framing Members* —** Used to attach furring channels (Item a) to studs (Item 2). Clips spaced 48 in. OC., and secured to studs with 1-5/8 in. wafer or hex head Type S steel screw through the center grommet. Furring channels are friction fitted into clips. RSIC-1 clip for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) clip for use with 2-23/32 in. wide furring channels.
PAC INTERNATIONAL L L C — Types RSIC-1, RSIC-1 (2.75)

6B. **Framing Members* —** — (Optional on one or both sides, Not Shown, As an alternate to Item 6) — Furring channel and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. 2-3/8 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members* —** Used to attach furring channels (Item 6Ba) to studs (Item 2). Clips spaced max. 48 in. OC. GENIECLIPS secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.
PLITEQ INC — Type Genie Clip

6C. **Steel Framing Members* —** (Optional, Not Shown, As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members* —** Used to attach furring channels (Item 6Ca) to studs. Clips spaced 48 in. OC., and secured to studs with 2 in. coarse drywall screw with 1 in. diam washer through the center hole. Furring channels are friction fitted into clips.
STUDCO BUILDING SYSTEMS — RESILMOUNT Sound Isolation Clips - Type A237R

6D. **Steel Framing Members* —** (Optional, Not Shown As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item 6Db. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized

steel wire. Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members* —** UUsed to attach furring channels (Item 6Da) to studs. Clips spaced 48 in. OC, and secured to studs with No.8 x 2-1/2 in. coarse drywall screw through the center hole. Furring channels are friction fitted into clips.
REGUPOL AMERICA — Type SonusClip

6E. **Steel Framing Members* —** (Optional, Not Shown As an alternate to Item 6) — Resilient channels and Steel Framing Members as described below:
a. **Resilient Channels —** Formed of No. 25 MSG galv steel, spaced 24 in. OC, and perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and secured in place with two No. 8 15 x 1/2 in. Philips Modified Truss screws spaced 2-1/2 in. from the center of the overlap. Gypsum board attached to resilient channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members* —** Used to attach resilient channels (Item 6Ea) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Resilient channels are secured to clips with one No. 10 x 1/2 in. pan-head self-drilling screw.
KEENE BUILDING PRODUCTS CO INC — Type RC+ Assurance Clip

6F **Steel Framing Members* —** (Optional, Not Shown, As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:
a **Furring Channels —** Formed of No. 25 MSG galv steel. 2-23/32 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping #6 framing screws, min. 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Gypsum board attached to furring channels as described in Item 4.

b **Steel Framing Members* —** Used to attach furring channels (Item 6Fa) to studs. Clips spaced maximum 48 in. OC. Clips secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center grommet. Furring channels are friction fitted into clips.

CLARKDIETRICH BUILDING SYSTEMS — Type ClarkDietrich Sound Clip

6F. **Steel Framing Members* —** (Optional, Not Shown) — Furring channels and Steel Framing Members as described below:
a. **Furring Channels —** Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire. Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members* —** Used to attach furring channels (Item 6Fa) to studs. Clips spaced 48 in. OC., and secured to studs with No. 10 x 2 in. screw through the center hole. Furring channels are friction fit into clips.
MASON INDUSTRIES INC — Type CWC-50

7. **Wall and Partition Facings and Accessories* —** (Optional, Not Shown) — Nominal 1/2 in. thick, 4 ft wide panels, for optional use as an additional layer on one or both sides of the assembly. Panels attached in accordance with manufacturer's recommendations. When the QR-500 or QR-510 panel is installed between the steel framing and the UL Classified gypsum board, the required UL Classified gypsum board layer(s) is/are to be installed as indicated as to fastener type and spacing, except that the required fastener length shall be increased by a minimum of 1/2 in. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.
PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock QR-500 and QR-510

8. **Mineral and Fiber Board* —** (Optional, Not Shown) — For optional use as an additional layer on one side of wall. Nom 1/2 in. thick, 4 ft wide with long dimension parallel and centered over studs. Attached to studs and floor and ceiling runners with 1-5/8 in. long Type S steel screws, spaced 12 in. OC and 24 in. OC along all intermediate framing. The required UL Classified gypsum board layer (Item 4M) is to be installed over the Mineral and Fiber Boards. Batts and Blankets, Item 3D, and Adhesive, Item 11, are required.
HOMASOTE CO — Homasote Type 440-32

8A. **Mineral and Fiber Board —** (Optional, Not Shown) — For optional use as an additional layer on one side of wall - Nom 1/2 in. thick, 4 ft wide, square edge fiber boards applied vertically to studs on one side of the wall in between the wood studs and the UL Classified Gypsum Board (Item 4). Fiber boards installed with 1-1/4 in. long, Type S steel screws spaced 12 in. OC max, with the last screws spaced 2 in. and 6 in. from edge of board. Gypsum board (Item 4) installed as indicated as to fastener type and spacing, except that the required fastener length shall be increased by a minimum of 1/2 in. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board. Not evaluated for use with Item 4M.
BLUE RIDGE FIBERBOARD INC — SoundStop

8B. **Mineral and Fiber Board* —** (Optional, Not Shown) — For optional use as an additional layer on one side of wall. Nom 1/2 in. thick, 4 ft wide with long dimension parallel and centered over studs. Attached to studs and floor and ceiling runners with 1-5/8 in. long Type S steel screws, spaced 12 in. OC and 24 in. OC along all intermediate framing. The required UL Classified gypsum board layer is to be installed over the Mineral and Fiber Boards and secured to studs with length of fasteners increased by 1/2 in. over the length specified for installation of the gypsum boards. Batts and Blankets, Item 3, are optional unless otherwise required. Not for use with Items 4F, 4J, 4L, and 4M.
HOMASOTE CO — Homasote Type 440-32

9. **Lead Batten Strips —** (Not Shown, For Use With Item 4E) — Lead batten strips, min 1-1/2 in. wide, max 10 ft long with a max thickness of 0.125 in. Strips placed on the interior face of studs and attached from the exterior face of the stud with two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum board (Item 4E) and optional at remaining stud locations. Required behind vertical joints.

9A. **Lead Batten Strips —** (Not Shown, for use with Item 4J) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.140 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.5% meeting the Federal specification QQ-L-201f, Grades "B, C or D". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 4J) and optional at remaining stud locations.

10. **Lead Discs or Tabs —** (Not Shown, For Use With Item 4E) — Used in lieu of or in addition to the lead batten strips (Item 8) or optional at other locations - Max 3/4 in. diam by max 0.125 in. thick lead discs compression fitted or adhered over steel screw heads or max 1/2 in. by 1-1/4 in. by max 0.125 in. thick lead tabs placed on gypsum boards (Item 4E) underneath screw locations prior to the installation of the screws. Lead discs or tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

10A. **Lead Discs —** (Not Shown, for use with Item 4J) — Max 5/16 in. diam by max 0.140 in. thick lead discs compression fitted or adhered over steel screw heads. Lead discs to have a purity of 99.5% meeting the Federal Specification QQ-L-201f, Grades "B, C or D".

11. **Adhesive —** Not Shown — (For use with Item 8) — Construction grade adhesive applied in vertical, serpentine, nominal 3/8 in. wide beads down the length of both vertical edges of Mineral and Fiber Board (Item 8).

12. **Wall and Partition Facings and Accessories* —** (CLBV) (Optional, Not Shown) — For use with Items 1 to 1I, Items 2 to 2J, Item 3, Items 4 to 4I, Item 5 and Item 6. For maximum fire rating of 1 hour. On one side of the wall, over the first layer of Gypsum Board (Item 4 to Item 4I), install RefleXor membrane with the gold side facing outwards. Membrane installed with T50 staples spaced 12 inches on center in both directions as per manufacturer's instructions, seams in membrane to be overlapped by 2 inches. When RefleXor membrane is used an additional layer of Gypsum Board that is identical to the one used in the first layer and as specified in Item 4 to Item 4I shall be installed over the membrane. The additional layer of Gypsum Board to be installed through the membrane to the stud

as specified in Item 4 to Item 4I except the fastener length shall be increased by a minimum of 5/8 inch. Install Batts and Blankets in the stud cavity as per Item 3.

On the other side of the wall, prior to the installation of the Gypsum Board, install Resilient Channels as per Item 6. Over the Resilient Channels install 3/4 inch thick SONOpan panel secured to the Resilient Channels with min. 1-1/4 in. long drywall screws and washers spaced at 16 in. OC on the perimeter of the panel and 8 in. OC in the field of the panel. Over the SONOpan panel install the same Gypsum Board as specified in Item 4 to Item 4I with the fastener length increased by minimum 3/4 inch. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.

Alternately, on the other side of the wall prior to the installation of the Gypsum Board, install 3/4 in. thick SONOpan panels, secured to one side of studs either horizontally or vertically. Panels secured to each stud with min. 1-1/4 in. long drywall screws spaced 12 in. OC. Over the SONOpan, install 25 MSG galv steel, Resilient Channels, spaced vertically 24 in. OC. Resilient Channels fastened through panels to each stud with min. 2 in. long drywall screws or self-tapping screws. Over the Resilient Channels install Gypsum Board as specified in Item 4 to Item 4I with the specified drywall screws. Panels not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.

MSL — RefleXor membrane, SONOpan panel

13. **Barrier Mesh —** (Optional, Not Shown) - Attached to steel studs on one or both sides of the wall using Barrier Mesh Clips spaced at maximum 12 inches on center vertically, using a flat head type screw penetrating through the steel at least 3/8 of an inch. For Steel Studs less than 0.033 inches in thickness, use self-piercing screws. For Steel Studs equal to or greater than 0.033 inches in thickness, use steel drill screws (self-tapping). Gypsum Board (Item 4) to be installed directly over the Barrier Mesh using prescribed screw patterns with lengths increased by a minimum 1/8 in. Barrier Mesh may be installed with the long dimension of the diamond pattern positioned vertically or horizontally. Barrier Mesh joints may occur as butt joints at the framing members and secured using the Barrier Mesh Clips or occur in between framing members as overlapping joints secured using 18 SWG wire ties spaced a maximum 12 in. on center.
CLARKDIETRICH BUILDING SYSTEMS — Barrier Mesh, Barrier Mesh Clips

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2023-12-01

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- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States
BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

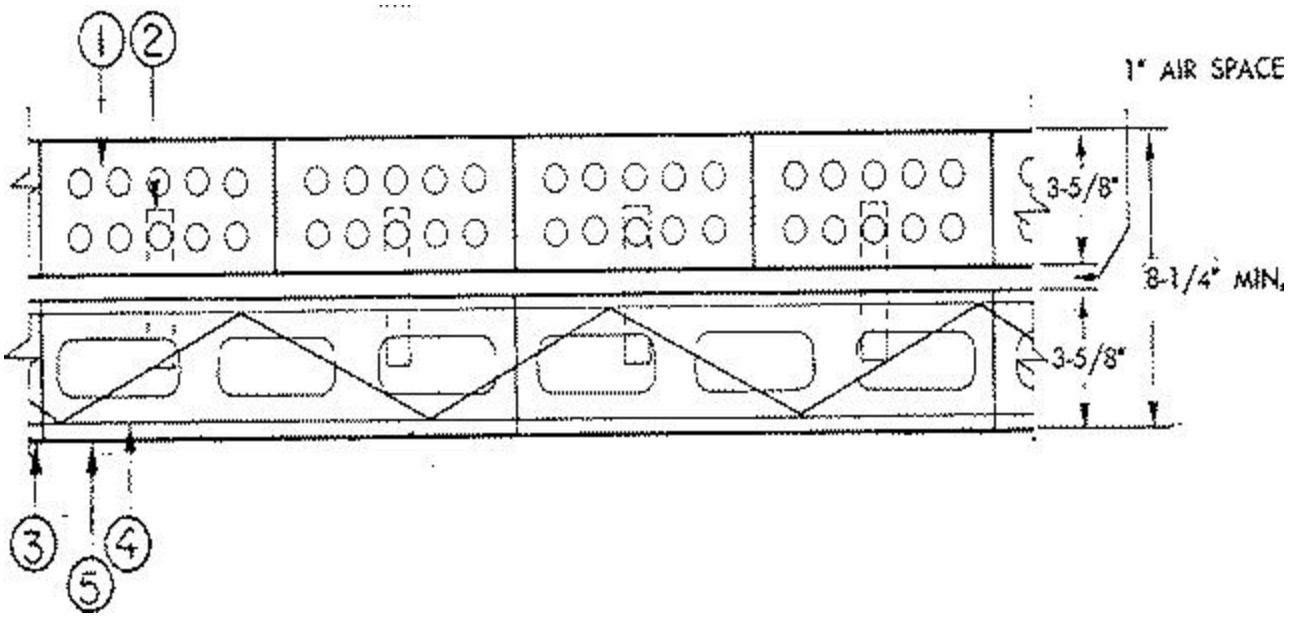
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. **U902**

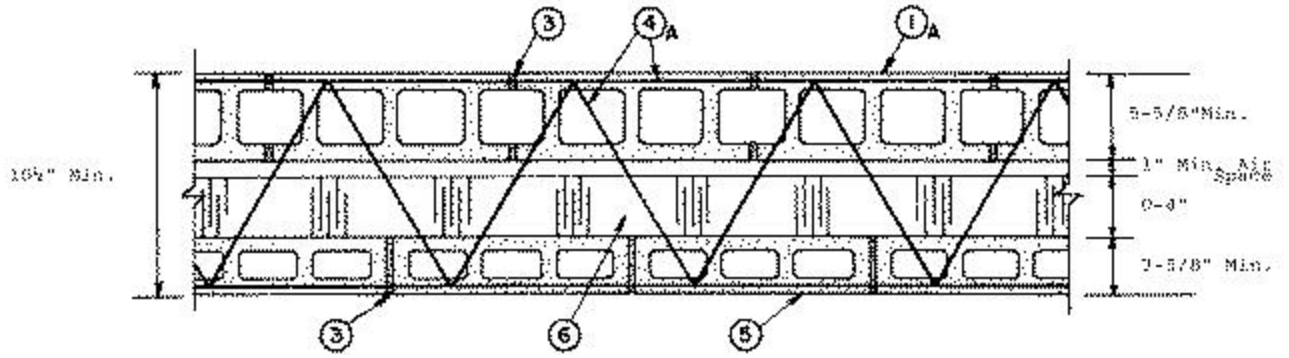
October 16, 2023

Bearing Wall Rating — 4 HR.
This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



Alternate Detail



1. **Clay Face Brick —** 3-5/8 in. wide by 2-1/4 in. high by 8 in. long.

1A. **Concrete Blocks* —** Various designs, Classification D-2 (2 h).
See Concrete Blocks category for list of eligible manufacturers.

2. **Brick Ties —** 3/4 in. wide, 7 in. long corrugated 26 MSG galv steel. Spaced one to each brick in every second course of blocks.

3. **Mortar —** Bricks and blocks laid in full bed of mortar nom. 3/8 in. thick of not less than 2-1/4 and not more than 3-1/2 parts clean sharp sand to 1 part Portland cement (proportioned by vol) and not more than 50 percent hydrated lime (by cement vol). Vertical joints staggered.

4. **Reinforcement —** Parallel and diagonal rods, 0.150 in. min diam with welded joints a max 16 in. OC. Placed the width of concrete block wall in every second course of blocks alternately with brick ties.

4A. **Masonry Reinforcement —** Prefabricated steel reinforcement, truss or ladder type, used for embedment in every second horizontal mortar joint. Placed the full width of wall assembly. Side and cross rods No. 9 (0.150 in.) min diam with welded joints a max 16 in. OC.

5. **Concrete Blocks* —** Various designs Classification D-2 (2 h). See Concrete Blocks category for list of eligible manufacturers.

6. **Foamed Plastic* —** (Optional — Not shown with clay face brick detail) Rigid polystyrene insulation for use between brick and/or concrete blocks. One or more layers of rigid extruded polystyrene insulation, 4 in. thick max having 1 in. min air space with face brick or blocks.
ATLAS MOLDED PRODUCTS, A DIVISION OF ATLAS ROOFING CORPORATION — Type ThermalStar

OC CELFORTEC LP

OWENS CORNING SCIENCE AND TECHNOLOGY, LLC — Types 150 or 250

DUPONT DE NEMOURS, INC. — Type Styrofoam

6A. **Foamed Plastic* —** (Optional-Not shown with clay face brick detail). Rigid polyisocyanurate insulation for use between brick and/or concrete blocks. One or more layers of rigid extruded polystyrene insulation, 4 in. thick max having 1 in. min air space with face brick or blocks.

ATLAS ROOFING CORP — EnergyShield Pro Wall Insulation, EnergyShield Pro 2 Wall Insulation, EnergyShield CGF Pro, EnergyShield Ply Pro, EnergyShield® CGF, EnergyShield® PanelCast, EnergyShield® and "EnergyShield® XR

DUPONT DE NEMOURS, INC. — Type Thermax Sheathing, Thermax Light Duty Insulation, Thermax Heavy Duty Insulation, Thermax Metal Building Board, Thermax White Finish Insulation, Thermax ci Exterior Insulation, Thermax XARMOR ci Exterior Insulation, Thermax IH Insulation, Thermax Plus Liner Panel, Thermax Heavy Duty Plus (HDP), TUFF-R™ ci Insulation, Thermax Butler Stylwall Insulation Board and Thermax Morton Heavy Duty Insulation Board

FIRESTONE BUILDING PRODUCTS CO L L C — "Enverge™ CI Foil Exterior Wall Insulation" and "Enverge™ CI Glass Exterior Wall Insulation"

HUNTER PANELS, A DIVISION OF CARLISLE CONSTRUCTION MATERIALS, LLC — Type "Xci-Class A", "Xci 286", "Xci Foil (Class A)", "Xci CG", "Xci Foil", "Xci CG NH", "Xci Foil NH"

RMAX, A BUSINESS UNIT OF SIKA CORPORATION — — Types "TSX-8500", "ECOMAXci FR", "TSX-8510", "ECOMAX xi FR White", "ECOMAXci", "ECOMAXci FR Air Barrier", "Thermasheath-XP", "Thermasheath", "Durasheath"

JOHNS MANVILLE — Type "AP Foil-Faced Foam Sheathing"

6B. **Foamed Plastic* —** (Optional-Not shown with clay face brick detail). Two-component foamed plastic formed from NCFI 11-001, NCFI 11-002, NCFI 11-015, NCFI 11-016 or NCFI11-017 spray applied between brick and/or concrete blocks at a nominal density of 2.1 pcf, 4 in. thick max, having a 1 in. min air space with face brick or blocks.

NCFI POLYURETHANES

6C. **Foamed Plastic* —** (Optional-Not shown with clay face brick detail). Spray applied, foamed plastic insulation spray applied between brick and/or concrete blocks, having a 1 in. min air space with face brick or blocks.

BASF CORP — Enertite® NM, Enertite® G, FE178®, Spraytite® 178, Spraytite® 81206, Walltite® 200, Walltite® US, Walltite® US-N, FE137®, FE158®, Spraytite® 158, Spraytite® SP, Spraytite® 81205, Spraytite® Comfort XL, and Walltite® XL.

6D. **Building Unit* —** (Optional-Not shown with clay face brick detail). Rigid polyisocyanurate composite insulation for use between brick and/or concrete blocks.

ATLAS ROOFING CORP — EnergyShield® Ply

HUNTER PANELS, A DIVISION OF CARLISLE CONSTRUCTION MATERIALS, LLC — Type "Xci NB" and "Xci Ply"

LAMINATORS INC — Type "Omega ci"

RMAX, A BUSINESS UNIT OF SIKA CORPORATION — "Thermasheath-SI", "ECOBASEci", "ThermaBase-CI", "ECOMAXci FR Ply", "ECOMAXci Ply".

6E. **Foamed Plastic* —** (Optional-Not shown with clay face brick detail) — Expanded polystyrene insulation installed to a maximum nominal density of 2.0 lb/ft^3.

BASF CORP STYRENIC FOAMS DIV — Types Neopor® GPS (Roofing Board), Neopor® GPS (EIFS), Neopor® GPS (Stucco), Neopor® GPS (CI), Neopor® GPS (IE), Neopor® GPS (Perma R-Chrome), Neopor® GPS (Termite Treated), Neopor® GPS (HALO Subterra), Neopor® GPS (Foundation PRO), Neopor® GPS (HALO Exterra), Neopor® GPS (HALO Interra), Neopor® GPS (PFT Pro Board), Neopor® GPS (PFT Red Label), and Neopor® GPS (PFT Chrome).

6F. **Insulation* —** (Optional - Not shown - Used in lieu of item 6) - Mineral wool insulation boards, min. 1 inch thick, max. 4 in. thick.

THERMAFIBER INC — Types RainBarrier 45, RainBarrier HD, RainBarrier ci High Compressive, Rain Barrier ci High Compressive Plus, RainBarrier ci High Compressive Max

6G. **Insulation — Mineral and Fiber Boards * —** (Optional - Not shown - Used in lieu of item 6) - Mineral wool insulation boards, min. 1 inch thick, max. 4 in. thick.
ROCKWOOL — Type Cavityrock

7. **Wall and Partition Facing and Accessories —** (Not Shown) Installed in accordance with the manufacturers installation instructions. Min. 0.25 in. (6 mm) thick panel fastened to the exterior surface.
KEENE BUILDING PRODUCTS CO INC — Types Driwall Rainscreen 020, Driwall Rainscreen 10 and CAV-AIR-ATOR

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2023-10-16

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- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States
BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. **U914**

April 14, 2022

Bearing Wall Rating — 3 HR.
Nonbearing Wall Rating — 3 HR.
This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

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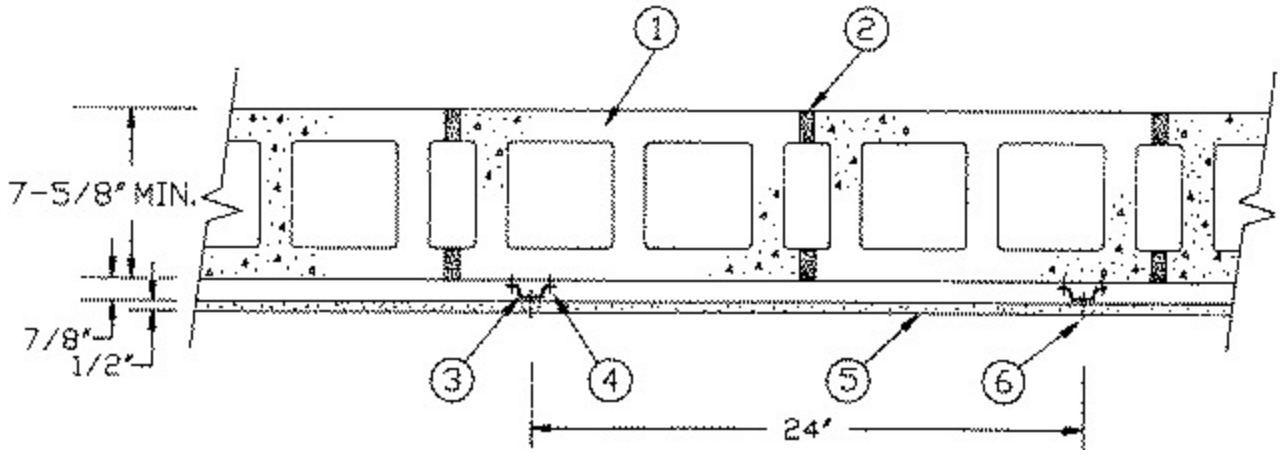

1. **Concrete Blocks* —** Various designs. Classification D-2 (2 hr). See **Concrete Blocks** category for list of eligible manufacturers.

2. **Mortar —** Blocks laid in full bed of mortar, nom 3/8 in. thick, of not less than 2-1/4 and not more than 3-1/2 parts clean sharp sand to 1 part Portland cement (proportioned by volume) and not more than 50 percent hydrated lime (by cement volume). Vertical joints staggered.

3. **Furring Channels —** Min 0.019 in. thick (25 gauge) galv steel, 1-3/8 in. wide on top and 2-9/16 in. or 2-3/4 in. or 2-23/32 in. wide at bottom by 7/8 in. deep. Spaced 24 in. OC perpendicular to floor with a channel parallel to and approximately 3 in. above floor and 3 in. below ceiling. Clearance between vertical and horizontal channels 1/2 in.

3A. **Furring Channels —** For use with item 4D. Min 0.019 in. thick (25 gauge) galv steel, 2-23/32 in. wide by 7/8 in. deep. Spaced 24 in. OC perpendicular to floor with a channel parallel to and approximately 3 in. above floor and 3 in. below ceiling. Clearance between vertical and horizontal channels 1/2 in.

4. **Channel Fasteners —** 1-1/4 in. long masonry screws with 3/16 in. body and 5/16 in. diameter head. Fasteners spaced 24 in. O.C. with the fasteners staggered on each long leg of the furring channel.

4A. **Steel Framing Members* —** Alternate method used to attach furring channels (Item 3) to concrete blocks (Item 1). Clips spaced 48 in. OC., and secured to blocks with 1/4 in. dia. By 3 in. long concrete expansion anchor (Item 4B) through the center grommet. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping #6 framing screws, min. 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Furring channels are friction fitted into clips. RSIC-1 clip for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) clip for use with 2-23/32 in. wide furring channels.
PAC INTERNATIONAL L L C — Types RSIC-1, RSIC-1 (2.75).

4B. **Concrete Expansion Anchor —** (Not Shown) — 1/4 in. dia. by 3 in. long carbon steel, pre-assembled, nail drive expansion anchor with mushroom head driven into the web of the concrete block. Min. embedment in concrete block of 1-3/8 in. and evaluated in accordance with ASTM E 488 to have ultimate load capacities of 980 lbs (tension) and 1400 lbs (shear) when used in 2000 psi concrete.

4C. **Steel Framing Members* —** (Not Shown) — Alternate method used to attach furring channels (Item 3) to concrete blocks (Item 1). Clips spaced 48 in. OC., and secured to blocks with 1/4 in. dia. by 3 in. long concrete expansion anchor (Item 4B) through the center hole. Ends of adjoining channels are overlapped 6 in. tied together with double strand of No. 18 AWG galvanized steel wire.Furring channels are friction fitted into clips.
STUDCO BUILDING SYSTEMS — RESILMOUNT Sound Isolation Clips - Type A237R

4D. **Steel Framing Members* —** (Not Shown) — Alternate method used to attach furring channels (Item 3) to concrete blocks (Item 1). Clips spaced 48 in. OC., and secured to blocks with 1/4 in. dia. by 3 in. long concrete expansion anchor (Item 4B) through the center hole. Ends of adjoining channels are overlapped 6 in. tied together with double strand of No. 18 AWG galvanized steel wire. Furring channels are friction fitted into clips.
REGUPOL AMERICA — Type SonusClip

4E. **Steel Framing Members* —** (Optional, Not Shown) — Resilient channels and Steel Framing Members as described below:
a. **Resilient Channels —** Formed of No. 25 MSG galv steel, spaced 24 in. OC, and perpendicular to studs. Channels secured to concrete blocks as described in Item b. Ends of adjoining channels overlapped 6 in. and secured in place with two No. 8 15 x 1/2 in. Philips Modified Truss screws spaced 2-1/2 in. from the center of the overlap. Gypsum board attached to resilient channels as described in Item 5.

b. **Steel Framing Members* —** Used to attach resilient channels (Item 4Ea) to concrete blocks. Clips spaced 48 in. OC., and secured to concrete blocks with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Resilient channels are secured to clips with one No. 10 x 1/2 in. pan-head self-drilling screw.
KEENE BUILDING PRODUCTS CO INC — Type RC+ Assurance Clip

4F. **Steel Framing Members* —** Alternate method used to attach furring channels (Item 3A) to concrete blocks (Item 1). Clips spaced 48 in. OC., and secured to blocks with 1/4 in. dia. By 3 in. long concrete expansion anchor (Item 4B) through the center grommet. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping #6 framing screws, min. 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Furring channels are friction fitted into clips.
CLARKDIETRICH BUILDING SYSTEMS — Type ClarkDietrich Sound Clip

5. **Gypsum Board* —** 1/2 in. thick, 4 ft wide, secured to furring channels with wallboard fasteners (Item 6). Gypsum plaster not more than 1/16 in. thick may be applied to wallboard in addition to joint treatment.
AMERICAN GYPSUM CO — Types AG-C.

CABOT MANUFACTURING ULC — Type C.

CERTAINTEED GYPSUM INC — Type C.

CGC INC — Types C, IP-X2, IPC-AR.

CERTAINTEED GYPSUM INC — Type LGFC-C/A.

GEORGIA-PACIFIC GYPSUM L L C — Types 5, DAPC, TG-C.

NATIONAL GYPSUM CO — Types eXP-C, FSK-C, FSW-C, FSMR-C.

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type PG-C.

PANEL REY S A — Type PRC

THAI GYPSUM PRODUCTS PCL — Type C.

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Type C

UNITED STATES GYPSUM CO — Types C, IP-X2, IPC-AR.

USG BORAL DRYWALL SFZ LLC — Type C

USG MEXICO S A DE C V — Types C, IP-X2, IPC-AR.

5A. **Gypsum Board* —** (As an alternate to Item 5) — 5/8 in. thick. Installed as described in Item 5.

NATIONAL GYPSUM CO — Type FSMR-C.

UNITED STATES GYPSUM CO — Type ULIX

5B. **Gypsum Board* —** (As an alternate to Item 5) — 5/8 in. thick. Installed as described in Item 5. Min. screw length 1-1/8 in.

PANEL REY S A — Type PRX2

6. **Wallboard Fasteners —** 1 in. long, self-drilling, self-tapping steel screws with bugle heads. Fasteners attached to each furring channel and spaced 8 in. OC at butt joints and 12 in. OC in the field of the board parallel with furring channels. Clearance between fasteners and edges of wallboard 3/4 in.

7. **Joint System — (Not shown) —** Paper tape embedded in cementitious compound over joints. Paper tape and exposed screw heads covered with two layers of compound. Edges of compound feathered out.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2022-04-14

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XHEZ - Through-penetration Firestop Systems

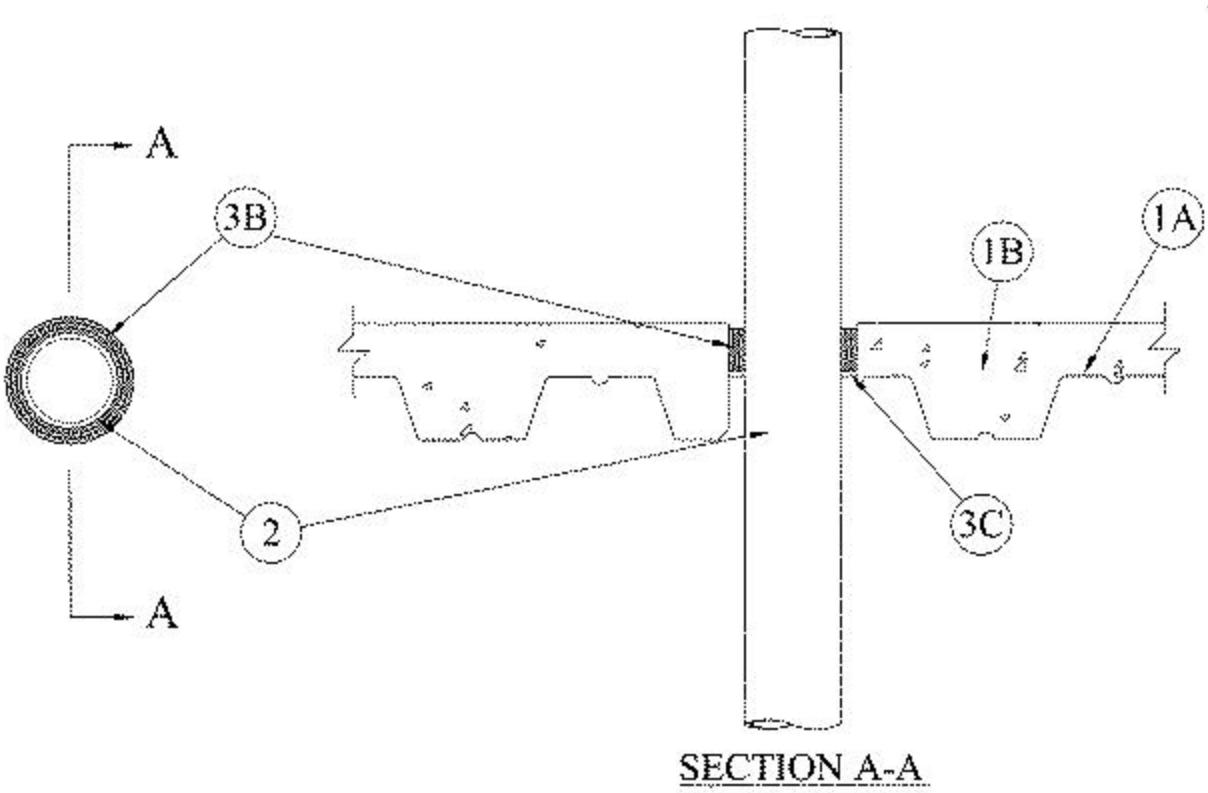
See General Information for Through-penetration Firestop Systems

System No. F-A-2051

January 22, 2001

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Floor Assembly —** The fire-rated unprotected concrete and steel floor assembly shall be constructed of the material and in the manner specified in the individual D900 Series designs in the UL Fire Resistance Directory and as summarized below:

A. **Concrete —** Min 2-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.

B. **Welded Wire Fabric —** 6 x 6 - W1.4 x W1.4

C. **Steel Floor and Form Units* —** Composite or noncomposite 3 in. deep fluted galv units as specified in the individual Floor-Ceiling design. Max diam of opening core-drilled through floor assembly is 5 in.

2. **Through Penetrants —** One nonmetallic pipe to be centered within the firestop system. The annular space between pipe and periphery of opening shall be nom 3/4 in. Pipe to be rigidly supported on both sides of floor assembly.The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 3 in. diam (or smaller) Schedule 40 cellular or solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

B. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 3 in. diam (or smaller) Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

C. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 3 in. diam (or smaller) SDR 17 CPVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

3. **Firestop System —** The details of the firestop systems shall be as follows:

A. **Steel Sleeve —** (Optional - Not shown) — Nom 6 in. diam (or smaller) cylindrical sleeve formed from min 22 guage sheet steel. Sleeve is installed by coiling sheet steel to a diam smaller than the through opening and allowing it to uncoil. Sleeve shall have a min 1 in. overlap along longitudinal seam and shall be cast or grouted into floor assembly. The sleeve shall be installed flush with the valley of the fluted deck and may be flush with or project a max 2 in. above top surface of the floor.

B. **Fill, Void or Cavity Materials* - Wrap Strip —** Nom 1/4 in. thick by 2 in. wide intumescent wrap strip. The wrap strip is continuously wrapped around the outer circumference of the pipe three times and slid into the annular space. When multiple strips are used to achieve the required total length, the ends are butted end to end and held in place with aluminum tape. The bottom edge of the wrap strip shall be positioned 1/4 in. above the crests of the steel floor units.
RECTORSEAL — Metacaulk Wrap Strip

C. **Fill, Void or Cavity Materials* - Caulk —** Min 1/4 in. thickness of fill material applied within the annulus, below the wrap strip, flush with the crests of the steel floor units.
RECTORSEAL — Metacaulk 1000

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Last Updated on 2001-01-22

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- Only products which bear UL's Mark are considered Certified.

XHBN - Joint Systems
XHBN7 - Joint Systems Certified for Canada

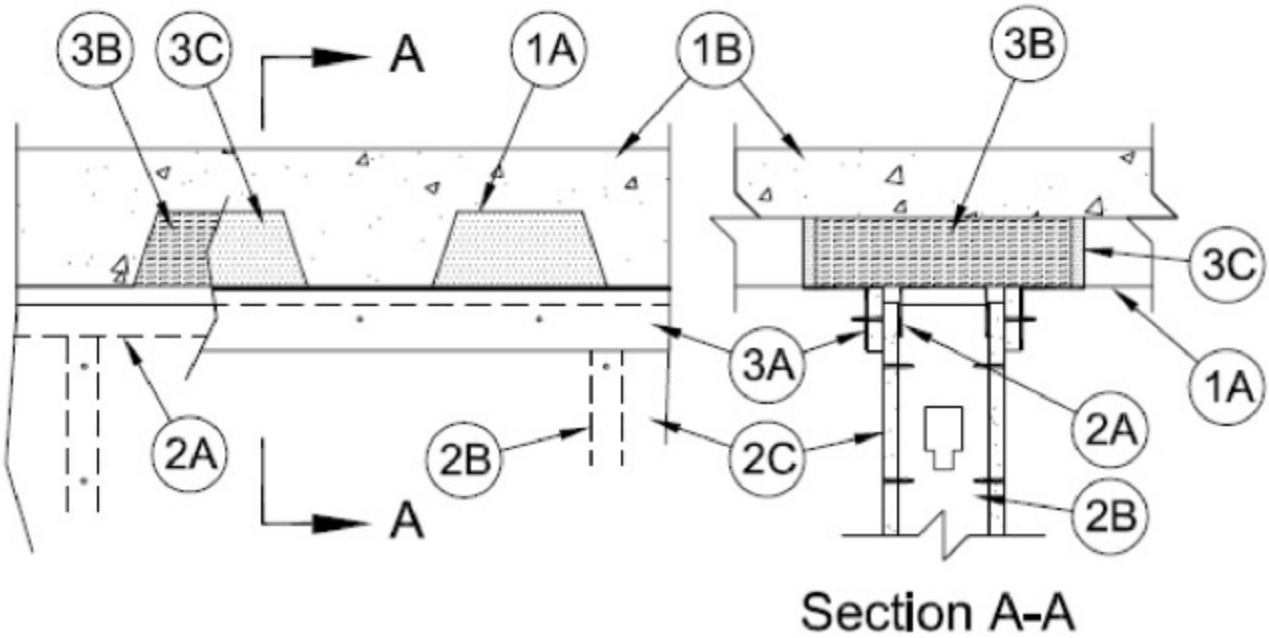
See General Information for Joint Systems

See General Information for Joint Systems Certified for Canada

System No. HW-D-0001

October 27, 2015

ANSI/UL2079	CAN/ULC S115
Assembly Rating — 1 Hr	F Rating — 1 Hr
Nominal Joint Width - 5/8, 1, 2 or 3 in. (See Item 3A)	FT Rating —1 Hr
Class II or III Movement Capabilities — 80% Compression or Extension	FH Rating — 1 Hr
L Rating At Ambient — Less Than 1 CFM/lin ft	FTH Rating — 1 Hr
L Rating At 400 F — Less Than 1 CFM/lin ft	Nominal Joint Width - 16, 25, 51 or 76 mm (See Item 3A)
	Class II or III Movement Capabilities — 80% Compression or Extension
	L Rating At Ambient — Less Than 1.55 L/s/lin m
	L Rating At 400 F — Less Than 1.55 L/s/lin m



1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2 1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly —** As an alternate to Item 1 Floor Assembly, the fire-rated roof assembly shall be constructed of the materials and in the manner described in the individual P700, P800 or P900 series Roof-Ceiling Designs in the UL Fire Resistance Directory and shall contain max 1-1/2 in. (38 mm) deep fluted galv steel deck. The hourly fire rating of the roof assembly shall be equal to or greater than the hourly fire rating of the wall assembly. In the case of spray-applied protection materials on the steel deck, the joint system shall be installed prior to the spray-applied protection material.

1B. **Floor Assembly —** As an alternate to Item 1 Floor Assembly, min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.

2. **Wall Assembly —** The 1 hr fire-rated nonbearing gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of min 25 ga galv steel channels for nom 5/8 in. (16 mm) joints. Ceiling runner to be min 20 ga steel channels for joints greater than 5/8 in. Ceiling runner to be sized to accommodate steel studs (Item 2B) and properly sized according to structural requirements. (See table under Item 3A for minimum flange lengths). Ceiling runner installed perpendicular to direction of fluted steel deck and secured to valleys with steel masonry anchors or by welds spaced max 12 in. (305 mm) OC. Ceiling runner secured to concrete floor slab (Item 1B) with steel masonry anchors spaced max 24 in. (610 mm) OC.

A1. **Light Gauge Framing* - Notched Ceiling Runner —** As an alternate to the ceiling runners in Items 2A and 2A1, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner installed perpendicular to direction of fluted steel deck and secured with steel masonry anchors spaced max 12 in. (305 mm) OC. Notched ceiling runner secured to concrete floor slab (Item 1B) with steel masonry anchors spaced max 24 in. (610 mm) OC. Notched ceiling runner suitable for 5/8 in. (16 mm) or 1 in. (25 mm) wide joints only.
OLMAR SUPPLY INC — Type SCR

B. **Studs —** Steel studs to be min 2 1/2 in. (64 mm) wide. Studs cut 5/8 to 1 in. (16 to 25 mm) less in length than assembly height for nom 5/8 in. (16 mm) joints, 1 to 1-1/4 in. (25 to 32 mm) for nom 1 in. (25 mm) joints, 2 to 2-1/4 in.

(51 to 57 mm) for nom 2 in. (51 mm) joints and 3 to 3-1/4 in. (76 to 83 mm) for nom 3 in. (76 mm) joints. Studs to have bottom nesting in and resting on floor runner and with top nesting in ceiling runner without attachment. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board* —** Gypsum board sheets installed to a min total thickness of 1/2 in. (13 mm) on each side of wall. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory except that a nom 5/8 in. (16 mm), 1 in. (25 mm), 2 in. (51 mm) or 3 in. (76 mm) gap shall be maintained between the top of the gypsum board and the bottom of the steel deck. The screws attaching gypsum board to studs (Item 2B) at the top of the wall shall be located 1 in. (25 mm), 1-1/4 in. (32 mm), 2-1/4 in. (57 mm) or 3-1/4 (83 mm) below the bottom of the ceiling runner (Item 2A) for nom 5/8 in. (16 mm), 1 in. (25 mm), 2 in. (51 mm) and 3 in. (76 mm) joints, respectively.

3. **Joint System — The joint system is designed to accommodate a max 80 percent compression or extension from its installed width.** The joint system consists of a forming material and fill material in the flutes of the steel deck and a "slip track" detail consisting of restraining angles in combination with gypsum board on the vertical flanges. When the floor assembly consists of a flat concrete slab (Item 1B), the forming material (Item 3B) and fill material (3C) are not used. The components of the system are as follows:

A. **Restraining Angles —** Angles formed from min 25 ga galv. Piece of gypsum board cut from the same gypsum board used for the wall (Item 2C). See table below for min angle and gypsum board strip length. Gypsum board liner secured to steel angle with min 1 in. (25 mm) long self-drilling, self-tapping Type S bugle head steel screws spaced max 8 in. (203 mm) OC. along longitudinal centerline of steel angle. Screws installed through face of gypsum board such that excess screw length protrudes through leg of steel angle. Restraining angles installed along top of wall on each side of wall assembly with gypsum board liner against wall surface and with horizontal leg of steel angle against valleys of steel deck or bottom of floor slab. Restraining angles secured to valleys of steel deck or to concrete floor slab with steel masonry anchors spaced max 12 in. (305 mm) OC.

Nominal Joint Width, in. (mm)	Minimum Angle and Gypsum Board Strip Length, in. (mm)	Minimum Runner Leg Length, in. (mm)
5/8 (16)	2 (51)	2-1/2 (64)
1 (25)	3 (76)	3-1/2 (89)
2 (50)	4-1/2 (114)	5 (127)
3 (76)	6-1/2 (165)	7 (178)

B. **Forming Material* —** Min 4 pcf (64 kg/m^3) density mineral wool batt insulation firmly packed into flutes of steel deck across top of wall as a permanent form. Forming material to be recessed from edges of restraining angles on each side of wall to accommodate the required thickness of fill material.
THERMAFIBER INC — Type SAF

B1. **Forming Material* —** (Optional, Not Shown) - Preformed mineral wool plugs, formed to the shape of the fluted floor units, friction fit to completely fill the flutes above the ceiling channel. The plugs shall project beyond each side of the ceiling runner and shall be recessed from both wall surfaces to accommodate the required thickness of fill material (Item 3C). Additional forming material, described in Item 3B, to be used in conjunction with the plugs to fill the gap between the top of gypsum board and bottom of steel deck.
THERMAFIBER INC — TopStop mineral wool deck plugs Type SAF batts

C. **Fill, Void or Cavity Material* —** Min 1/2 in. (13 mm) thickness of fill material applied within the recess of each steel deck flute, flush with the outside edge of the restraining angle on each side of the wall. Dry mix material mixed with water at a rate of 2.1 parts dry mix to 1 part water, by weight, in accordance with accompanying instructions.
UNITED STATES GYPSUM CO — Type FC

C1. **Fill, Void or Cavity Material* —** As an alternate to Item 3C, min 1/2 in. (13 mm) thickness of two component fill material applied within the recess of each steel deck flute, flush with the outside edge of the restraining angle on each side of the wall. Ready-mixed component mixed with accelerator component at a rate of 66 parts of ready-mixed component to 1 part of accelerator component by weight in accordance with the accompanying installation instructions.
UNITED STATES GYPSUM CO — Type RFC

C2. **Fill, Void or Cavity Material* —** As an alternate to Item 3C, min 1/8 in. (3 mm) wet thickness of fill material sprayed or brushed on each side of the wall to completely cover mineral wool forming material (Item 3B) and to overlap a min of 1/2 in. (13 mm) onto restraining angle and steel deck.
UNITED STATES GYPSUM CO — Type SA

C3. **Fill, Void or Cavity Material* —** As an alternate to Item 3C, min 1/4 in. (6 mm) wet thickness of fill material sprayed on each side of the wall to completely cover the mineral wool forming material and to lap min 1/2 in. (13 mm) onto restraining angle and steel deck.
UNITED STATES GYPSUM CO — Type AS

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Last Updated on 2015-10-27

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XHBN - Joint Systems
XHBN7 - Joint Systems Certified for Canada

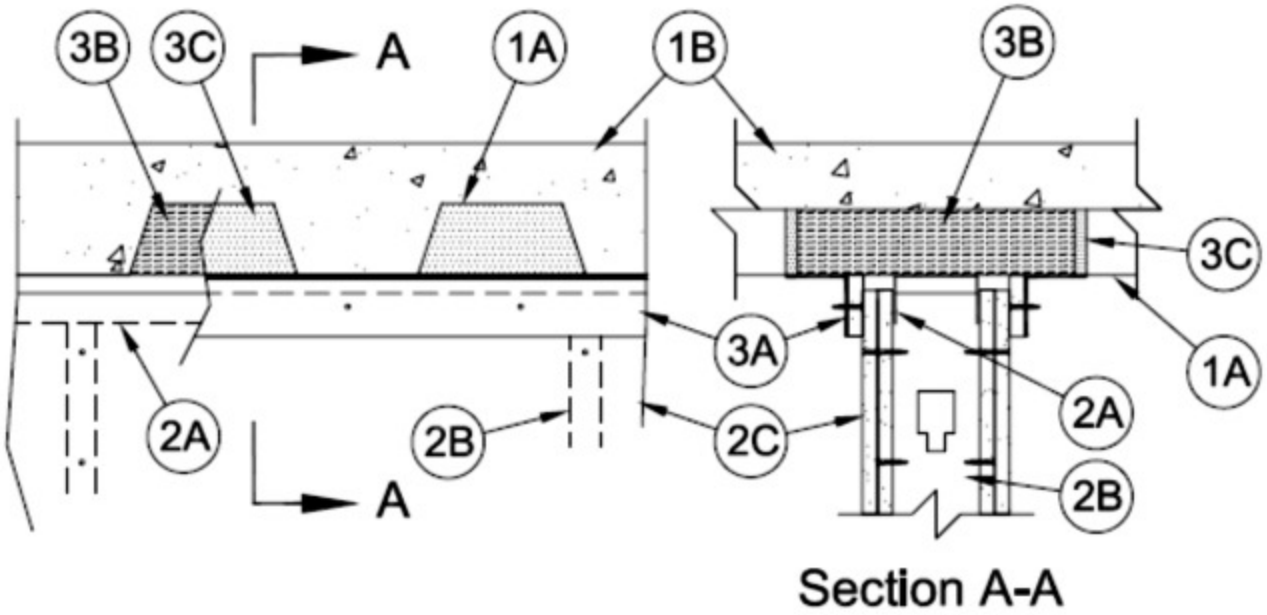
See General Information for Joint Systems

See General Information for Joint Systems Certified for Canada

System No. HW-D-0002

October 27, 2015

ANSI/UL2079	CAN/ULC S115
Assembly Rating — 2 Hr	F Rating — 2 Hr
Nominal Joint Width - 5/8 , 1, 2 or 3 in. (See Item 3A)	FT Rating —2 Hr
Class II or III Movement Capabilities — 80% Compression or Extension	FH Rating — 2 Hr
L Rating At Ambient — Less Than 1 CFM/lin ft	FTH Rating — 2 Hr
L Rating At 400 F — Less Than 1 CFM/lin ft	Nominal Joint Width - 16, 25, 51 or 76 mm
	Class II or III Movement Capabilities — 80% Compression or Extension
	L Rating At Ambient — Less Than 1.55 L/s/lin m
	L Rating At 400 F — Less Than 1.55 L/s/lin m



Section A-A

1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly —** As an alternate to Item 1 Floor Assembly, the fire-rated roof assembly shall be constructed of the materials and in the manner described in the individual P700, P800 or P900 series Roof-Ceiling Designs in the UL Fire Resistance Directory and shall contain max 1-1/2 in. (38 mm) deep galv steel fluted roof units. The hourly fire rating of the roof assembly shall be equal to or greater than the hourly fire rating of the wall assembly. In the case of spray-applied protection materials on the steel roof units, the joint system shall be installed prior to the spray-applied protection material.

1B. **Floor Assembly —** As an alternate to Item 1 Floor Assembly, min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.

2. **Wall Assembly —** The 2 hr fire-rated nonbearing gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of min 25 ga galv steel channels for nom 5/8 in. (16 mm) joints. Ceiling runner to be min 20 ga steel channels for joints greater than 5/8 in. Ceiling runner to be sized to accommodate steel studs (Item 2B) and properly sized according to structural requirements. (See table under Item 3A for minimum flange lengths). Ceiling runner installed perpendicular to direction of fluted steel deck and secured to valleys with steel masonry anchors or by welds spaced max 12 in. (305 mm) OC. Ceiling runner secured to concrete floor slab (Item 1B) with steel masonry anchors spaced max 24 in. (610 mm) OC.

A1. **Light Gauge Framing* - Notched Ceiling Runner —** As an alternate to the ceiling runners in Items 2A and 2A1, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner installed perpendicular to direction of fluted steel deck and secured with steel masonry anchors spaced max 12 in. (305 mm) OC. Notched ceiling runner secured to concrete floor slab (Item 1B) with steel masonry anchors spaced max 24 in. (610 mm) OC. Notched ceiling runner suitable for 5/8 in. (16 mm) or 1 in. (25 mm) wide joints only.
OLMAR SUPPLY INC — Type SCR

B. **Studs —** Steel studs to be min 2-1/2 in. (64 mm) wide. Studs cut 5/8 to 1 in. (16 to 25 mm) less in length than assembly height for nom 5/8 in. (16 mm) joints, 1 to 1-1/4 in. (25 to 32 mm) for nom 1 in. (25 mm) joints, 2 to 2-1/4 in.

(51 to 57 mm) for nom 2 in. (51 mm) joints and 3 to 3-1/4 in. (76 to 83 mm) for nom 3 in. (76 mm) joints. Studs to have bottom nesting in and resting on floor runner and with top nesting in ceiling runner without attachment. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board* —** Gypsum board sheets installed to a min total thickness of 1 in. (25 mm) on each side of wall. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 5/8 in. (16 mm), 1 in. (25 mm), 2 in. (51 mm) or 3 in. (76 mm) gap shall be maintained between the top of the gypsum board and the bottom of the steel deck. The screws attaching gypsum board to studs (Item 2B) at the top of the wall shall be located 1 in. (25 mm), 1-1/4 in. (32 mm), 2-1/4 in. (57 mm) or 3-1/4 (83 mm) below the bottom of the ceiling runner (Item 2A) for nom 5/8 in. (16 mm), 1 in. (25 mm), 2 in. (51 mm) and 3 in. (76 mm) joints, respectively.

3. **Joint System — The joint system is designed to accommodate a max 80 percent compression or extension from its installed width.** The joint system consists of a forming material and fill material in the flutes of the steel deck and a "slip track" detail consisting of restraining angles in combination with gypsum board on the vertical flanges. When the floor assembly consists of a flat concrete slab (Item 1A), the forming material (Item 3B) and fill material (Item 3C) are not used. The components of the system are as follows:

A. **Restraining Angles —** Angles formed from min 25 ga galv. Piece of gypsum board cut from the same gypsum board used for the wall (Item 2C). See table below for min angle and gypsum board strip length. Gypsum board liner secured to steel angle with min 1 in. (25 mm) long self-drilling, self-tapping Type S bugle head steel screws spaced max 8 in. (203 mm) OC. along longitudinal centerline of steel angle. Screws installed through face of gypsum board such that excess screw length protrudes through leg of steel angle. For joints greater than 5/8 in. (16 mm), two layers of gypsum board liner are required. Restraining angles installed along top of wall on each side of wall assembly with gypsum board liner against wall surface and with horizontal leg of steel angle against valleys of steel deck or bottom of floor slab. Restraining angles secured to valleys of steel deck or to concrete floor slab with steel masonry anchors spaced max 12 in. (305 mm) OC.

Nominal Joint Width, in. (mm)	Minimum Angle and Gypsum Board Strip Length, in. (mm)	Minimum Runner Leg Length, in. (mm)
5/8 (16)	2 (51)	2-1/2 (64)
1 (25)	3 (76)	3-1/2 (89)
2 (50)	4-1/2 (114)	5 (127)
3 (76)	6-1/2 (165)	7 (178)

B. **Forming Material* —** Min 4 pcf (64 kg/m^3) density mineral wool batt insulation firmly packed into flutes of steel deck across top of wall as a permanent form. Forming material to be recessed from edges of restraining angles on each side of wall to accommodate the required thickness of fill material.
THERMAFIBER INC — Type SAF

B1. **Forming Material* —** (Optional, Not Shown) - Preformed mineral wool plugs, formed to the shape of the fluted floor units, friction fit to completely fill the flutes above the ceiling channel. The plugs shall project beyond each side of the ceiling runner and shall be recessed from both wall surfaces to accommodate the required thickness of fill material (Item 3C). Additional forming material, described in Item 3B, to be used in conjunction with the plugs to fill the gap between the top of gypsum board and bottom of steel deck.
THERMAFIBER INC — TopStop mineral wool deck plugs Type SAF batts

C. **Fill, Void or Cavity Material* —** Min 1/2 in. (13 mm) thickness of fill material applied within the recess of each steel deck flute, flush with the outside edge of the restraining angle on each side of the wall. Dry mix material mixed with water at a rate of 2.1 parts dry mix to 1 part water, by weight, in accordance with accompanying instructions.

UNITED STATES GYPSUM CO — Type FC

C1. **Fill, Void or Cavity Material* —** As an alternate to Item 3C, min 1/2 in. (13 mm) thickness of two component fill material applied within the recess of each steel deck flute, flush with the outside edge of the restraining angle on each side of the wall. Ready-mixed component mixed with accelerator component at a rate of 66 parts of ready-mixed component to 1 part of accelerator component by weight in accordance with the accompanying installation instructions.
UNITED STATES GYPSUM CO — Type RFC

C2. **Fill, Void or Cavity Material* —** As an alternate to Item 3C, min 1/8 in. (3 mm) wet thickness of fill material sprayed or brushed on each side of the wall to completely cover mineral wool forming material (Item 3B) and to overlap a min of 1/2 in. (13 mm) onto restraining angle and steel deck or concrete floor slab.
UNITED STATES GYPSUM CO — USG Type-SA

C3. **Fill, Void or Cavity Material* —** As an alternate to Item 3C, min 1/4 in. (6 mm) wet thickness of fill material sprayed on each side of the wall to completely cover the mineral wool forming material and to lap min 1/2 in. (13 mm) onto restraining angle and steel deck.
UNITED STATES GYPSUM CO — Type AS

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Last Updated on 2015-10-27

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XHBN - Joint Systems

See General Information for Joint Systems

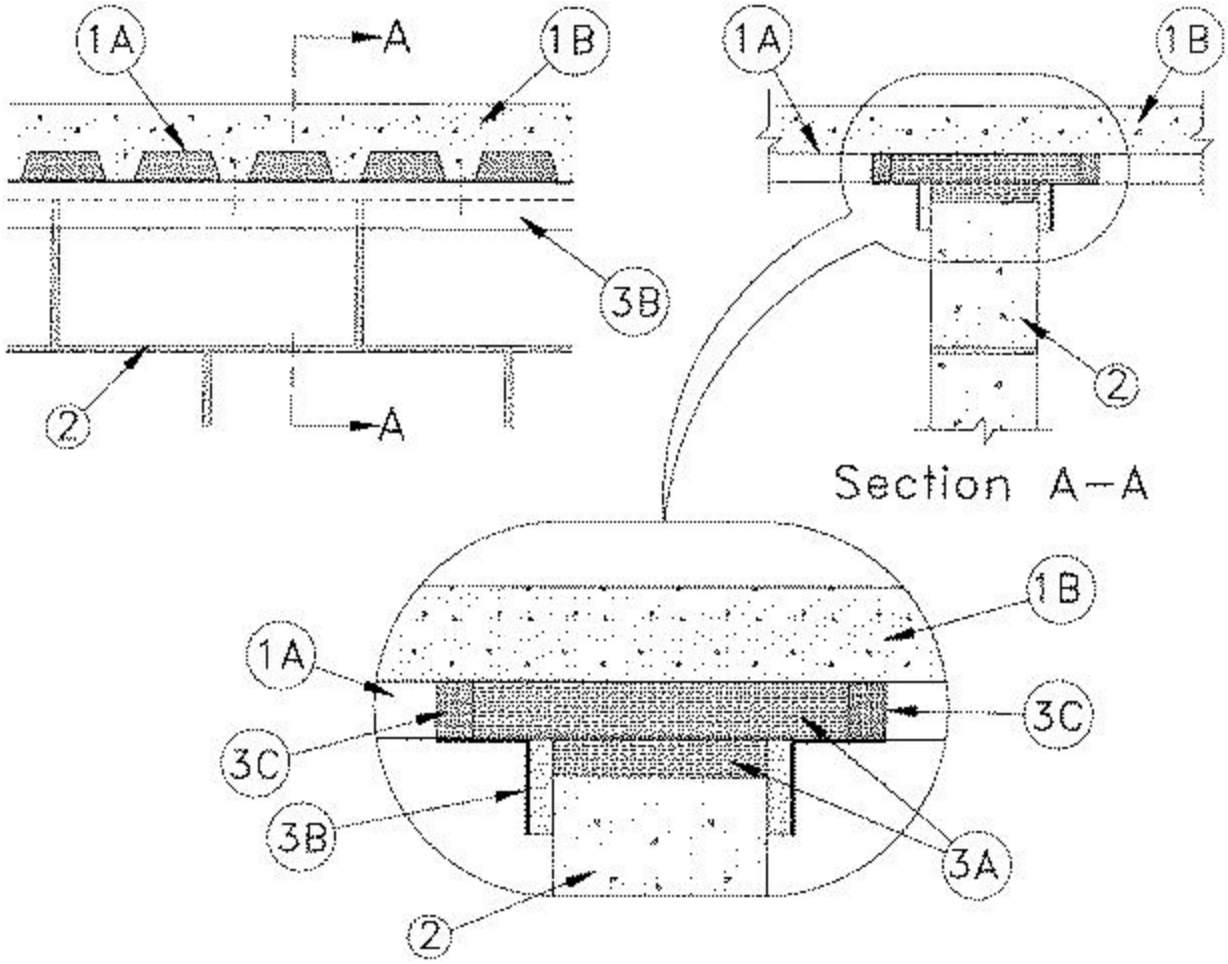
System No. HW-D-0009

July 20, 2000

Assembly Rating — 2 Hr

Nominal Joint Width — 1 in.

Class II and III Movement Capabilities — 25% Compression, 12% Extension



1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** Max 3 in. deep galv steel fluted floor units.

B. **Concrete —** Min 2 1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly —** As an alternate to Item 1, Floor Assembly, the fire-rated roof assembly shall be constructed of the materials and in the manner described in the individual P700, P800 or P900 series Roof-Ceiling Designs in the UL Fire Resistance Directory and shall contain max 1-1/2 in. deep galv steel fluted roof units. The hourly fire rating of the roof assembly shall be equal to or greater than the hourly fire rating of the wall assembly. In the case of spray-applied protection materials on the steel roof units, the joint system shall be installed prior to the spray-applied protection material.

1B. **Floor Assembly —** As an alternate to Item 1, Floor Assembly , min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete.

2. **Wall Assembly —** Min 4 1/2 in. thick reinforced lightweight or normal weight (100 - 150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.**
See **Concrete Blocks** (CAZT) category in the Fire Resistance directory for names of manufacturers.

3. **Joint System — Max separation between bottom of floor and top of wall (at time of installation of joint system) is 1 in. The joint system is designed to accommodate a max 25 percent compression and 12 percent extension from its installed width.** The joint system consists of a forming material and fill material in the flutes of the steel floor units, a forming material in the gap between the top of wall and bottom of floor and a "slip track" detail consisting of restraining angles, as follows:

A. **Forming Material* —** Min 4 pcf density mineral wool batt insulation compressed 25 to 50 percent in thickness and slid into joint opening to completely fill gap between top of wall and the bottom of the steel floor units or underside of flat concrete slab. Adjoining lengths of mineral wool batt forming material tightly-butted with butted joints spaced min

24 in. OC. Additional mineral wool batt insulation firmly packed into flutes of steel floor units above the compressed batt forming material after installation of the restraining angles (Item 3B). Forming material in flutes of steel floor units to be recessed min 1 in. from edge of restraining angle on each side of wall to accommodate fill material (Item 3C).
THERMAFIBER INC — Type SAF

B. **Restraining Angles —** Min 2-1/2 by 2-1/2 in. angle formed from min 25 ga galv steel with one leg lined with a 2-1/2 in. wide piece of nom 1/2 in. or 5/8 in. thick Gypsum Wallboard*. Gypsum Wallboard liner secured to steel angle with min 1 in. long self-drilling, self-tapping Type S bugle head steel screws spaced max 8 in. OC along longitudinal centerline of steel angle. Screws installed through face of wallboard such that excess screw length protrudes through leg of steel angle. Restraining angles installed along top of wall on each side of wall assembly with gypsum liner against wall surface and with horizontal leg of steel angle against valleys of steel floor units. Restraining angles secured to valleys of steel floor units with min 1/2 in. long powder-driven steel fasteners, or equivalent, spaced max 12 in. OC. See **Gypsum Board** (CKNX) category for names of manufacturers.

C. **Fill, Void or Cavity Material* —** Dry mix material mixed with water at a rate of 2.1 parts dry mix to 1 part water, by weight, in accordance with the accompanying installation instructions. A min 1 in. depth of fill material shall be applied within the recess of each steel floor unit flute above the horizontal leg of the restraining angle on each side of the wall.
UNITED STATES GYPSUM CO — Type FC

C1. **Fill, Void or Cavity Material* —** Not Shown — Used as an alternate to Item 3C. Ready-mixed component mixed with accelerator component at a rate of 66 parts of ready-mixed component to 1 part of accelerator component by weight in accordance with the accompanying installation instructions. A min 1 in. depth of fill material shall be applied within the recess of each steel floor unit above the horizontal leg of the restraining angle on each side of the wall.
UNITED STATES GYPSUM CO — Type RFC

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Last Updated on 2000-07-20

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XHBN - Joint Systems
XHBN7 - Joint Systems Certified for Canada

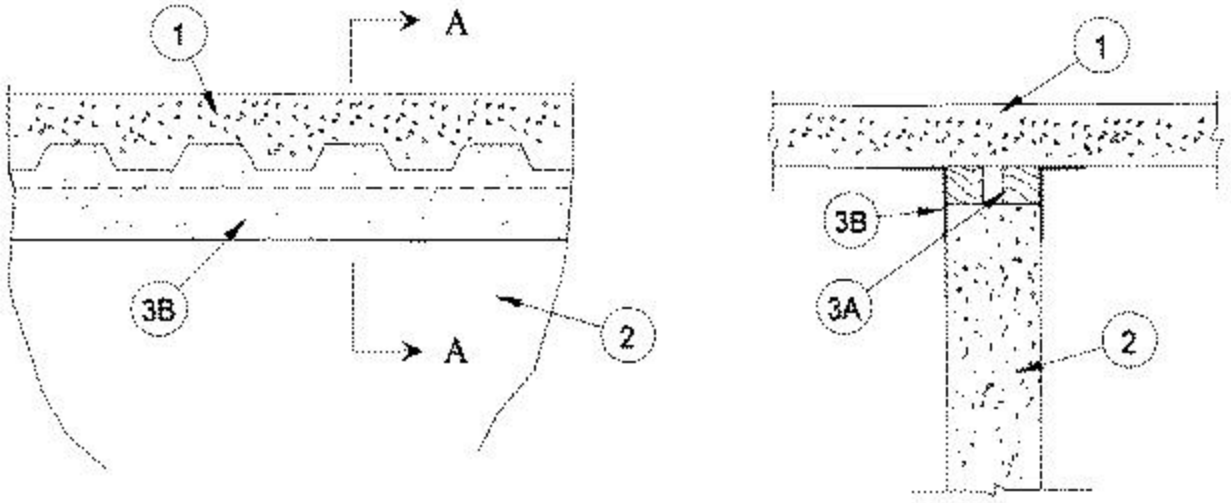
See General Information for Joint Systems

See General Information for Joint Systems Certified for Canada

System No. HW-D-0040

January 23, 2018

ANSI/UL2079	CAN/ULC S115
Assembly Rating — 2 Hr	F Rating — 2 Hr
Nominal Joint Width - 2 In.	FT Rating —2 Hr
Class II Movement Capabilities — 19% Compression or Extension	FH Rating — 2 Hr
L Rating At Ambient — Less Than 1 CFM/lin ft (See Item 3B)	FTH Rating — 2 Hr
L Rating At 400 F — Less Than 1 CFM/lin ft (See Item 3B)	Nominal Joint Width - 51 mm
	Class II Movement Capabilities —19% Compression or Extension
	L Rating at Ambient — Less than 1.55 L/s/lin m (See Item 3B)
	L Rating at 204°C — Less than 1.55 L/s/lin m (See Item 3B)



SECTION A-A

1. **Floor Assembly —** The fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** Max 3 in. (76 mm) deep galv fluted units.

A1. **Spray Applied Fire Resistive Material* —** (Optional, not shown) — Prior to the installation of the Forming Material and Fill, Void or Cavity Materials (Items 3A, 3B), the steel floor units may be sprayed with a min 5/16 in. (8 mm) to max 11/16 in. (17 mm) thickness of fire resistive material.
GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

2. **Wall Assembly —** Min 7-1/2 in. (191 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks.**
See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System — Max separation between bottom of floor and top of wall is 2 in. (51 mm). The joint system is designed to accommodate a max 19 percent compression or extension from its installed width.** The joint system consists of a forming material and a fill material, as follows:

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation compressed and firmly packed into the flutes and the gap between the top of the wall and bottom of the floor on both sides of the wall. Pieces of batt to be cut a min thickness of 3 in. (76 mm) to the shape of the deck approximately 25 percent larger than the area of the flutes with additional min 4 in. (102 mm) wide sections of a thickness at least 50 percent larger than gap between the top of the wall and bottom of the steel floor units. Mineral wool to be compressed and firmly packed into the flutes and compressed in thickness and inserted edge first into the gap between the top of the wall and bottom of the steel floor units, flush with both sides of wall.
INDUSTRIAL INSULATION GROUP L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Board

ROCKWOOL MALAYSIA SDN BHD — Type Safe

ROCKWOOL — Type Safe

THERMAFIBER INC — Type SAF

B. **Fill, Void or Cavity Material* —** Min 1/16 in. (1.6 mm) dry thickness (min 1/8 in. or 3.2 mm wet thickness) of fill material sprayed or brushed on each side of the wall in the flutes of the steel floor units and between the top of the wall and the bottom of the floor to completely cover mineral wool and overlap a min of 1/2 in. (13 mm) onto wall and floor on both sides of wall. When the steel deck is coated with spray applied material (Item A1), the fill material shall overlap min 2 in. (51 mm) onto the spray applied material.
3M COMPANY — FireDam Spray 200

B1. **Fill, Void or Cavity Material* — Tape —** As an alternate to Item B, Tape cut to size and press applied within fluted areas of joint to completely cover mineral wool lapping min 1 in. (25 mm) onto the contour of the steel floor units and extending to lap min 1 in. (25 mm) onto the concrete wall. Additional pieces of Tape are applied along the joint to completely cover the remaining mineral wool between bottom of steel deck and top edge of wall along length of joint, lapping min 1 in. (25 mm) onto the contour of the steel floor units and concrete wall. When the steel deck is coated with spray applied material (Item 1A1), the Tape shall overlap min 2 in. (51 mm) onto the spray applied material. Adjoining lengths of Tape shall overlap min 1/2 in. (13 mm). Tape shall be applied at both sides of wall.
3M COMPANY — 3M Fire and Water Barrier Tape

L Ratings apply only when FireDam™ Spray 200 is used.

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Last Updated on 2018-01-23