To: Potential Bidders

From: Governor’s Office of Storm Recovery (“GOSR”)

Date: July 12th, 2022

Subject: Addendum # 4 – GOSR-IFB-2022-01 – Storm Hardening at Edgewater Park Volunteer Fire Department

Questions Due Date: EXTENDED to July 6th 2022 no later than 2:00 pm EDT

Bid Due Date: EXTENDED to July 15th 2022 no later than 2:00 pm EDT

NOTICE TO CONTRACTORS: This Addendum shall form a part of the Contract and clarifies, corrects, or modifies the original Invitation for Bid documents prepared by GOSR. This addendum must be signed and returned with the Bid.

MODIFICATIONS TO INVITATION FOR BID

The following are official modifications which are hereby incorporated into GOSR-IFB-2022-01 for Storm Hardening at Edgewater Park Volunteer Fire Department. The information contained in this Addendum prevails over the original IFB language and prior Addendums for all modifications below.

1. Revisions to Table of Contents
   a. Included Sections:
      i. 078446 FIRE-RESISTIVE JOINT SYSTEMS
      ii. 079200 JOINT SEALANTS
      iii. 085113 ALUMINUM HURRICANE WINDOWS (answers question #20)
      iv. 220523 VALVES
      v. 220529 PIPE HANGERS AND SUPPORTS
      vi. 220553 PIPE AND VALVE IDENTIFICATION
      vii. 220576 DRAINAGE ACCESSORIES
      viii. 220700 PIPING INSULATION
      ix. 220800 CLEANING AND TESTING
      x. 223400 FUEL-FIRED, DOMESTIC-WATER HEATERS
      xi. 230529 PIPE HANGERS AND SUPPORTS
      xii. 230550 VIBRATION ISOLATION
      xiii. 230553 PIPE AND VALVE IDENTIFICATION
      xiv. 232000 HVAC PIPING

2. Insert Drawing EN-001 Sheet 6 of 20 replaces T3.0 to also answer question #20
3. Drawing A-008 Sheet 18 of 20 updated to answer question #9
4. Additional Specs provide that were not included in the bid (wainscoting for Meeting Room) also to answer question #9

QUESTIONS & ANSWERS

The following are the questions submitted and answers provided for the above-mentioned Invitation for Bid:

**Question 1:** “Room #105 Kitchen, after disconnects are completed by trades will the owner remove the appliances from the room and store for future use.”

**Answer 1:** The contractor is responsible for disposal of existing appliances, or to be returned to owner and placed in owner storage facility.

**Question 2:** “Note within Kitchen on sheet 12 of 20, Proposed First Floor, states new appliances, exhaust hood, fixtures, cabinets, and counters. Clarify scope of work within the Kitchen. Provide specifications for cabinets, counter, appliances, and exhaust hood if required to be new and under the scope of work.”

**Answer 2:**

- Cabinets: Hampton Bay or approved equal
- Countertops: Hampton Bay or approved equal
- Range: Southbend S60DD-2RR or approved equal as per P-001.00 3 of 6
- Hood: Greenheck or approved equal
- Refrigerator: Whirlpool or approved equal

**Question 3:** “Room #105 Kitchen, will existing Ansul System installed within the kitchen exhaust hood, be reused for future reinstallation?”

**Answer 3:** Existing to be re-used.

**Question 4:** “Doors #103B-1, #200-1 & # 205-1: Are existing frames to be removed and new HM frames be supplied and installed per door schedule and details?”

**Answer 4:** Yes.

**Question 5:** “Existing Restroom #106A, no demolition noted on sheet 8 of 20. Floor system to be removed per sheet #7 of 20. New five inch (5”) thick floor slab to align with finished floors of rooms #101 & # 105. Existing floor level of room #106A and #106 currently align / match. Clarify scope of work within this area.”

**Answer 5:** Existing floor system of existing restroom #106A is to remain.

**Question 6:** “Door #103B-1, clarify removal of existing stone lintel. Is the scope of work intended to remove the original stone lintel and infill exterior stone wall surface?”

**Answer 6:** Remove the door and buck, inspect lintel, replace as necessary.
Question 7: “Confirm that the new interior room finishes are only selected for first floor rooms per Finish Schedule and Note #8.”

Answer 7: Confirmed, as indicated on drawings.

Question 8: “Confirm flooring within Foyer room # 107 remains “existing” per Finish Schedule.”

Answer 8: This is not included in the contract, refer to the Drawings for scope of work.

Question 9: “Specify type of new flooring and base within Meeting Room #101 and Kitchen #105.”

Answer 9: Refer to the revised sheet A-008 – Room Finish Schedule and see supplied wainscoting cut sheet.

Question 10: “Provide detail for repair of North Tower Soffits.”

Answer 10: See A10.00, 20 OF 20 Architectural Drawings.

Question 11: “During the Pre-Bid Site Visit, the stairway, railing, and balusters within Hallway #200 leading to room #301 were considerably deteriorated and structurally questionable. Confirm scope of work within this area, the staircase, railing, and balusters.”

Answer 11: These items are not in the scope of work.

Question 12: “Considering the strict requirements of the project and site during the construction phase of the contract, would a construction fence be required or suggested?”

Answer 12: The Contractor is responsible for maintaining a secure site during construction. Contractor to provide fencing for work zone laydown areas, or other areas of work as required by NYC Building Code.

Question 13: “Mechanical Plan [7 of 9]: Is it the intent to connect the kitchen exhaust hood into the new roof mounted toilet exhaust fan?”

Answer 13: No, the existing hood ducting is to be inspected and re-used.

Question 14: “Provide specifications for steel reinforcing noted in details of stairs, ramps, and concrete slabs.”

Answer 14: Grade 60, ASTM A615.

Question 15: “Could not locate the 7 Fire Alarm Drawings referenced on page 569. Please provide fire alarm drawings.”

Answer 15: An Addendum has been issued with the Fire Alarm Drawings. See Addendum #2 https://stormrecovery.ny.gov/sites/default/files/crp/community/documents/Addendum%202_GOSR-IFB-2022-01_Firehouse_FINAL.pdf

Question 16: “ELECTRICAL, SHEET 3 of 5, ELECTRICAL LEGEND “Provide Telephone, Data and Cable T.V. Receptacles and wiring as per owners’ request. Provide any owners requests for items referenced at this time to include within the scope of work and bid.”

Answer 16: Provide three receptacles and pulling string from new suspended ceiling system, for each service (telephone, cable television and data) within Room # 101.
Question 17: “Technical Specifications: Section 028200- ASBESTOS REMOVAL, PART 1 GENERAL, 1.01 SCOPE OF WORK #1.01 (B), Confirm that Work Areas #2, 3A and 3B and #5 are included within the scope of work under the project and should be included within our bid.”

**Answer 17:** Environmental specifications are provided for reference and potential hazards in the building. Refer to the Drawings for scope of work contained in this contract.

Question 18: “Technical Specifications: Section 028300 – REMOVAL AND DISPOSAL OF LEAD-CONTAINING PAINT, PART 1 GENERAL, #1.1 (A) (4), Confirm that work area identified as Stairwell and Adjacent Rooms are included within the scope of work under the project and should be included within our bid.”

**Answer 18:** Environmental specifications are provided for reference and potential hazards in the building. Refer to the Drawings for scope of work contained in this contract.

Question 19: “Technical Specifications: Section 028700 – REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND FLOURESCENT LAMPS, PART 1 GENERAL, #(A) (2), Confirm that work within the 2nd floor Kitchen, 2nd floor EPOC / Tower and 3rd floor EPOC (301) are included within the scope of work under the project and should be included within our bid.”

**Answer 19:** Environmental specifications are provided for reference and potential hazards in the building. Refer to the Drawings for scope of work contained in this contract.

Question 20: “Please clarify the window manufacturer and model for specified hurricane resistant windows. Spec section 085113 is not available.”

**Answer 20:** Refer to the attached specifications section included with this Addendum

Question 21: “Who will oversee the work on behalf of the Owner, ensuring that it is built safely on time, within budget? Will a CM-agent/ Owner’s Rep/ Clerk of the Work be procured?”

**Answer 21:** The Contractor is responsible for safety, performance of scopes of work and to maintain the contract schedule. Mark Anthony Architects will provide construction administration. The Contractor will be managed by the Governor’s Office of Storm Recovery Project Delivery Office.

All other terms and conditions in the Invitation for Bids remain unchanged.

If submitting a Bid, this Addendum # 4 for GOSR-IFB-2022-01 must be signed, dated, attached to, and made a part of your Bid.

Name of Company: _____________________________________________________

Authorized Signature: ___________________________________________________

Print Name and Title: _____________________________________________________

Date: __________________________________________________________________

Address: __________________________________________________________________

City, State, Zip Code: _____________________________________________________
Telephone Number: ______________________________________________________
Email Address: _________________________________________________________
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SECTION 012900 — PAYMENT PROCEDURES
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SECTION 013100 — PROJECT MANAGEMENT AND COORDINATION
Section Description: Administrative requirements for project meetings; preconstruction, construction kick-off, progress; RFI’s and Web sites

SECTION 013200 — PROJECT SCHEDULING AND PROGRESS DOCUMENTATION — SINGLE PRIME CONTRACT
Section Description: Contractor's responsibility to coordinate and cooperate with Owner to maintain P6 Project Management (scheduling software); Contractor's reports.

SECTION 013300 — SUBMITTAL PROCEDURES
Section Description: Procedures for action and informational submittals including product submittals and submittal schedule

SECTION 014000 — QUALITY AND CODE REQUIREMENTS
Section Description: Administrative and regulatory requirements for Work permit, code compliance certificate and certificate of occupancy; NYS or NYC Statement of Special Inspections and Tests

SECTION 015000 — TEMPORARY FACILITIES AND CONTROLS
Section Description: Temporary utilities and facilities for construction support, security and facility protection

SECTION 016000 — PRODUCT REQUIREMENTS
Section Description: Administrative and procedural requirements for product, material, and equipment selection and handling, warranties and comparable products

SECTION 017329 — CUTTING AND PATCHING
Section Description: Procedural requirements for cutting and patching

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GENERAL REQUIREMENTS for CONSTRUCTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
1. Joints in or between fire-resistance-rated constructions.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
   1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.04 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistant joint systems.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
   1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
SECTION 078446 – FIRE RESISTIVE JOINT SYSTEMS
   a. Fire-resistive joint system products bear classification marking of qualified testing agency.
   b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
   c. UL - “Fire Resistance Directory.”

1.06 PROJECT CONDITIONS
   A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
   B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.07 COORDINATION
   A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
   B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
   C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.01 FIRE-RESISTIVE JOINT SYSTEMS
   A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
   B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
      1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
      2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
      3. 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:
         a. Hilti, Inc.
         b. 3M Fire Protection Products.
         c. Cemco - Cemco Hotrod Type-X.
         d. Or approved equal
   C. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.
PART 3 - EXECUTION

3.01 EXAMINATION
A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION
A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
   2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.
B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primersto areas of bond; do not allow spillage and migration onto exposed surfaces.
C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistant joint system's seal with substrates.

3.03 INSTALLATION
A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
   2. Apply fill materials so they contact and adhere to substrates formed by joints.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION
SECTION 078446 – FIRE RESISTIVE JOINT SYSTEMS

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer’s name.

3.05 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078446
NY Rising – Governor's Office of Storm Recovery
GOSR Work Order Number: NTF-1-DES
Edgewater Park Volunteer Fire Department — Storm Hardening and Abatement

SECTION 079200 – JOINT SEALANTS

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Latex joint sealants.
   4. Preformed joint sealants.

1.03 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Samples for Verification: For each type of sealant submit a color sample board and one sample joint, 1/2” wide by 6” long including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   5. Retain subparagraph below if generic test data are acceptable.
   6. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.04 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
SECTION 079200 – JOINT SEALANTS

testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project with a minimum of three years experience in the installation of the work of this section.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.07 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.08 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full color range.

2.02 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790.
b. Pecora Corporation; 301 NS
c. Sika Corporation, Construction Products Division; SikaSil-C990.
NY Rising – Governor’s Office of Storm Recovery
GOSR Work Order Number: NTF-1-DES
Edgewater Park Volunteer Fire Department — Storm Hardening and Abatement

SECTION 079200 – JOINT SEALANTS

d. Tremco Incorporated; Spectrem 1.

B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Pecora Corporation; 311 NS.
      b. Tremco Incorporated; Spectrem 800.
      c. or approved equal.

C. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 890-SL.
      b. Pecora Corporation; 310 SL.
      c. Tremco Incorporated; Spectrem 900 SL.

D. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Tremco Incorporated; Tremsil 200.
      b. Pecora Corporation; 898.
      c. Or Approved Equal.

2.03 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
      b. Tremco Incorporated; Dymonic 100.
      c. Or approved Equal.

B. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C920. Type S, Grade NS, Class 25, for Use T.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Building Systems; Sonolastic NP1 .
      b. Sika Corporation, Construction Products Division; Sikaflex - 1a.
      c. Tremco Incorporated; Vulkem 116, Dymonic FC.

C. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Building Systems; Sonolastic SL 1.
      b. Pecora Corporation; Urexpan NR-201.
      c. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
      d. Tremco Incorporated; Vulkem 45.

D. Immersible Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Uses T and I.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
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a. BASF Building Systems; Sonolastic NP 2.
b. Pecora Corporation; Dynatred.
c. Tremco Incorporated; THC 901.

2.04 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Building Systems; Sonolastic.
      c. Pecora Corporation; AC-20+.
      d. Tremco Incorporated; Tremflex 834.
      e. Sherwin Williams Company (SherMax Urethanized Elastomeric Sealant).

2.05 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Tremco Incorporated; Spectrum SimpleSeal.
      b. Tremco Incorporated; Illmod 600
      c. Dayton Superior Specialty Chemicals; Polytite Standard.
      d. Sandell Manufacturing Co., Inc.; Polyseal.

2.06 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.07 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
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C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that donot stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
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C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
   4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
      a. Use masking tape to protect surfaces adjacent to recessed toolled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations and at perimeters of acoustical Panel edge channels of Acoustical Panel Ceiling systems, with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer’s written recommendations.

3.04 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 1 test for each 500 feet of joint length thereafter or 1 test per each floor per elevation.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes
sealant manufacturer’s field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were
installed, names of persons who installed sealants, test dates, test locations, whether joints
were primed, adhesion results and percent elongations, sealant fill, sealant
configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used
originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant
contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing
or noncompliance with other indicated requirements will be considered satisfactory. Remove
sealants that fail to adhere to joint substrates during testing or to comply with other requirements.
Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING
A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods
and with cleaning materials approved in writing by manufacturers of joint sealants and of products in
which joints occur.

3.06 PROTECTION
A. Protect joint sealants during and after curing period from contact with contaminating substances and
from damage resulting from construction operations or other causes so sealants are without
deterioration or damage at time of Substantial Completion. If, despite such protection, damage or
deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so
installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE
A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Tile control and expansion joints.
   3. Urethane Joint Sealant: Single component, nonsag, traffic grade Single component,
pourable, traffic grade.
   5. Joint-Sealant Color: As selected by Architect from manufacturer’s full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water
immersion.
   1. Joint Locations:
      a. Joints in pedestrian plazas.
   2. Urethane Joint Sealant: Immersible, multicomponent, nonsag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer’s full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      b. Control and expansion joints in unit masonry.
      c. Joints in dimension stone cladding.
SECTION 079200 – JOINT SEALANTS

1. Joint Locations:
   a. Joints between metal panels.
   b. Joints between different materials listed above.
   c. Perimeter joints between materials listed above and frames of doors windows and louvers.
   d. Control and expansion joints in ceilings and other overhead surfaces.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
4. Joint Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      b. Control and expansion joints in tile flooring.
   2. Urethane Joint Sealant: Single component, nonsag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      a. Perimeter joints of exterior openings where indicated.
      b. Tile control and expansion joints.
      c. Vertical joints on exposed surfaces of walls and partitions.
      d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
   2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Location:
      a. Acoustical joints where indicated.
      b. Other joints as indicated.

END OF SECTION 079200
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes aluminum windows for exterior locations.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.
SECTION 085113 – ALUMINUM HURRICANE WINDOWS

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.06 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Failure to meet performance requirements.

   b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.

   c. Faulty operation of movable sash and hardware.

   d. Deterioration of materials and finishes beyond normal weathering.

   e. Failure of insulating glass.

2. Warranty Period:

   a. Window: 2 years from date of Substantial Completion.

   b. Glazing Units: 2 years from date of Substantial Completion.

   c. Aluminum Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. 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:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Crystal Window & Door Systems, LTD.

SECTION 085113 – ALUMINUM HURRICANE WINDOWS

2. Kawneer Company Inc

a. Series 8470TL Thermal Windows – Horizontal Slider (Hurricane Windows)

b. 4” (101.6 mm) frame depth

c. HS-HC70 / HS-AW70

3. EFCO Corporation; a Pella company.

C. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.02 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/LS.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AMMA certified with label attached to each window.

B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.45 Btu/sq. ft. x h x deg F.

C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.36.

D. Air Infiltration:

1. <.30 CFM/SF @ 1.6 PSF.

E. Water Performance:

1. No Leakage @ 11.3 PSF.

F. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.
SECTION 085113 – ALUMINUM HURRICANE WINDOWS

G. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.

H. Windborne-Debris Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 of 120 mph ultimate design wind speed and requirements of authorities having jurisdiction.

2.03 ALUMINUM WINDOWS

A. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Double Hung


1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

C. Insulating-Glass Units: ASTM E 2190, certified through IGCC as complying with requirements of IGCC.

1. Glass: ASTM C 1036, Type I, Class 1, q3.
   a. Tint: Gray.
   b. Kind: Fully tempered where indicated on Drawings.

2. Lites: Lite configurations as indicated.

3. Filling: Fill space between glass lites with argon.

4. Low-E Coating: Sputtered on third surface.

D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
1. Dual Glazing:
   a. Interior Lite: 1/4” Solargray Glass.
   b. Exterior Lite: 6mm Clear-0.030" PVB -6mm Clear Glass with Low-E coating on third surface. Hurricane resistant glazing locations.

E. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
   1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.04 ACCESSORIES

A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

B. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

C. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

2.05 INSECT SCREENS

A. Extruded aluminum frames, 6063-T6 alloy and temper, joined at corners: 18 x 16 mesh aluminum screen cloth; frames finished to match aluminum windows; splines shall be PVC, removable to permit rescreening.

2.06 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fit joints; make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.


7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

C. Fabricate aluminum windows that are re-glazable without dismantling sash or framing.

D. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact. Thermal barriers shall be designed in accordance with AAMA TIR A8.

1. Non structural thermal barriers are used only in conjunction with structural thermal barriers. The purpose of non structural thermal barriers is to enhance thermal performance of the primary structural thermal barriers (polyamide struts) by inhibiting heat transfer through thermal radiation and convection. Non structural thermal barriers shall not be used as primary load carrying members.

2. Rigid non structural thermal barriers shall be constructed of extruded polyvinylchloride (PVC).

E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash.

F. Weep Holes: Provide weep holes and internal passages in window frames to conduct infiltrating water to exterior.

G. Provide water-shed members as required above lines of natural water penetration.

Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of
H. Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093-inch (2.4 mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.

I. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section “Glazing” and with AAMA/WDMA/CSA 101/L.S.2/A440 (NAFS).

J. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section “Glazing” and glazing system indicated. Provide glazing stops to match sash.

2.07 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM’s ”Metal Finishes Manual” for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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.

2.08 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish (Three-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer’s standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear 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 2605 and with coating and resin manufacturers’ written instructions.

1. Color and Gloss: As selected by Architect from full range of industry colors and color...
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer’s written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer’s written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows 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 to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodeable surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.

2. Air-Infiltration Testing:
   a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/L.S.2/A440 performance class indicated.
   b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/L.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:
   a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/L.S.2/A440 performance grade indicated.
   b. Allowable Water Infiltration: No water penetration.


C. Remove and replace noncomplying windows and retest as specified above.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.04 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

   1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
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D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer’s written instructions.  

END OF SECTION 085113
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze angle valves.
2. Brass ball valves.
3. Bronze ball valves.
4. Iron ball valves.
5. Iron, single-flange butterfly valves.
7. Bronze lift check valves.
8. Bronze swing check valves.
10. Iron swing check valves with closure control.
13. Iron, plate-type check valves.
15. Iron gate valves.
16. Bronze globe valves.
17. Iron globe valves.
18. Lubricated plug valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   2. ASME B31.1 for power piping valves.
   3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.
   4. Set ball and plug valves open to minimize exposure of functional surfaces.
   5. Set butterfly valves closed or slightly open.
   6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
PART 2 - 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 (DN 200) and larger.
   2. Handwheel: For valves other than quarter-turn types.
   3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.
   4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.
   5. 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 (50-mm) 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.

F. Valve-End Connections:
   1. Flanged: With flanges according to ASME B16.1 for iron valves.
   2. Grooved: With grooves according to AWWA C606.
   4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE ANGLE VALVES

A. Class 125, Bronze Angle Valves with Bronze Disc:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hammond Valve.
      b. Milwaukee Valve Company.
2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig (1380 kPa).
   d. Ends: Threaded.
   e. Stem and Disc: Bronze.
   f. Packing: Asbestos free.
   g. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 150, Bronze Angle Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Stockham Division.
   a. Kitz Corporation.

2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 300 psig (2070 kPa).
   d. Ends: Threaded.
   e. Stem and Disc: Bronze.
   f. Packing: Asbestos free.
   g. Handwheel: Malleable iron, bronze.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Milwaukee Valve Company.
   c. NIBCO INC.

2. Description:
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Bronze.
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i. Ball: Chrome-plated brass.

j. Port: Full.

B. Three-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   b. Milwaukee Valve Company.
   c. NIBCO INC.

2. Description:

   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Three piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Bronze.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

BRONZE SWING CHECK VALVES

Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:

   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Horizontal flow.
   e. Ends: Threaded.
   f. Disc: Bronze.

Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
NY Rising – Governor’s Office of Storm Recovery
GOSR Work Order Number: NTF-1-DES
Edgewater Park Volunteer Fire Department — Storm Hardening and Abatement

SECTION 220523 - VALVES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 300 psig (2070 kPa).
   c. Body Design: Horizontal flow.
   e. Ends: Threaded.
   f. Disc: Bronze.

IRON SWING CHECK VALVES

Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-71, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
   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 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
SECTION 220523 - VALVES

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 200 psig (1380 kPa).
   d. Ends: Threaded or solder joint.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze.

C. Class 150, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Milwaukee Valve Company.
   b. NIBCO INC.

2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 300 psig (2070 kPa).
   d. Ends: Threaded.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze, or aluminum.

D. Class 150, RS Bronze Gate Valves:
NY Rising – Governor’s Office of Storm Recovery
GOSR Work Order Number: NTF-1-DES
Edgewater Park Volunteer Fire Department — Storm Hardening and Abatement

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 300 psig (2070 kPa).
   d. Ends: Threaded.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze.

2.7 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
   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.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
2. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
   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.

2.8 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-80, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
   d. Ends: Threaded or solder.
   e. Stem and Disc: Bronze.
   f. Packing: Asbestos free.
   g. Handwheel: Malleable iron, bronze.

2.9 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-85, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
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c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

2.10 LUBRICATED PLUG VALVES

A. Class 125, Regular-Gland, Lubricated Plug Valves with Threaded Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Homestead.
   c. Rockwell.

2. Description:
   a. Standard: MSS SP-78, Type II.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
   d. Pattern: Regular.
   e. Plug: Cast iron or bronze with sealant groove.

B. Class 125, Regular-Gland, Lubricated Plug Valves with Flanged Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Homestead.
   c. Rockwell.

2. Description:
   a. Standard: MSS SP-78, Type II.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
   d. Pattern: Regular.
   e. Plug: Cast iron or bronze with sealant groove.

C. Class 125, Cylindrical, Lubricated Plug Valves with Threaded Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Homestead Valve; a division of Olson Technologies, Inc.
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2. Description:
   a. Standard: MSS SP-78, Type IV.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
   d. Pattern: Regular.
   e. Plug: Cast iron or bronze with sealant groove.

D. Class 125, Cylindrical, Lubricated Plug Valves with Flanged Ends:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Homestead Valve; a division of Olson Technologies, Inc.

2. Description:
   a. Standard: MSS SP-78, Type IV.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
   d. Pattern: Regular.
   e. Plug: Cast iron or bronze with sealant groove.

2.11 SILENT CHECK VALVE

A. For each clear water pump discharge line, provide Val-matic 1800 BN.2 Series iron body stainless steel trim, center guided disc with replaceable bushing, Bun4-N sealing.

B. For each sewage ejector pump discharge line, provide Val-matic 500 Series biased swing-flex check valve.

2.12 CURB VALVES

A. AWWA hub end IBBM double disc gate type with square spindle nut, 200 psi wwp.
   1. Similar to Kennedy No. 56X (bell end).
   2. Similar to Kennedy No. 571X (mechanical joint).
   3. On underground piping.

B. AWWA flanged and IBBM double disc gate type with square spindle nut, 200 psi wwp.
   1. Similar to Kennedy No. 561X.
   2. On inside piping.

C. Provide with adjustable tar coated cast iron extension shaft and flush box with lock type extra heavy cast iron cover marked WATER.
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D. Locate in the sidewalk area at or within 2 ft. of curb.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 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 check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.3 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.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
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SECTION 220523 - VALVES
1. Shut-off Service: Ball or gate valves.
2. Throttling Service: Globe or ball.
3. Pump-Discharge Check Valves: Silent Check Valve
   a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
   b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring or iron, center-guided, resilient-seat check valves.
   c. NPS 2-1/2 (DN 65) 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 classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 (DN 50) 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 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
   4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
   5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.
   7. For Grooved-End Copper Tubing: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Bronze Angle Valves: Class 125 Class 150, bronze disc.
   3. Ball Valves: One Two Three piece, full port, bronze with bronze stainless-steel trim.
   4. Bronze Swing Check Valves: Class 125 Class 150, bronze disc.
   5. Bronze Gate Valves: Class 125 Class 150.

B. Pipe NPS 2-1/2 (DN 65) and Larger:
   1. Iron Valves, NPS 2-1/2 and larger provided with flanged ends.
   2. Iron Ball Valves: Class 150.
   3. Iron Swing Check Valves: Class 125 Class 250, metal seats.
   4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring weight.
   5. Iron, Grooved-End Swing Check Valves: 300 CWP.
   6. Iron Gate Valves: Class 125 Class 250, NRS OS&Y.

3.6 SANITARY-WASTE VALVE SCHEDULE
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A. Pipe NPS 2 (DN 50) and Smaller:  
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.  
   2. Bronze Angle Valves: Class 125 Class 150, bronze disc.  
   3. Ball Valves: One Two Three piece, regular port, bronze with bronze stainless-steel trim.  
   4. Bronze Swing Check Valves: Class 125 Class 150, bronze disc.  
   5. Bronze Gate Valves: Class 125 Class 150, NRS RS.  

B. Pipe NPS 2-1/2 (DN 65) and Larger:  
   1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.  
   2. Iron Ball Valves: Class 150.  
   3. Iron Swing Check Valves: Class 125 Class 250, metal seats.  
   4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring weight.  
   5. Iron, Grooved-End Swing Check Valves: 300 CWP.  
   6. Iron Gate Valves: Class 125 Class 250, NRS OS&Y.  
   8. Lubricated Plug Valves: Class 125 Class 250, regular gland, threaded flanged.  

3.7 VALVE CONSTRUCTION/APPLICATION SCHEDULE  

The following are of Milwaukee Valve’s model numbers except where otherwise noted:  

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Pipe Size</th>
<th>Press. Steam (Class)</th>
<th>Rate Wog</th>
<th>Bonnet Stem/Assembly</th>
<th>Material/Body Style</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate</td>
<td>2-1/2” &amp; Smaller</td>
<td>125#/200#</td>
<td>UB/RS UB/NRS</td>
<td>AB/IPS or SE</td>
<td>1152, 1169, 105, 115</td>
<td></td>
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<tr>
<td>Gate</td>
<td>3” &amp; Larger</td>
<td>125#/200#</td>
<td>OS&amp;Y/RS</td>
<td>IBBM/FL</td>
<td>F2885M</td>
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</tr>
<tr>
<td>Gate</td>
<td>3” &amp; Larger</td>
<td>125#/200#</td>
<td>FL/NRS</td>
<td>IBBM/FL</td>
<td>F2882M</td>
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<tr>
<td>Gate</td>
<td>2-1/2”</td>
<td>150#/300#</td>
<td>UB/RS</td>
<td>AB/IPS or SE</td>
<td>1151, 1169</td>
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<tr>
<td>Gate</td>
<td>3” &amp; Larger</td>
<td>250#/500#</td>
<td>OS&amp;Y/RS</td>
<td>IBBM/FL</td>
<td>Stockham F2894M</td>
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<tr>
<td>Ball</td>
<td>2” &amp; Smaller</td>
<td>150#/600#</td>
<td>Buna-N-O-Rings</td>
<td>AB/IPS or SE 2-piece</td>
<td>Apollo 70-100/70-200 Series</td>
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<tr>
<td>Ball</td>
<td>2-1/2” &amp; 3”</td>
<td>150#/600#</td>
<td>Stainless Steel Ball Teflon O Rings</td>
<td>AB/IPS or SE 3-piece</td>
<td>Apollo 82-100/82-200 Series</td>
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<tr>
<td>Gas Ball</td>
<td>3/4” &amp; Smaller</td>
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<td>- - - - - -</td>
<td>AB/IPS</td>
<td>GB-10-L</td>
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220523 - 14
<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Application</th>
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</thead>
<tbody>
<tr>
<td>Gate Valves</td>
<td>Control shut-off valve for all domestic water systems.</td>
</tr>
<tr>
<td>Globe Valves</td>
<td>Domestic hot water balancing cocks.</td>
</tr>
<tr>
<td>Ball Valves</td>
<td>Optional control shut-off valves, 3 inches and smaller.</td>
</tr>
</tbody>
</table>
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Optional domestic hot water balancing cocks.

Check Valves
- Swing type on domestic water except pump discharge lines.
- Non-slam type on domestic pump discharge lines.
- Weighted lever type swing on ejector and sump pump discharge lines.

Plug Valves
- Gas control valves.

Gas Ball Valves
- Optional gas control valves 3/4 inch

3.9 INSTALLATION

A. Install Class 125 valves in portions of system where water pressure does not exceed 100 psig. Install Class 150 valves in portions of system where water pressure does not exceed 200 psig. Install Class 250 valves in portions of system where water pressure does not exceed 350 psig.

B. Provide valve box and cover on all valves for underground services.

C. All water supply system control valves and check valves 2 1/2 inch and smaller to be all bronze construction. 2-1/2” and smaller control valves to have union bonnets. All water system control valves 3 inch and larger to be outside screw and yoke.

D. Water supply system control valves and check valves 3 inch and larger to be iron body flanged, with bronze internal parts.

E. Provide pressure reducing valves where indicated on drawings and on all other branches and mains as required to maintain a maximum pressure of 80 psig at the fixture.

F. Provide separate "Y" strainers upstream of all pressure reducing valves.

END OF SECTION 220523
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment support.
2. Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-suppression piping.
3. Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
4. Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For the following:
   1. Steel pipe hangers and supports.
   2. Thermal-hanger shield inserts.
   3. Pipe positioning systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze pipe hangers. Include Product Data for components.
   2. Metal framing systems. Include Product Data for components.
   3. Pipe stands. Include Product Data for components.
   4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE


B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
   4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 “Hanger and Support Applications” Article for where to use specific hanger and support types.

B. Manufacturers:
   2. Carpenter & Paterson, Inc.
   4. Anvil.
   5. GS Metals Corp.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:
   2. GS Metals Corp.
   3. Thomas & Betts Corporation.
   4. Tolco Inc.
   5. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig (690-kPa) minimum, compressive-strength insulation insert encased in sheet metal shield.
B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 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.

1. Manufacturers:

   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
   c. Masterset Fastening Systems, Inc.
   d. MKT Fastening, LLC.
   e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

   b. Empire Industries, Inc.
   c. Hilti, Inc.
   d. ITW Ramset/Red Head.
   e. MKT Fastening, LLC.
   f. Powers Fasteners.
2.7 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Manufacturers:
   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece plastic stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Manufacturers:
   a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers:
   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.
   c. Portable Pipe Hangers.
   
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Manufacturers:
   a. Portable Pipe Hangers.
   
2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.
NY Rising – Governor’s Office of Storm Recovery  
GOSR Work Order Number: NTF-1-DES  
Edgewater Park Volunteer Fire Department — Storm Hardening and Abatement

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2.8 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified 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 indirect contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. 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 non-insulated or insulated
SECTION 220529 – PIPE HANGERS AND SUPPORTS

stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750),

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).

8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).

10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).

12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.

16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. 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 20 (DN 20 to DN 500).

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
H. 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 (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. 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. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. 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 (340 kg).
   b. Medium (MSS Type 32): 1500 lb (680 kg).
   c. Heavy (MSS Type 33): 3000 lb (1360 kg).
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. 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
SECTION 220529 – PIPE HANGERS AND SUPPORTS

- Insulation that matches adjoining insulation.
- Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
- Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
   a. Horizontal (MSS Type 54): Mounted horizontally.
   b. Vertical (MSS Type 55): Mounted vertically.
   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel 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 building structure.

B. 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
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intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) 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.

F. Pipe Stand Installation:
   1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
   2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.


J. 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.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. 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 (DN 65) 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.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

O. 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 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 (DN 100) 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 (DN 100) 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 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.3 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 smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.4 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 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 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 (40 mm).

3.6 PAINTING

A. Touch Up: 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 minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections. Section "High-Performance Coatings."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 22 05 29
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.
   4. Stencils.
   5. Valve tags.
   6. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS
1. Metal Labels for Equipment: Material and Thickness: Brass, 0.032-inch (0.8-mm) minimum thickness, 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 (64 by 19 mm).

3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.


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 (A4) 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, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), 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 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. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to 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 (38 mm) high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.

   2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
   3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

   1. Tag Material: Aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled stamped holes for attachment hardware.
   2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

   1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
NY Rising – Governor’s Office of Storm Recovery
GOSR Work Order Number: NTF-1-DES
Edgewater Park Volunteer Fire Department — Storm Hardening and Abatement

SECTION 220553 – PIPE AND VALVE IDENTIFICATION

1. Size: 3 by 5-1/4 inches (75 by 133 mm) minimum Approximately 4 by 7 inches.
2. Fasteners: Reinforced grommet and wire or string.
3. Nomenclature: Large-size primary caption such as “DANGER,” “CAUTION,” or “DO NOT OPERATE.”

3 PART 3 - 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 Division 09 Section “Interior Painting”.

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer’s option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.

   1. Identification Paint: Use for contrasting background.

C. 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 10 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.

D. Pipe Label Color Schedule:

   1. Domestic Water Piping:
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2. Sanitary Waste and Storm Drainage Piping:
   - Background Color: Black Blue Red White Yellow.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:
   - Cold Water: 2 inches (50 mm), square.
   - Hot Water: 2 inches (50 mm), square.

2. Valve-Tag Color:
   - Cold Water: Green
   - Hot Water: Green

3. Letter Color:
   - Cold Water: Black
   - Hot Water: Black

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

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SECTION 220576 – DRAINAGE ACCESSORIES

SECTION 220576  
DRAINAGE ACCESSORIES

PART 1 GENERAL

1.01 REFERENCES
A. Comply with the applicable requirements of ASME A112.36.2M - Cleanouts, and ASME A112.1.2 - Drainage Funnels and Air Gaps.

1.02 SUBMITTALS
A. Product Data: Catalog sheets, specifications, and installation instructions for each item specified except fasteners.

1.03 MAINTENANCE
A. Special Tools: Deliver the following to the Director’s Representative:  
   1. Tools for Vandal Resistant Fasteners: One for each type and size.  
   2. T-Handle Wrench for Cleanout Plugs: One for each type and size.

PART 2 PRODUCTS

2.01 CLEANOUT PLUG
A. Cast brass or bronze, with threaded end, and raised or countersunk head.  
   1. Tapped head for attachment of cleanout wall or deck plate covers where required.

B. Anti-Seize Lubricant: Never-Seez by Bostik Chemical Group, Broadview, IL; Molykote 1000 by Dow Corning Corp, Midland, MI; Anti-Seize Lubricant by Loctite Corp, Newington, CT.

2.02 CLEANOUT
A. Threaded pipe fitting or cast iron ferrule with gas tight cleanout plug.

2.03 CLEANOUT WALL PLATE
A. Round, stainless steel or polished chrome plated bronze cover plate with stainless steel vandal resistant fastener to secure to cleanout plug.

2.04 CLEANOUT DECK PLATE
A. Standard duty floor cleanout fitting with coated cast iron body; round, polished nickel bronze scoriated top secured to cleanout plug with stainless steel vandal resistant fastener; threaded height adjustment, cast iron head, gas tight cleanout plug, and connection to match piping option selected.

B. Membrane flange and clamping collar, secured with corrosion resistant fasteners.

2.05 HOUSE TRAP

A. Service weight cast iron soil pipe running trap with bell and spigot ends and two cleanout hubs.

2.06 FRESH AIR INLET

A. Pipe Materials: Same as drainage system at point of connection.

B. Grille Free Area: At least equal to cross sectional area of pipe to which connection made.

C. Grille Material: Polished nickel bronze, with removable grate, either perforated or bar type. Grate attached to grille body with vandal resistant fastener.

D. Attachment to Piping:
   1. Threaded Piping: Use threaded end grille.
   2. Non Threaded Piping: Use pipe locking device and vandal resistant fastener.

E. Mushroom Cap: Coated cast iron, secured with vandal resistant fasteners.

2.07 CONDUCTOR EXPANSION JOINT

A. Coated cast iron body with brass telescoping sleeve, adjustable packing gland with graphite, neoprene or mineral fiber gasket, and connection to match piping option selected.

2.08 GREASE TRAP

A. Cast iron or steel construction with threaded inlet and outlet connections, removable baffles or screens, bolted and gasketed cover with recessed lift rings or grip holes.
   1. Finish: Factory enamel coated inside and outside.
   2. Non-skid cover top surface.
B. Provide built-in flow control or adjustable flow control fitting for installation in system piping.

2.09 AIR GAP FITTING

A. Coated cast iron body with air gaps, set screw or threaded inlet, and outlet connection to match piping option selected.

2.10 INDIRECT WASTE FUNNEL

A. Combination Funnel Drain and P Trap: Polished chrome plated cast brass construction.
   1. Funnel: 4 inch top dia., 4 inches deep, with threaded outlet.
   2. P Trap: Bottom cleanout, threaded inlet, and outlet connection to match piping option selected.

2.11 FASTENERS

A. Corrosion Resistant Fasteners: Brass, bronze, or Type 302 or 304 stainless steel bolts.

B. Vandal Resistant Fasteners: Torx head with center pin.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer’s printed installation instructions, unless otherwise specified.

B. Cleanout Plug: Lubricate threads with anti-seize lubricant before final installation.

C. Fresh Air Inlets:
   1. Free Standing Type:
      a. Set vertical portion in bed of concrete for stability.
      b. Installation Height: Minimum 18 inches above finished grade.
      c. Paint mushroom cap and pipe exposed above grade level.
   2. Wall Type:
      a. Installation Height: Minimum 18 inches above finished grade.

D. Grease Trap: Set flow control as recommended by the manufacturer’s instructions.

E. Secure external components in place with vandal resistant fasteners or devices.
which cannot be removed without special tools.

END OF SECTION 220553
1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Cellular glass.

2. Insulating cements.
3. Adhesives.
5. Lagging adhesives.
7. Factory-applied jackets.
10. Field-applied jackets.
11. Tapes.
12. Securements.
13. Corner angles.

B. Related Sections include the following:

1. Division 21 Section "Fire-Suppression Systems Insulation."
2. Division 23 Section "HVAC Insulation."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

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.
8. Detail field application for each equipment type.
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C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sample Sizes:
   a. Preformed Pipe Insulation Materials: 12 inches (300 mm) long by NPS 2 (DN 50).
   b. Sheet Form Insulation Materials: 12 inches (300 mm) square.
   c. Jacket Materials for Pipe: 12 inches (300 mm) long by NPS 2 (DN 50).
   d. Sheet Jacket Materials: 12 inches (300 mm) square.
   e. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

D. Qualification Data: For qualified Installer.

E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

F. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test- response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting 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 and inspecting 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.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

   1. Piping Mockups:
      a. One 10-foot (3-m) section of NPS 2 (DN 50) straight pipe.
      b. One each of a 90-degree threaded, welded, and flanged elbow.
      c. One each of a threaded, welded, and flanged tee fitting.
      d. One NPS 2 (DN 50) or smaller valve, and one NPS 2-1/2 (DN 65) or larger valve.
      e. Four support hangers including hanger shield and insert.
      f. One threaded strainer and one flanged strainer with removable portion of insulation.
      g. One threaded reducer and one welded reducer.
      h. One pressure temperature tap.
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1. One mechanical coupling.

2. Equipment Mockups: One tank or vessel.
3. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
4. Notify Architect seven days in advance of dates and times when mockups will be constructed.
5. Obtain Architect’s approval of mockups before starting insulation application.
6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Demolish and remove mockups when directed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 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. Glass Fiber:
   1. Insulation: ASTM C547; rigid molded, noncombustible.
      a. 'K' ('ksi') value: ASTM C335, 0.24 at 75 degrees F, 0.035 at 24 degrees C).
      b. Minimum Service Temperature: -20 -120 degrees.
      c. Maximum Service Temperature: 450 degrees F.
      d. Maximum Moisture Absorption: 0.2 percent by volume.
   2. Vapor Barrier Jacket
      a. ASTM C921, White kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
      b. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
      c. Secure with self sealing longitudinal laps and butt strips.
      d. Secure with outward clinch expanding staples and vapor barrier mastic.
   3. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12 inch centers.
   4. Vapor Barrier Lap Adhesive.
      a. Compatible with insulation.
   5. Insulating Cement/Mastic
      a. ASTM C195; hydraulic setting on mineral wool.
   6. Fibrous Glass Fabric
      a. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
      b. Blanket: 1.0 lb/cu ft (16 kg/cu m) density.
   7. Indoor Vapor Barrier Finish
      a. Vinyl emulsion type acrylic, compatible with insulation, white color.
   8. Outdoor Vapor Barrier Mastic
      a. Vinyl emulsion type acrylic, compatible with insulation, white color.
   9. Insulating Cement
      a. ASTM C449.

G. Cellular Glass:
   1. Insulation: ASTM C552:
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a. 'K' value: 0.40 at 75 degrees F.  
b. Maximum Water Vapor Transmission: 0.1 perm.

H. Jackets:

1. PVC Plastic:
      1) Minimum Service Temperature: -40 degrees F.  
      2) Maximum Service Temperature: 150 degrees F.  
      3) Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.  
      4) Maximum Flame Spread: ASTM E84; 25.  
      5) Maximum Smoke Developed: ASTM E84; 50, 100.  
      6) Thickness: 20 mil.  
      7) Connections: Brush on welding adhesive and tacks.  

   b. Covering Adhesive Mastic.  
      1) Compatible with insulation.

2. ABS Plastic
   a. Jacket: One piece molded type fitting covers and sheet material, off white color.
      1) Minimum Service Temperature: -40 degrees F.  
      2) Maximum Service Temperature of 180 degrees.  
      3) Moisture Vapor Transmission: ASTM E96; 0.012 perm inches.  
      4) Thickness: 30 mil.  
      5) Connections: Brush on welding adhesive.

3. Canvas Jacket: UL listed  
   b. Lagging Adhesive  
      1) Compatible with insulation.

   a. Thickness: 0.025 inch.  
   b. Finish: Embossed.  
   c. Joining: Longitudinal slip joints and 2 inch laps.  
   d. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protectiveliner.  
   e. Metal Jacket Bands: 3/8 inch wide; 0.015 inch.

5. Stainless Steel Jacket: Type 304 stainless steel.a.
   a. Thickness: 0.010, 0.016, 0.018, inch.  
   b. Finish: Corrugated.

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2.3 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of <Insert value> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-52.
   b. Foster Products Corporation, H. B. Fuller Company; 81-42.
   c. Marathon Industries, Inc.; 130.
   d. Mon-Eco Industries, Inc.; 11-30.
   e. Vimasco Corporation; 136.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over equipment and pipe insulation.
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4. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; CP-76.
   b. Foster Products Corporation, H. B. Fuller Company; 30-45.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Pittsburgh Corning Corporation; Pittseal 444.
   f. Vimasco Corporation; 750.

2. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; CP-70.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Vimasco Corporation; 750.

3. Materials shall be compatible with insulation materials, jackets, and substrates.

4. Permanently flexible, elastomeric sealant.

5. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).

6. Color: White or gray.

7. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. 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.

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B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use de-mineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and 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. 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.

3. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket.
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 (75-mm) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). 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 (50 mm) 4 inches (100 mm) o.c.
   a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints 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 (100 mm) 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.
5. Handholes.
6. Cleanouts.

3.4 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 (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.
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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 (50 mm).
   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 in Division 07 Section "Penetration Firestopping" and fire-resistant joint sealers.

F. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 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 twice 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,
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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, vessels, and equipment.
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 (50 mm) 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.

3.6 CELLULAR-GLASS INSULATION INSTALLATION

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
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clinched staples at 6 inches (150 mm) o.c.

4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but 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 (25 mm), 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.

3.7 FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paintjacket with paint system identified below and as specified in Division 09 painting Sections.

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.

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.
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SECTION 220700 – PIPING INSULATION

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

   1. Inspect field-insulated equipment, 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 one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

   2. 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.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Domestic water pump insulation shall be the following:

   1. Cellular Glass: 2 inches (50 mm) thick.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

   1. Drainage piping located in crawl spaces.
   2. Underground piping.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water: Including all cold water mains, branch, riser and all piping in pipe chase.
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1. NPS 1 (DN 25) and Smaller: Insulation shall be the following:
   a. Cellular Glass: 1/2 inch thick.

2. NPS 1-1/4 (DN 32) and Larger: Insulation shall be the following:
   a. Cellular Glass: 1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water: Including all hot water mains, branch, risers and all piping in pipe chase.

1. NPS 1-1/4 (DN 32) and Smaller: Insulation shall be the following:
   a. Cellular Glass: 1 inch thick.

2. NPS 1-1/2 (DN 40) and Larger: Insulation shall be the following:
   a. Cellular Glass: 2 inches thick.

C. Stormwater:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Cellular Glass: 1-1/2 inches (38 mm) thick.

D. Roof Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Cellular Glass: 1-1/2 inches (38 mm) thick.

E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1/2 inch (13 mm) thick.

F. All piping provided with electric freeze protection.

1. Cellular Glass: 2 inches thick.

G. All piping provided with HWATT.


END OF SECTION 220700
SECTION 22 08 00 – CLEANING AND TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes commissioning process requirements for Plumbing systems, assemblies, and equipment.
B. Related Sections:
   1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3 DEFINITIONS
A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
B. CxA: Commissioning Authority.
C. Plumbing: Domestic hot water heating systems.
D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 ALLOWANCES
A. Labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing are covered by the "Schedule of Allowances" Article in Division 01 Section "Allowances."

1.5 UNIT PRICES
A. Commissioning testing allowance may be adjusted up or down by the "List of Unit Prices" Article in Division 01 Section "Unit Prices" when actual man-hours are computed at the end of commissioning testing.
1.6 CONTRACTOR’S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend testing, adjusting, and balancing review and coordination meeting.

C. Participate in Plumbing systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

D. Provide information requested by the CxA for final commissioning documentation.

E. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.7 CxA’S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures for actual Plumbing systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.


1.8 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for Plumbing systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that Plumbing systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing, adjusting, and balancing reports.

1.9 SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.
PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that Plumbing systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that Plumbing instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 TESTING AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least five (5) business days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of Plumbing systems at the direction of the CxA.

1. The CxA will notify testing and balancing subcontractor five (5) business days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS
SECTION 220800 – CLEANING AND TESTING

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of Plumbing testing shall include entire Plumbing installation. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Plumbing and Plumbing Instrumentation and Control Subcontractors shall prepare detailed testing plans, procedures, and checklists for Plumbing systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed due to a deficiency outside the scope of the Plumbing system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 PLUMBING SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Domestic water heating tank / heater Testing and Acceptance Procedures: Provide submittals, test data, inspector record, and boiler certification to the CxA.

B. Plumbing Instrumentation and Control System Testing: See "Instrumentation and Control for Plumbing" and "Sequence of Operations for Plumbing Controls." Assist the CxA with preparation of testing plans if so requested. Provide submittals, points lists and operating sequences to the CxA.

C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 22 piping Sections. Subcontractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
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SECTION 220800 – CLEANING AND TESTING

4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Energy Supply System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of gas and hot-water systems and equipment at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

E. Plumbing Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including Plumbing terminal equipment and unitary equipment.

F. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

END OF SECTION 22 08 00
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SECTION 223400 – FUEL FIRED, DOMESTIC-WATER HEATERS  

SECTION 22 34 00 – FUEL FIRED, DOMESTIC-WATER HEATERS  

PART 1 - GENERAL  

1.1 RELATED DOCUMENTS  
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.  

1.2 SUMMARY  
A. Section Includes:  
1. Brazed-plate, domestic-water heat exchangers.  
2. Frame-and-plate, domestic-water heat exchangers.  
3. Control Valves and Piping Accessories  
4. Control Panel  

1.3 SUBMITTALS  
A. Product Data: For each type and size of domestic-water heat exchanger indicated. Include the following:  
1. Heater rated capacities.  
3. Boiler water inlet and outlet temperatures at full load.  
4. Heater rated working pressures, shell and coils.  
5. Relief valve type and rating.  
8. Electrical power and control wiring diagrams with indication of field wiring connections.  
9. Catalog information on major components.  
10. All of the above shall be specifically prepared and certified for this project.  

B. Submittals which are generic and not specifically designed to meet the requirements of this project shall not be acceptable.  

C. Product Certificates: ASME Pressure Vessel Code Section VIII  

D. Domestic-Water, Heat-Exchanger Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction, ASME Pressure Vessel Code Section VIII  

E. Operation and Maintenance Data: For domestic-water heat exchangers to include in emergency, operation, and maintenance manuals.  

F. Warranty.  

1.4 QUALITY ASSURANCE
A. 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. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

B. ASME Compliance: Where ASME-code construction is indicated, fabricate and label heat-exchanger storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

C. Comply with NSF 5 Water heaters, hot water supply boilers, and heat recovery equipment.

D. Manufacturing firms regularly engaged in manufacture of this material meeting all capacities and operating characteristics of the specified manufacturer's product whose products have been in satisfactory use, in similar service, for not less than ten (10) years.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.6 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of domestic-water heat exchangers that fail in materials or workmanship within specified warranty period of one year from the date of initial operation or 18 months from date of delivery, whichever occurs first.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with all specified requirements, provide products as produced by the manufacture used as the basis of design. Other manufacturers, whose products have been in satisfactory use in similar service for not less than 10 years, may be submitted for approval as an equal provided the submission contains sufficient information for evaluation and the manufacturer certifies full compliance with the performance, physical characteristic requirements and all operational features of these Specifications.

B. Should the initial "Or, Equal" submittal be incomplete or otherwise fail to demonstrate "Or, Equal" status, no further submissions by the failed manufacturer will be reviewed.

2.2 DOMESTIC-WATER HEAT EXCHANGERS PACKAGES

A. Description: Factory packaged assembly of plate heat-exchanger pressure vessel, controls, and specialties for heating domestic water to be supplied by the manufacturer ready to accept existing boiler water and domestic water lines.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by

a. RUUD/ RHEEM

B. Brazed-Plate, Domestic-Water Heat Exchangers:

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SECTION 223400 – FUEL FIRED, DOMESTIC-WATER HEATERS

1. See plumbing schedule for manufacturer, models numbers and heater(s) criteria. Description: Assembly of heat-exchanger plates, permanently brazed together, for using heating hot water to heat domestic water.

2. Brazed Plate Working Pressure Temperature Rating: 250 psig at 200 °F


5. Plate Material: 316L Stainless steel.

6. Plate Thickness: Not less than 0.7 mm.


8. Brazing Filler Metal: Copper.

9. Insulation: Contractor shall install insulation in the field in accordance other sections of this specification. Surround entire heat exchanger except connections.

C. Frame-and-Plate, Domestic-Water Heat Exchangers:

1. Description: Assembly of nonfixed-position, heat-exchanger plates, with frame, for using heating hot water to heat domestic water.

2. Working-Pressure Rating: 150 psig at 300 °F


4. Frame:
   b. Fixed, Frame Plate; Pressure Plate; Support Column; and Nuts and Bolts: Carbon steel.

5. Channel Plates:
   b. Plate Thickness: Not less than 0.8 mm.


7. Protective Shroud: Steel, covering channel plates.

8. Insulation: Contractor shall install insulation in the field in accordance other sections of this specification. Surround entire heat exchanger except connections.

D. Temperature Control Panel: Nema12, system mounted and prewired control panel shall provide for adjustable, feedback based temperature control. For redundancy, each control valve shall have a dedicated controller. Each DHW zone shall provide:

1. PID temperature controller, digital display, low-temperature alarm and remote alarm contact, for AX outlet, feedback temperature sensor installed in a brass thermowell.

2. PID temperature controller, digital display, high-temperature alarm and remote contact, for remote Mixing Valve outlet, feedback temperature sensor installed in a brass thermowell.

3. Temperature display, digital display, for AX inlet, feedback temperature sensor installed in a brass thermowell.

4. The PID temperature controller
SELECTION 223400 – FUEL FIRED, DOMESTIC-WATER HEATERS

5. Electronic boiler water control valve. The valve shall be a 3-way or 2-way as indicated on schematics, having the following performance characteristics:
   a. Time to Full Open Position: 15 seconds.
   b. Time to Full Closed Position: 15 seconds.

6. Power supply: 120 volt, 60 HZ and 220 volt, 50 HZ, 20 amp circuit required.

E. Packaged Components:

1. Header piping with dielectric flanges.
2. All piping type K copper or stainless steel.
4. Y-strainers with blowdown valve for boiler water.
5. Basket strainer for domestic water.
6. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves conforming to ANSI Z21.22, set at 150 PSIG / 210°F. Include one or more relief valves with total relieving capacity at least as great as heat input.
7. Bronze ball type isolation valves.
8. High performance butterfly isolation valves for boiler water.
9. 3/4” Bronze domestic water drain valve.
10. In-place connections for easy and simple cleaning of the plate heat exchanger (plate frame type only).
11. Thermometers.

F. Stand and System Base:

1. Factory fabricated for floor mounting.
2. Non-corroding aluminum structural common base with aluminum diamond deck service decks.

G. Service Contract: The manufacturer’s representative shall include a one (1) year service contract. The service contract period shall commence upon owner acceptance of the system. The service contract shall include a complete system inspection twice a year including: visual inspection of the heaters for damage, corrosion, leaks; record all temperature and pressure readings; blow down strainers; check heat exchangers for leaks; check / adjust temperature controls; verify operation of over temperature limit system; drain and blow down heaters to reduce scale build up. Any required service work to be noted in a formal inspection report along with a detailed proposal for the repairs.

H. Capacity and Characteristics: Refer to schedule

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heat exchangers specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test domestic-water heat exchangers to minimum of one and one-half times pressure rating before shipment.
3.1 DOMESTIC-WATER, HEAT-EXCHANGER INSTALLATION

A. Domestic-Water, Heat-Exchanger Mounting: Install domestic-water heat exchangers on concrete base. Comply with requirements for concrete bases specified in Division 03 Section "[Cast-in-Place Concrete] [Miscellaneous Cast-in-Place Concrete]."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor heat exchangers to substrate.

B. Install domestic-water heat exchangers level and plumb, according to layout drawings, piped in reverse return arrangement it multiple units, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to heat exchangers and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
2. Install shutoff valves on heating hot-water piping to heat exchangers. Comply with requirements for shutoff valves specified in Division 23 Section "General-Duty Valves for HVAC Piping."

C. Extend relief-valve outlet, individually, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install heat-exchanger drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heat exchangers that do not have tank drains. Comply with requirements for hose-end drain valves specified in Division 22 Section "Domestic Water Piping Specialties."

E. Fill domestic-water heat exchangers with water.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Section "Domestic Water Piping."

B. Comply with requirements for heating hot-water piping specified in Division 23 Section "Hydronic Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to domestic-water heat exchangers, allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of domestic-water heat exchangers.
3.3 IDENTIFICATION
   A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL
   A. Perform start-up tests and inspections.

   B. Prior to start-up the contractor shall perform the following:
      1. Complete installation and startup checks according to manufacturer's written instructions.
      2. Prior to filling the heaters, pipe the discharges from the high temperature safety solenoid and the relief valves, individually, to a clean floor drain capable of handling full flow.
      3. After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
      4. Flush all piping
      5. Clean strainers

   C. Manufacturer's Field Start-Up Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
      1. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
      2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

   D. Domestic-water heat exchangers will be considered defective if proper operation cannot be demonstrated.

   E. Prepare test and inspection reports.

3.5 DEMONSTRATION
   A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain domestic-water heat exchangers.
PART 1 GENERAL

1.01 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Companion high density filler pieces for installation over the top 180 degree surface of pipe or tubing, at points of support where a combination clevis hanger, insulation shield and high density insulating saddle are installed.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Piping Insulation: Section 230700 or 230719.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Details of trapeze hangers and upper hanger attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.
   2. Details of pipe anchors.

B. Product Data: Catalog sheets, specifications and installation instructions for each item specified except fasteners.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with the applicable requirements of the ASME B31 Piping Codes.
   2. Unless otherwise shown or specified, comply with the requirements of the Manufacturer’s Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.
2.01 PIPE HANGERS AND SUPPORTS

A. Combination clevis hanger, pipe insulation shield and vapor barrier jacketed highdensity insulating saddle with companion high density filler piece.

1. Insulating saddles and filler pieces shall be of the same thickness and materials as the adjoining pipe insulation. Saddles shall cover the lower 180 degrees of the pipe or tubing, and companion filler pieces shall cover the upper 180 degrees of the pipe or tubing. Physical sizes, gages, etc. of the components of insulated hangers shall be in accordance with the following schedule:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (Inches)</th>
<th>SHIELD LENGTH (Inches)</th>
<th>SHIELD GAGE</th>
<th>SADDLE LENGTH (Inches)</th>
<th>VAPOR BARRIER JACKET LENGTH (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 2-1/2</td>
<td>4</td>
<td>16</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>3 to 6</td>
<td>4</td>
<td>14</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>8 to 14</td>
<td>10</td>
<td>12</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>16 and up</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>16</td>
</tr>
</tbody>
</table>

A. Pipe Insulation Shields: Fabricated of steel, with a minimum arc of 180 degrees, unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (Inches)</th>
<th>SHIELD LENGTH (Inches)</th>
<th>SHIELD GAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 2-1/2</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>3 to 8</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>10 to 14</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>16 and up</td>
<td>18</td>
<td>10</td>
</tr>
</tbody>
</table>

B. Adjustable Floor Rests and Base Flanges: Steel.

C. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two nuts at each end for positioning rod and hanger, and locking each in place.

D. Riser Clamps: Malleable iron or steel.
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SECTION 230529 – PIPE HANGERS AND SUPPORT

E. Rollers: Cast Iron.

F. Restraints, Anchors, and Supports for Grooved End Piping Systems: As recommended by the grooved end fitting manufacturer, and as required for seismic restraints.

2.02 ANCHORS AND ATTACHMENTS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly’s Div./USM Corp. Parasleeve Series, Ramset’s Dynabolt Series, or Red Head/Phillips AN, HN, or FS Series.

B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti’s Kwik Bolt Series, Molly’s Div./USM Corp. Parabolt PB Series, Ramset’s Trubolt T Series, or Red Head/Phillips WS Series.

C. Self-Drilling Anchors (Group III, Type 1): Ramset’s RD Series, or Red Head/Phillips S Series.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset’s Dynaset DS Series, Hilti’s HDI Series, or Red Head/Phillips J Series.

E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS Series.

F. Beam Clamps: Forged steel beam clamp, with welded eye nut (right hand thread), steel tie rod, nuts, and washers, Grinnell’s Fig No. 292 (size for load, beam flange width, and rod size required).

G. Metal Deck Ceiling Bolts: B-Line Systems’ Fig. B3019.

2.02 VIBRATION ISOLATION FOR PIPING

A. Type: Combination rubber and spring type designed for insertion in a split hanger rod for isolating piping from the overhead construction.

1. Approved isolators: Amber Booth Type BSSR, Korfund Type VX, Mason Industries, Type DNHS, Vibration Eliminator Co. Type SNRC and Vibration Mountings and Controls Type RSH.

B. To ensure that piping weight is properly distributed and not being supported by equipment flanges, the first three rubber and spring isolators on the inlet shall be of the "position indicating" type.

1. Approved Isolators: Amber Booth Type PBSS, Korfund Type VXLS, Mason Industries Type PDNHS, Vibration Eliminator Co. Type PR2H and Vibration Mountings and Controls Type RSHP.
2.03 **FASTENERS**

A. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.04 **SHOP PAINTING AND PLATING**

A. Hangers, supports, rods, inserts and accessories used for pipe supports, unless chromium plated, cadmium plated or galvanized shall be shop coated with metal primer paint. Electroplated copper hanger rods, hangers and accessories may be reused with copper pipe or copper tubing.

B. Hanger supports for chromium plated pipe shall be chromium plated brass.

**PART 3 EXECUTION**

3.01 **PREPARATORY WORK**

A. Place inserts into construction form work expeditiously, so as not to delay the Work.

3.02 **INSTALLATION**

A. Do not hang or support one pipe from another or from ductwork.

1. **Do not bend threaded rod.**

B. Support all insulated horizontal piping conveying refrigerants or other fluids below ambient temperature, by means of hangers or supports with insulations shields installed outside of the insulation.

C. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.

1. For Steel, Alloy Steel, Threaded Brass Pipe and Fibrous Glass Reinforced Plastic Pipe (FRP):

<table>
<thead>
<tr>
<th>PIPE SIZE (Inches)</th>
<th>MAXIMUM SPACING (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and under</td>
<td>8</td>
</tr>
</tbody>
</table>

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SECTION 230529 – PIPE HANGERS AND SUPPORT

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE</th>
<th>MAXIMUM SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2 and under</td>
<td>6</td>
</tr>
<tr>
<td>2 and over</td>
<td>10</td>
</tr>
</tbody>
</table>

3. For Copper Pipe and Copper Tubing:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (Inches)</th>
<th>MAXIMUM SPACING (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 to 2</td>
<td></td>
</tr>
<tr>
<td>2-1/2 and 3</td>
<td></td>
</tr>
<tr>
<td>4 and 5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>8, 10 and 12</td>
<td></td>
</tr>
</tbody>
</table>

4. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.

5. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

6. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.

7. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

D. Size hanger rods in accordance with the following:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (Inches)</th>
<th>SINGLE ROD HANGER SIZE (Inches)</th>
<th>DOUBLE ROD HANGER SIZE (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PIPE</td>
<td>TUBING</td>
</tr>
<tr>
<td>1/2 to 2</td>
<td>3/8</td>
<td>1/4</td>
</tr>
<tr>
<td>2-1/2 and 3</td>
<td>1/2</td>
<td>3/8</td>
</tr>
<tr>
<td>4 and 5</td>
<td>5/8</td>
<td>1/2</td>
</tr>
<tr>
<td>6</td>
<td>3/4</td>
<td>1/2</td>
</tr>
<tr>
<td>8, 10 and 12</td>
<td>7/8</td>
<td>5/8</td>
</tr>
</tbody>
</table>
E. Vertical Piping:
   1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.

   2. Install intermediate supports between riser clamps on maximum 6 foot centers, for copper tubing risers 1-1/4" in size and smaller, installed in unfinished rooms or spaces other than mechanical equipment machine or steam service rooms, or penthouse mechanical equipment rooms.

3.03 UPPER HANGER ATTACHMENTS

A. General:
   1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
   2. Do not attach hangers to steel decks that are not to receive concrete fill.
   3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
   4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for uses as intermediate supports based on a minimum safety factor of five.
   1. Do not use drive-on beam clamps.
   2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
   3. Do not drill holes in main structural steel members.
   4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer’s recommended limits.

C. Attachment to Concrete Filled Steel Decks:
   1. New Construction: Install metal deck ceiling bolts.
   2. Existing Construction: Install welding studs (except at
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roof decks). Do not support a load in excess of 250 lbs from any single welded stud.

3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.

E. Attachment to Existing Cast-In-Place Concrete:
1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.
2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.

F. Attachment to Cored Precast Concrete Decks (Flexicore, Dox Plank, Spancrete, etc.): Toggle bolts may be installed in cells for the support of piping up to a maximum of 2-1/2 inches in size.

J. Attachment to Wood Construction: Secure hangers to the sides (only) of wood members, by means of malleable iron side beam connectors, or malleable iron or steel side beam brackets. Do not secure hanger attachments to nailing strips resting on top of steel beams.

1. Secure side beam connectors to wood members with two No. 18 x 1-1/2 inch long wood screws, or two No. 16 x 1-1/2 inch long drive screws.
Do not support piping over 1-1/2 inches in size from side beam connectors. Do not hammer in wood screws.

2. Secure side beam brackets to wood members with steel bolts or lag screws. Do not use lag screws in wooden members having a nominal thickness (beam face) under 2 inches in size. Install bolts or lag screws in the sides of a timber or a joist, at the mid-point or above, not less than 2-1/2 inches from the lower edge when supporting branch lines and not less than 3 inches from the lower edge when supporting mains. Install heavy gage steel washers under all nuts.

3. Secure side beam brackets to wooden beams or joists, with lag screws or bolts of size as follows:

<table>
<thead>
<tr>
<th>PIPE SIZE (Inches)</th>
<th>LAG SCREW SIZE (Inches)</th>
<th>BOLT DIAMETER (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 and under</td>
<td>3/8 diameter x 1-3/4</td>
<td>3/8</td>
</tr>
<tr>
<td>2-1/2 and 3</td>
<td>1/2 diameter x 2</td>
<td>1/2</td>
</tr>
<tr>
<td>4 and 5</td>
<td>Use Bolt</td>
<td>5/8</td>
</tr>
</tbody>
</table>
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a. Do not support piping larger than 3 inches with lag screws. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.

b. The minimum width of the lower face of wood beams or joints in which lag screws of size as specified may be used is as follows:

<table>
<thead>
<tr>
<th>LAG SCREW DIAMETER (Inches)</th>
<th>NOMINAL WIDTH OF BEAM FACE (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>2</td>
</tr>
<tr>
<td>1/2</td>
<td>3</td>
</tr>
</tbody>
</table>

4. Do not secure hanger attachment to the diagonals or vertical members of the trusses.

3.04 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS AND SWAY BRACES

A. Install pipe anchors, restraints and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner that will not affect the structural integrity of the building.

B. In grooved end piping systems, install restraints, and rigid supports as recommended by the manufacturer of the grooved end fittings to ensure proper support and alignment of the piping under operating and testing pressures (maximum hanger or support spacing shall be as previously specified).

1. Horizontal piping shall maintain a constant pitch without sags, humps, or lateral deflections. Branch piping shall remain perpendicular to main piping and/or risers.

2. Vertical piping shall remain plumb without deflections.

3. Vertical piping shall be rigidly supported, or anchored at both top and bottom, and wherever necessary to prevent movement and/or shearing forces at branch connections.

3.05 PIPING IN TUNNELS: NOT USED

3.06 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPORBARRIER JACKETED HIGH DENSITY INSULATING SADDLES: NOT USED
3.07 PIPE INSULATION SHIELDS: NOT USED

3.08 PIPE COVERING PROTECTION SADDLES: NOT USED

3.09 FIBROUS GLASS REINFORCED PLASTIC PIPE (FRP) SUPPORTS

A. Provide inserts between supports and FRP as detailed.

3.10 VIBRATION ISOLATION FOR PIPING

A. Install vibration isolation in accordance with the manufacturer’s printed installation instructions, unless otherwise specified.

B. Piping: The isolator deflections shall be equal to or greater than the static deflection of the vibration isolators provided for the connected machinery as follows:

1. Piping Connected to Vibration Isolated HVAC Equipment: For a distance of 50 feet or 50 pipe diameters, whichever is greater.
2. Condenser Water: For the full length of the piping.
3. Chilled and Hot Temperature Piping: For risers from pumps and for the first 20 feet of the branch connection of the main supply and return piping at each floor.
4. Water Distribution Piping Application: Resiliently support piping with combination rubber and spring isolation hangers.
   a. Provide spring elements with 5/8-inch static deflection; install the hanger with spacing so that the first harmonic natural frequency is not less than 360 Hz. Provide double-deflection neoprene elements.
   b. For the first two isolation hangers from the rotating equipment of 3-1/2 inch and smaller piping systems, ensure a deflection equal to the equipment-isolation static deflection.
   c. For the first four piping isolation hanger supports from rotating equipment of 4-inch and larger piping systems, use resilient hanger-rod isolators at a fixed elevation regardless of load changes. Incorporate an adjustable preloading device to transfer the load to the spring element within the hanger mounting after the piping system has been filled with water.
   d. Horizontal Piping Runs Within Mechanical
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Equipment, Steam Service, Machine and Penthouse Mechanical Equipment Rooms:
Provide combination rubber and spring type isolators, designed for insertion of a split hanger rod, for the following:

1. Chilled water supply and return;
2. Condenser water supply and return;
3. Heating hot water supply and return;
4. Primary and secondary supply and return water;
5. Steam and condensate piping.

3.11 SEISMIC RESTRAINT SYSTEMS FOR PIPING: NOT USED

END OF SECTION 230529
SECTION

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VIBRATION

ISOLATION

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Vibration Isolation for Ductwork: Section 233133.

1.02 DEFINITIONS

A. Ground Floor: Floor or floor slab of building resting directly on earth.

1.03 SUBMITTALS

A. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.

B. Shop Drawings:
   1. Details of intermediate structural steel members and method of attachment required for installation of vibration isolating devices.
   2. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, and selection of seismic restraints.
   3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Product Data:
   1. Catalog sheets, specifications, and installation instructions.
   2. Vibration isolator schedule showing usage.
2.01 MANUFACTURERS/COMPANIES

A. Amber-Booth Co.
B. Korfund Dynamics Corp.
C. Mason Industries Inc.
D. Vibration Eliminator Co., Inc.
E. Vibration Mountings and Controls, Inc.

2.03 STEEL SPRING ISOLATORS

A. Types:
   1. Housed Springs: Provide units with telescoping cast iron or steel housings, containing one or more springs, complete with resilient alignment inserts and a minimum 1/4 inch thick rubber or neoprene sound deadening pad bonded to the base of housing.

B. Construction Features Required:
   1. Provide limit stops for spring isolators with deflections of 2 inch or more so as to prevent undue motion during start and stop, but unrestrained movement during normal operation.
   2. Hot dip galvanize all steel parts of isolators for outdoor use, with the exception of springs.
   3. Cadmium plate or neoprene coat springs.
   4. Do not use isolator leveling bolts for jacking screws.

2.06 VIBRATION ISOLATION BASES

A. Type: Factory fabricated welded structural steel (ASTM A36) bases and rails with the following:
   1. Support brackets to anchor base to vibration isolation.
   2. Pre-located equipment anchor bolts.
   3. Auxiliary motor slide bases or rails.
   4. Steel angles welded to frame for outrigger isolation mountings.
   5. Factory Finish: Corrosive resistant finish.

B. Design bases to result in lowest possible mounting height with not less than one inch clearance above housekeeping pad or floor.
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C. Configure bases to accommodate supported equipment.
   1. Provide bases for isolating pumps of physical size and shape as required to accommodate base elbow supports. Provide mounting templates.

2.07 COMBINATION RUBBER AND SPRING ISOLATORS: NOT USED

2.08 PAD TYPE ISOLATORS

A. Provide neoprene or rubber mountings, corrugated or waffle faced both sides, single or double layered or laminated, or size and thickness as specified for the particular equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Jack equipment bases or inertia bases into position and block or wedge before springs are loaded. After equipment is bolted in place and springs are loaded, by means of the leveling bolts, remove the temporary blocking or wedging.

B. Housekeeping Pads:
   1. Coordinate size and location of pads with the Work of related contracts.
   2. Coordinate housekeeping pads with restraint manufacturer to provide minimum edge distance of 10 bolt diameters around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings.
      a. If cast-in anchors are being used, size housekeeping pads in accordance with ACI requirements for bolt coverage and embedment.

C. Vibration Isolation Bases:
   1. Coordinate size and location of bases with the Work of related contracts.

3.02 APPLICATION

A. Provide vibration isolators or vibration isolation bases for mechanical equipment, piping and high velocity ductwork of type as specified.

B. Select isolation devices for uniform static deflection, in accordance with the distribution of weight and forces.
   1. Whenever rotational speed is the cause of disturbing frequency, utilize the lowest operating speed of the
SECTION 230550 – VIBRATION ISOLATION

1. Selection shall result in uniform loading and deflection, even when equipment weight is not evenly distributed.

2. Select springs for a total deflection greater than the selected static deflection, to provide an adequate safety factor.

C. Isolate floor mounted fan units, air handling units and self-contained air conditioning units, (with the exception of utility sets, fan units with wheels less than 27 inches and all equipment mounted on the ground floor), to obtain the following efficiencies:

<table>
<thead>
<tr>
<th>RPM</th>
<th>MINIMUM DEFLECTION</th>
<th>EFFICIENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 325</td>
<td>3.5</td>
<td>80</td>
</tr>
<tr>
<td>326 to 525</td>
<td>2.0</td>
<td>80-90*</td>
</tr>
<tr>
<td>526 to 575</td>
<td>1.5</td>
<td>90</td>
</tr>
<tr>
<td>576 to 1000</td>
<td>1.25</td>
<td>90-95*</td>
</tr>
<tr>
<td>1001 to 1200</td>
<td>.75</td>
<td>95</td>
</tr>
<tr>
<td>1201 and over</td>
<td>.50</td>
<td>95</td>
</tr>
</tbody>
</table>

*Lower efficiency at lowest RPM - higher efficiency at highest RPM.

3.03 VIBRATION ISOLATION SCHEDULE

A. Fans:

1. Equip fans and air handling units, located above the ground floor and not indicated to be provided with a concrete inertia block or be ceiling mounted or suspended with vibration elimination equipment as follows:

   a. Provide an integral structural steel base with a common steel member running the full length of the fan and motor, with built-in motor slide rails, so as to form a common support for fan unit and motor, with spring type isolators, unless otherwise indicated.

   b. Provide spring unit isolators, or steel rail type isolator bases with spring type isolators, for floor mounted units with motors mounted on the casings or frames.

2. Equip fans and handling units located on the ground floor, with the exception of medium or high pressure units not specified to be provided with a concrete inertia block, or be ceiling mounted or suspended, with unit isolators or steel rail type isolator bases.

3. Ceiling Suspended Fans and Air Handling Units:
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Provide combination rubber and spring type isolators, designed for insertion in a split hanger rod. Provide isolators with an efficiency as specified under the paragraph entitled “APPLICATION” of this Section, with no deflection greater than 1-1/2 inches required.

F. Remote Installed Refrigerant Compressor Units, Self Contained Belt Driven or Direct Driven Condensing Units and Floor Mounted Product Coolers: Provide steel rail type bases with built-in, metal housed, rubber-in-shear unit isolators, permanently fixed in place and provided with adjustable snubber devices. Provide rail bases on Ground Floor designed for 1/4 inch static deflection and above Ground Floor 1/2 inch static deflection.

3.03 FIELD QUALITY CONTROL

A. Provide equipment and apparatus required for performing inspections and tests.
   1. Notify Director’s Representative a minimum of 14 days prior to equipment sound, vibration, and seismic testing.
   2. Rebalance, adjust, or replace equipment with noise or vibration levels in excess of those given in the equipment specifications, or equipment manufacturer's data.

B. Field Inspections:
   1. Prior to initial operation, inspect the vibration isolators and seismic snubbers for conformance to drawings, specifications, and manufacturer's data and instructions.
      a. Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls.
      b. Check connector alignment before and after filling of system and during operation.
      c. Correct misalignment without damage to connector and in accordance with manufacturer's recommendations.

C. Spring Isolator Inspection
   1. After installation of spring isolators or protected spring isolators, and seismic restraint devices, the equipment shall rock freely on its spring isolators within limits of stops or seismic restraint devices. Eliminate or correct any interferences.
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D. Tests
1. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels.
2. Equipment Vibration Tests
   a. Perform vibration tests to determine conformance with vibration isolation schedule specified.

END OF SECTION 230550
SECTION 230553

PIPE AND VALVE IDENTIFICATION

PART 1 GENERAL

1.01 REFERENCES

1.02 SUBMITTALS
A. Product Data: Catalog sheets, specifications and installation instructions for each item specified.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS
A. W.H. Brady Co., Milwaukee, WI.
B. Emco, Buffalo, NY.
C. Panduit Corp., Tinley Park, IL.
D. Seton Nameplate Corp., New Haven, CT.

2.02 PIPE MARKERS AND ACCESSORIES
A. Snap-on Marker: One piece wrap around type constructed of precoiled acrylicplastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, 3/4 inch adhesive strip on inside edge, and 360 degree visibility.
B. Strap-On Marker: Strip type constructed of precoiled acrylic plastic with clearpolyester coating, integral flow arrows, legend printed in alternating directions, factory applied grommets, and pair of stainless steel spring fasteners.
C. Stick-On Marker: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, and integral flow arrows for applications where flowarrow banding tape is not being used.
Pipe Marker Legend and Color Field Sizes:

<table>
<thead>
<tr>
<th>OUTSIDE DIAMETER OF PIPE OR INSULATION (Inches)</th>
<th>LETTER SIZE (Inches)</th>
<th>LENGTH OF COLOR FIELD (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 to 1-1/4</td>
<td>1/2</td>
<td>8</td>
</tr>
<tr>
<td>1-1/2 to 2</td>
<td>3/4</td>
<td>8</td>
</tr>
<tr>
<td>2-1/2 to 6</td>
<td>1-1/4</td>
<td>12</td>
</tr>
</tbody>
</table>

A. Banding Tapes: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating.
   1. Plain Tape: Unprinted type; color to match pipe marker background.
   2. Flow Arrow Tape: Printed type with integral flow arrows; color match pipe marker background.

B. Pipe Size Labels: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, vertical reading pipe size in inches, and legend size matching adjacent pipe marker.

2.02 PIPE SERVICE IDENTIFICATION TAGS

A. Type: No. 19 B & S gage brass, with 1/4 inch high pipe service abbreviated legend on one line, over 1/2 inch high pipe size legend in inches, both deep stamped and black filled; and 3/16 inch top hole for fastener.

B. Size: 2 inch square tag.

C. Fasteners: Brass “S” hook or brass jack chain of size as required for pipe to which tag is attached.

2.03 VALVE SERVICE IDENTIFICATION TAGS

A. Type: No. 19 B & S gage brass, with 1/4 inch high valve service abbreviated lettering on one line over 1/2 inch high valve service chart number, both deep stamped and black filled; and with 3/16 inch top hole for fastener.

B. Sizes:
   1. HVAC Use: 1-1/2 inch dia round.

C. Fasteners: Brass “S” hook or brass jack chain of size as required for valve stem handle to which tag is attached.

2.04 VALVE SERVICE IDENTIFICATION CHART FRAMES

A. Type: Satin finished extruded aluminum frame with rigid clear
PART 3 EXECUTION

3.01 PREPARATION

A. Complete testing, insulation and finish painting work prior to completing the Work of this Section.

B. Clean pipe surfaces with cleaning solvents prior to installing piping identification.

C. Remove dust from insulation surfaces with clean cloths prior to installing piping identification.

3.02 INSTALLATION

A. Install the Work of this Section in accordance with the manufacturer’s printed installation instructions, unless otherwise specified.

B. Stick-On Pipe Markers:
   1. Install minimum of 2 markers at each specified location, 90 degrees apart on visible side of pipe.
   2. Encircle ends of pipe markers around pipe or insulation with banding tape with one inch lap. Use plain banding tape on markers with integral flow arrows, and flow arrow banding tape on markers without integral flow arrows.

C. Pipe Size Labels: Install labels adjacent to each pipe marker and upstream from flow arrow. Install a minimum of 2 pipe size labels at each specified location, 90 degrees apart on visible side of pipe.

D. Pipe Service Identification Tags: Attach tags to piping being identified with “S” hooks or jack chains.

3.03 PIPING IDENTIFICATION SCHEDULE

A. Piping Identification Types:
   1. Piping or Insulation under 3/4 inch od: Pipe identification tags.
   2. Piping or Insulation 3/4 inch to 5-7/8 inch od: Snap-on marker or stick-on marker.
   3. Piping or Insulation 6 inch od and Larger: Strap-on marker or stick-on marker.

B. Locate piping identification to be visible from exposed points of observation.
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1. Locate piping identification at valve locations; at points where piping enters and leaves a partition, wall, floor or ceiling, and at intervals of 20 feet on straight runs.

2. Where 2 or more pipes run in parallel, place printed legend and other markers in same relative location.

3.04 VALVE IDENTIFICATION SCHEDULE

A. Valve Service Identification Tags:
   1. Tag control valves, except valves at equipment, with a brass tag fastened to the valve handle or stem, marked to indicate service and numbered in sequence for the following applications:
      a. Domestic water valves controlling mains, risers and branch runouts.
      c. Valves in heating, ventilating, air conditioning and refrigeration systems.

B. Valve Service Identification Charts:
   1. Provide 2 framed valve charts for each piping system specified to be provided with valve identification tags. Type charts on 8-1/2 x 11 inches heavy white bond paper, indicating valve number, service and location.
   2. Hang framed charts at locations as directed.

END OF SECTION 230553
SECTION 232000 HVAC PIPING

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

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

1.02 SUBMITTALS

A. Product Data:
   1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
   2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.

B. Quality Control Submittals:
   1. Installers Qualification Data:
      a. Welder Qualification Data: Copies of certification; include names, home addresses.
      b. Welding Procedures:
         1) Copy of QW-482 “Suggested Format for Welding Procedure Specification (WPS)” for all welders for all weld types.
         2) Copy of QW-483 “Suggested Format for Procedure Qualification Record (PQR)” as specified in Welding Quality Assurance below for all weld types.
      c. Welders’ Certificates:
         1) Copy of QW-484 “Suggested Format for Manufacturer’s Record of Welder or Welding Operator Qualification Tests (WPQ)” for all welders for all weld types.
      d. Brazer Qualification Data for Refrigerant Piping: State refrigerant piping brazing experience; include names, home addresses and social security numbers of brazers.
   2. Quality Control Submittals (for Hydraulic Press Joints, if used): Copy
of hydraulic press fitting manufacturer’s printed field inspection procedures for hydraulic press joints in copper tubing.

3. Welding Procedure Submittals: Submit the following:
   a. Welding Procedure Specifications: Provide for each weld type.
      1) Recommended to use ASME Form E00006, QW-482 “Suggested Format for Welding Procedure Specification (WPS)”.
   b. Procedure Qualification Records: Provide for each weld type.
      1) Recommended to use ASME Form E00007, QW-483 “Suggested Format for Procedure Qualification Record (PQR)”.

5. Contract Closeout Submittals:
   a. Copy of Final Hydrostatic Testing Record Log.

1.03 QUALITY ASSURANCE

A. Qualifications of Welding Procedures, Welders and Welding Operators: Comply with the following:

B. Welding Procedures:
   1. Record in detail, and qualify the Welding Procedure Specifications for every welding procedure that is proposed to be used for the Project.
   2. Develop procedures for all metals included in the work.
   3. Qualify the procedures for making transition welds between different materials, or between plates or pipes of different wall thickness.
   4. Qualification for each welding procedure shall conform to the requirements of ASME B31.1, and as specified herein.
   5. Describe the method for each system including the number of beads, the volts, the amperes, and the welding rod for various pipe thicknesses and materials.
   6. The welding procedures shall specify end preparation for butt welds including cleaning, alignment, and root openings.
   7. Preheat, interpass temperature control, and postheat treatment of welds shall be as required by approved welding procedures, unless otherwise indicated or specified.
   8. Approval of any procedure does not relieve the Contractor of the sole responsibility for producing acceptable welds.
   9. Welding procedures shall be identified individually and shall be clearly referenced to the type of welding required for this project.
  10. These procedures shall be the same as those used for all pipe welder qualification tests, all shop welds, and all field welds.
  11. Provide procedure qualification records for all proposed Welding Procedure Specifications (WPS).

C. Welder Qualification:
   1. WPQs:
      a. Provide welder qualifications for each welder for each weld type.
2. Perform WPQs under the witness of an independent agency.
   a. The witness shall be a representative of an independent testing agency, Authorized Inspector, or consultant, any of which must be approved by the National Certified Pipe Welding Bureau.
   b. The qualifying test segment must be a 2 inch nominal pipe size with wall thickness within range of the WPS.
   c. Tests position shall be “6G” per ASME Section IX.

3. Evidence of Continuity: Welder qualifications must be current.
   a. If the qualification test is more than 6 months old, provide record of welding continuity for each welder.
   b. Record of welding continuity shall show that the welder in question has performed welding to the procedure in question without a 6 month continuous span of inactivity since the date that the welder qualification test was passed for the submitted welding procedure.
   c. Record of welding continuity shall include, at a minimum, the welder’s employer name and address, the date the welder qualification test was passed, and the dates indicating welding continuity including welding procedure for each date.

D. Weld Records:
1. For all welding within the scope of ASME B31.1, submit for approval an administrative procedure for recording, locating, monitoring, and maintaining the quality of all welds to be performed on the project.
   a. The weld record shall include but not be limited to drawings and schedules identifying location of each weld by individual number, identification of welder who performed each weld by individual welder’s name, stamp number, date and WPS used.

2. After achieving qualification, but before being assigned work, each qualified person shall be assigned an identifying number by the Contractor to be used to identify all of his welds.
   a. A list of qualified persons with their respective numbers shall be submitted and maintained accurately with deletions and additions reported promptly.

3. Upon completing a joint, the welder shall mark the pipe not more than 6 inches from the weld with the identifying number and the last two digits of the year in which the work was performed.
   a. Make identification marks with a rubber stamp or felt-tipped marker with permanent, weatherproof ink or other methods approved by the Director’s Representative that do not deform the metal.
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b. Place identification marks for seam welds adjacent to the welds at 3-foot intervals.

c. Identification by die stamps or electric etchers is not acceptable.

d. Provide required markers. Substitution of a map of welds with welders’ names is not acceptable.

4. Maintain a constantly updated log available to the Director’s Representative at all times.

E. Qualifications of Brazers: Comply with the following:

1. Certification of brazing operators by recognized authorities which require a qualification test.

2. Refrigerant Piping: The persons performing the brazing and their Supervisors shall be personally experienced in refrigerant piping brazing procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Pipe Storage:

1. Upon the receipt of each shipment of pipe on the job, maintain the pipe marking, and store pipe in accordance with ASTM material specifications, and method of manufacture (seamless, etc.) of each length of pipe.

2. Pipe markings shall be clearly readable at the time of pipe installation.

3. If at the time of its installation, any length of pipe not readily identifiable will be subject to rejection, or arbitrary downgrading by the Director’s Representative to the lowest grade which has been received on the job to that date.

4. Provide factory-applied plastic end-caps on each length of pipe and tube, except for concrete, corrugated metal, bell and-spiogt, and clay pipe.

a. Maintain end-caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

PART 2 PRODUCTS

2.01 STEEL PIPE AND FITTINGS

2.02 COPPER AND BRASS PIPE, TUBING AND FITTINGS

A. ACR Tube: ASTM B 280.

B. Wrot Copper Tube Fittings, Solder Joint: ASME B16.22.

C. Cast Copper Alloy Tube Fittings, Solder Joint: ASME B16.18.
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G. Flared Tube Fittings:
   1. Refrigerant Tube Type: SAE J513.

H. Flanges: Conform to the Standards for fittings used in systems.
I. Unions: Cast bronze, 150 lb Class, bronze to bronze seats, threaded or solderjoint.

2.03 HYDRAULIC PRESS FITTINGS FOR COPPER TUBING

A. Acceptable Fittings:

B. Operating Conditions:
   1. Maximum Operating Pressure: 200 psi.
   2. Operating Temperature Range: 0-250 degrees F.
   3. Maximum Test Pressure: 600 psi.
   4. Maximum Vacuum: 29.2 inches hg @ 68 degrees F.

C. Features:
   1. Fittings: Copper and copper alloy conforming to material requirements of ASME B16.18 or ASME B16.22.
      a. Stainless Steel Grip Ring: Adds strength to the joint without collapsing the interior passageway.
   2. No flame for soldering required for installation of fittings and valves.
   3. Unpressed connections identified during pressure testing when water flows past sealing element.
   4. Sealing Elements: Factory installed, EPDM.
   5. Fittings that have been pressed can be rotated. If rotated more than 5 degrees, the fitting must be repressed to restore its resistance to rotational movement.
   6. Extended fitting end lead allows for twice the retention grip surface, and assists with proper tube alignment.
   7. Soldered adapter fittings are not allowed.

2.04 HIGH DENSITY POLYETHYLENE (HDPE) PIPING AND FITTINGS: NOT USED

2.05 COUPLINGS AND FITTINGS FOR GROOVED END PIPE: NOT USED

2.06 FIBERGLASS REINFORCED PLASTIC PIPING (FRP)

A. Condensate Return Applications:
   1. Maximum Operating Conditions: 250 degrees F at 125 psig.
   2. Conforming to ASTM D 2310, Classification RTRP-11; ASTM D 232000 - 5
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2996, Classification RTRP-11, and MIL-P-28584 B.

3. Pipe: Filament wound using continuous glass filaments, epoxy resin, and minimum 0.020 inch reinforced liner; Series 2000 MP by Ameron, or Green Thread CR Series by NOV Fiberglass Systems.

4. Fittings: Filament wound or compression molded bell and spigot epoxy fittings and flanges; as recommended and furnished by the pipe manufacturer for the intended service; Series 2000 MP by Ameron, or Green Thread CR Series by NOV Fiberglass Systems.

5. Epoxy Adhesive: As recommended and furnished by the pipe and fitting manufacturer for the intended service.

2.07 JOINING AND SEALANT MATERIALS

A. Thread Sealant:
1. LA-CO Industries’, Slic-Tite Paste with Teflon.
2. Loctite Corp.’s No. 565 Thread Sealant.
3. Thread sealants for potable water shall be NSF approved.

B. Solder: Solid wire type conforming to the following:
1. Type 2: Lead-free tin-silver solder (ASTM B 32 Alloy Grade Sn 96); All-State Welding Products Inc.’s 430, Engelhard Corp.’s Silvabrite, or J.W. Harris Co. Inc.’s Stay-Brite.


D. Brazing Alloys:
1. Type 1: AWS A5.8, Class BCuP-5, for brazing copper to brass, bronze, or copper; Engelhard’s Silvaloy 15, J.W. Harris Co. Inc.’s Stay-Silv 15, and Handy & Harman’s Sil-Fos.
2. Type 2: AWS A5.8, Class BAg-7, for brazing copper to steel or stainless steel; Engelhard’s Silvaloy-56T, J.W. Harris Co. Inc.’s Safety-Silv 56, and Handy & Harman’s Braze 560.

G. Brazing Flux: AWS Type FB3A; Handy & Harman’s Handy Flux or J.W. HarrisCo. Inc.’s Stay-Silv.

H. Electrodes and Welding Rods:
1. Electrodes for Use in Arc Welding: Heavily coated, not larger than 3/16 inch diameter exclusive of coating, unless otherwise approved.
2. Welding Rods: Free flowing when fused, so as to avoid excessive puddling.
3. Electrodes for Welding Stainless Steels: Coated and used with reverse polarity.
4. Filler material shall conform to the appropriate AWS-ASTM specification.

I. Flange Gasket Material:
1. For Use With Cold Water or Chilled Water: 1/16 inch thick rubber.
2. For Use With Hot Water, or Air: Waterproofed non-asbestos mineral or ceramic fiber, or a combination of metal and waterproofed non-asbestos mineral or ceramic fiber, designed for the temperature and pressures of the piping systems in which installed.
3. For use with Steam, Feedwater, Blow-Off and Natural Gas: Spirally wound, Type 304 stainless steel with non-asbestos filler material, and carbon steel outer ring.
   a. Maximum Operating Pressure: 600 psi at 700 degrees F.
   b. Thickness: 1/16 thick, conforming to the flange face on which they are used.
   c. Acceptable Gaskets: Flexitallic Style CG with Flexite SuperFiller by Flexitallic Inc., Deer Park, TX; (281) 479-3491.
4. For use with Fuel Oil: Non-asbestos, compressed sheet, nitrile binder.
   a. Maximum Operating Pressure: 600 psi at 700 degrees F.
   b. Thickness: 1/16 thick, conforming to the flange face on which they are used.
   c. Acceptable Manufacturers: Sepco, or Sur-Seal.

J. Flange Bolts, Washers and Nuts
   2. Washers: ASTM F436 Structural Type 1 hardened steel flat hot dipped galvanized.
   3. Nuts: ASTM A194 2H.

K. Gaskets For Use With Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.

L. Anti-Seize Lubricant: Bostik Inc.’s Never Seez or Dow Corning Corp.’s Molykote 1000.

2.08 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS


B. Mechanical Modular Seals: Thunderline Corp.’s Link Seal wall and floor seals designed for the service of piping system in which installed.

2.09 DIELECTRIC CONNECTORS: NOT USED

2.10 PIPE SLEEVES
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A. Type A: Schedule 40 steel pipe.

B. Type B: No. 16 gage galvanized sheet.

C. Type C: Schedule 40 steel pipe with 1/4 inch steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

D. Type D: No. 16 gage galvanized sheet steel with 16 gage sheet metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

2.11 FLOOR, WALL AND CEILING PLATES

A. Cast Brass: Solid type with polished chrome plated finish, and set screw.
   1. Series Z89 by Zurn, 929 Riverside Drive, Grosvenordale, CT 06255,(800) 243-1830.
   2. Model 127XXXX by Maguire Mfg., Cheshire CT 06410, (203) 699-

B. Stamped Steel: Split type, polished chrome plated finish, with set screw.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install piping at approximate locations indicated, and at maximum height.

B. Install piping clear of door swings, and above sash heads.

C. Make allowances for expansion and contraction.

D. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.

E. Install vertical piping plumb.

F. Use fittings for offsets and direction changes, except for Type K soft annealed copper tube.

G. Cut pipe and tubing ends square; ream before joining.

   1. Thread brass pipe with special threading dies.
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I. Make final connections to equipment with unions, flanges, or mechanical type joint couplings.

3.02 STEAM PIPING SYSTEMS

A. Install to permit complete drainage.

B. Pitch:
   1. Pitch horizontal steam mains, return mains and branches downward, 1/4 inch per 10 feet in direction of flow.
   2. Pitch steam runouts and connections to risers upward, 3/16 inch per foot in direction of flow.
   3. Pitch return branches and runouts downward, 1/4 inch per 10 feet in direction of flow.

C. Use eccentric reducers flat on bottom in horizontal piping.

D. Install drip legs with traps at low points, ends of mains, bottoms of risers and ahead of pressure regulators and control valves.

E. Size short vertical supply and return connections, from horizontal runouts to radiator traps and valves, same size as trap or valve.

3.03 WATER AND PROPYLENE GLYCOL PIPING SYSTEMS: NOT USED

3.04 NATURAL GAS PIPING SYSTEMS: NOT USED

3.05 LIQUEFIED PETROLEUM GAS PIPING SYSTEMS: NOT USED

3.06 FUEL OIL SYSTEM PIPING: NOT USED

3.07 PIPE JOINT MAKE-UP

A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with the manufacturer’s printed application instructions for the intended service.
   1. Chrome Plated Brass Piping: Tighten joint with strap or Parmalee wrench; do not mar pipe finish. Install piping so that no threads are visible.

B. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type solder specified. Remove residue.

C. Flanged Pipe Joint:
   1. Install threaded companion flanges on steel pipe; flanges on
galvanized pipe are not required to be galvanized.

2. Provide a gasket for each joint.
   a. Hot Water Pipe Gasket: Coat with a thin film of oil before making up joint.
   b. Compressed, Control, and Instrument Air Pipe Gasket: Coat with a thin film of oil before making up joint.

3. Flange Bolt Installation:
   a. Clean and coat nuts, bolt threads and washers with anti-seize lubricant before making up joint.
   b. With each bolt; one hardened steel washer is required under the nut.
   c. With each stud; one hardened steel washer is required under the nut at each end.
   d. Torque Requirements: Stress bolts to 30,000 psi.
   e. Check torque with a calibrated breaking action torque wrench on the final torque round.
   f. Bolts shall be cold and hot torqued.
   g. Torque Pattern: Cross or star pattern with at least four passes. Limit each pass to 30 percent of full torque increases.
   h. Hot torque: Re-torque the flange bolts with the system at normal operating pressure, and operating temperature for a minimum of 12 to 15 hours.

4. Coat bolt threads and nuts with anti-seize lubricant before making up joint.

D. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved endfittings and couplings, in conformance with the manufacturer’s printed installation instructions.
   1. Cut grooved end piping is not acceptable.

E. Welded Pipe Joint:
   1. General:
      a. Weld pipe joints only when ambient temperature is above 0 degree F where possible.
      b. Bevel pipe ends at a 37.5 degree angle where possible, smooth through cuts, and clean to remove slag, metal particles, and dirt.
      c. Use pipe clamps or tack-weld joints with 1 inch long welds; 4 welds for pipe sizes to 10 inches, 8 welds for pipe sizes 12 inches to 20 inches.
      d. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass.
      e. Eliminate valleys at center and edges of each weld.
      f. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes, and non-metallic inclusions.
      g. Do not weld-out piping system imperfections by tack-
welding procedures. Refabricate as required to comply with requirements.

h. If piping component ends are bored, such boring shall not result in the finished wall thickness after welding less than the minimum design thickness.

i. Align the inside diameters of piping components to be butt-welded as accurately as is practicable within existing commercial tolerances on diameters, wall thickness and out of roundness.

j. Preserve alignment during welding. The internal misalignment of the ends to be joined shall not exceed 0.05 inch.

2. Welding Processes:
   a. All welding on metal piping systems shall be performed using qualified welding procedures and qualified welders and welding operators in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.
   b. All welding shall be performed by a process that is compatible with the work being welded and the working conditions. Shielded metal-arc welding (SMAW) shall not be used on work less than 3/16 inch thick.
   c. Welding shall be performed by using only one of the following processes:
      1) Shielded Metal Arc Welding (SMAW), also known as “Stick” Welding.
      2) Gas Tungsten Arc Welding (GTAW), also known as TIG and Heliarc Welding.
      3) Submerged Arc Welding (SAW).
   d. Where a specific welding process is called for in the piping group, it shall govern.
   e. All stainless steel work less than 3/16 inch thick shall be welded by the gas tungsten-arc (GTAW) process with the back side purged with argon. Work thicker than 3/16 inch shall have a root pass by the GTAW Process with the back purged with argon and the balance of the weld may be completed by SMAW Process or any other suitable process.

3. Welding Grooves:
   a. Bevel the ends of steel pipe and fittings to be erected with butt welded joints to form welding grooves in accordance with ANSI B16.25, except where otherwise noted herein, or on the Contract Drawings.
   b. Bevel welding grooves for butt welded joints in pipe of unequal wall thickness in accordance with ASME Code for Pressure Piping B31.1 - latest edition, latest revision and section that is applicable.

4. Backing Rings: Backing rings or consumable inserts are not acceptable.

5. Cleaning of Welding: Completely remove all slag or flux remaining on the bead of welding before laying down the next successive bead.
and at the completion of the weld.

a. Wire brush all completed welds a minimum of 2 inches on both sides and coated with one coat of high temperature (minimum rated 500 deg. F) primer prior to being insulated.

6. Preheating of Welded Joints: Pipe adjacent to joints before and during welding shall be preheated by any suitable method in accordance with the qualified welding procedure, and in all cases shall be in accordance with ASME B31.1, Paragraph 131.

7. Weld Quality:

a. All welds shall have full penetration and complete fusion with a minimum of weld metal protruding on the inside of the pipe.

b. The finished weld contour shall be uniform, with the toe or edge of the weld merging smoothly into the base material.

c. Butt welds shall have a slight reinforcement build-up gradually from the toe or edge toward the center of the weld.

d. The limitation on butt weld reinforcement shall be in accordance with ASME B31.1, Table 127.4.2 and shall apply separately to both inside and outside surfaces of the joint.

e. Fillet welds may be slightly concave on the furnished surface.

8. Identification of Welders:

a. Upon completing a joint, the welder shall mark the pipe not more than 6 inches from the weld with the identifying number and the last two digits of the year in which the work was performed.

b. Make Identification marks with a rubber stamp or felt-tipped marker with permanent, weatherproof ink or other methods approved by the Director’s Representative that do not deform the metal.

c. Place identification marks for seam welds adjacent to the welds at 3-foot intervals.

d. Identification by die stamps or electric etchers is not acceptable.

e. Provide required markers. Substitution of a map of welders’ names is not acceptable.

9. Postheat Treatment of Welded Joints In Carbon and Ferritic Alloy Steel Pipe:

a. Postheat treatment of welded joints in carbon and ferritic alloy steel piping shall be in accordance with ASME B31.1, as specified in the piping group, or on the Contract Drawings, except the cooling rate for stress relieving shall not exceed 200 degrees F per hour down to 600 degrees F.

1) In each case, the temperature given is a minimum and where a higher temperature is called for in the welding procedure, the welding procedure shall govern.

b. Perform stress relieving by one of the following methods:
1) Electrical resistance or induction coil heating is the preferred method for field use.
   a) Record the temperature by pyrometer from the start of the heating operation until 600 degrees F. is reached during cooling.

1) The gas, natural or liquid petroleum, torch stress relieving procedure may be used only where approved by Director’s Representative.
   a) Maintain temperature record from the start of the heating operation until 600 degrees F. is reached during cooling.
   b) Place two measuring thermocouples 180 degrees apart at the centerline of the weld and two measuring thermocouples each placed 90 degrees away from the centerline thermocouples at a distance from the centerline of the weld equal to three times the wall thickness.

3 Furnace postheat treatment may be employed when desirable to treat several welded or formed assemblies simultaneously.
   a) Temperature range, heating conditions, holding time, and cooling conditions shall be as outlined above but shall satisfy the requirements for the thickest section, etc. of the load.
   b) When this method is used, adequately support pipe and pipe assemblies to minimize distortion.

10. Socket Welding Joints:
   a. Where socket welding valves or fittings are used, space pipe with a minimum of 1/16 inch clearance between the end of the pipe and the socket so that no stresses will be imparted to the weld due to “bottoming” of the pipe in the socket.
   b. The fit between the socket and the pipe shall conform to applicable standards for socket weld fittings and in no case shall the inside diameter of the socket exceed the outside diameter of the pipe by more than 0.075 inches.

F. Brazed Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to brazing temperature, and join the metals with brazing alloy. Remove residue.
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G. Refrigerant Pipe Joint:
1. Hard Drawn Tubing, Brazed Joint: Make up joint with appropriate type of brazing alloy. Sweep piping interior with dry nitrogen at a rate of 1 to 3 cfm during brazing operation. Hard Drawn Tubing, Soldered Joint: Solder joints with Type 2 solder at valves, controls, and other locations where brazing temperatures could cause damage.
2. Soft Annealed Tubing Joint: Make up joints with refrigerant tube type flared fittings. Do not bend tubing at a radius less than 5 times the tubediameter.

3.08 PIPING PENETRATIONS
A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall, floor, or roof construction:

<table>
<thead>
<tr>
<th>CONSTRUCTION</th>
<th>SLEEVE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frame construction.</td>
<td>None Required</td>
</tr>
<tr>
<td>2. Foundation walls.</td>
<td>A*</td>
</tr>
<tr>
<td>3. Non-waterproof interior walls.</td>
<td>B*</td>
</tr>
<tr>
<td>4. Non-waterproof interior floors on metal decks.</td>
<td>D*</td>
</tr>
<tr>
<td>5. Non-waterproof interior floors not on metal decks.</td>
<td>B*</td>
</tr>
<tr>
<td>6. Floors not on grade having a floor drain.</td>
<td>A</td>
</tr>
<tr>
<td>7. Floors over mechanical equipment, steam service, machine, and boiler rooms.</td>
<td>A</td>
</tr>
<tr>
<td>8. Floors finished or to be finished with latex composition or terrazzo, and on metal decks.</td>
<td>D*</td>
</tr>
<tr>
<td>9. Floors finished or to be finished with latex composition or terrazzo, and not on metal decks.</td>
<td>A</td>
</tr>
<tr>
<td>10. Earth supported concrete floors.</td>
<td>None Required</td>
</tr>
<tr>
<td>11. Exterior concrete slabs on grade.</td>
<td>A</td>
</tr>
<tr>
<td>12. Fixtures with floor outlet waste piping.</td>
<td>None Required</td>
</tr>
<tr>
<td>13. Metal roof decks.</td>
<td>C</td>
</tr>
<tr>
<td>14. Non-metal roof decks.</td>
<td>A</td>
</tr>
<tr>
<td>15. Waterproof floors on metal decks.</td>
<td>D</td>
</tr>
<tr>
<td>16. Waterproof floors not on metal decks.</td>
<td>A</td>
</tr>
<tr>
<td>17. Waterproof walls.</td>
<td>A</td>
</tr>
</tbody>
</table>

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

B. Diameter of Sleeves and Core Drilled Holes:

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NY Rising – Governor’s Office of Storm Recovery
GOSR Work Order Number: NTF-1-DES
Edgewater Park Volunteer Fire Department — Storm Hardening and Abatement

SECTION 232000 – HVAC PIPING

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.

2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
   a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.
   b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of insulation, unless otherwise specified.
   c. Mechanical Modular Seals: Size holes in accordance with the manufacturer’s recommendations.

C. Length of Sleeves (except as shown otherwise on Drawings):
   1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
   2. Floors, Finished: Equal in length to total finished thickness of floor and extending 1/2 inch above the finished floor level, except as follows:
      a. In furred spaces at exterior walls, extend sleeve one inch above the finished floor level.
   3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2 inch above the concrete slab.
   4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

D. Packing of Sleeves and Core Drilled Holes:
   1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 - FIRESTOPPING.
   2. Pack sleeves in exterior walls or waterproofed walls above inside earth or finished floors with oakum to within 1/2 inch of each wall face, and finish both sides with sealant. See Section 079200.
      a. Sealant Types:
         1) Piping Conveying Materials up to 140 degrees F other than Fuel Oil System Piping: Type 1C (one part).
         2) Piping Conveying Materials over 140 degrees F: Type 4.
         3) Fuel Oil System Piping: Type 1C (2 part).
      b. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
   3. Pack sleeves in exterior concrete slabs with oakum to full depth, and within 1/2 inch of top of sleeve and finish the remainder with sealant. See Section 079200.
      a. Sealant Types:
         1) Piping Conveying Materials up to 140 degrees F
SECTION 232000 – HVAC PIPING

other than Fuel Oil System Piping: Type 1C (one part).

2) Piping Conveying Materials over 140 degrees F: Type 3
3) Fuel Oil System Piping: Type 1C (2 part).

b. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.

3.09 FLOOR, WALL AND CEILING PLATES

A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:

1. In Finished Spaces:
   a. Piping 4 Inch Size and Smaller: Solid or split, chrome plated cast brass.

2. Unfinished Spaces (Including Exterior Concrete Slabs): Solid, unplated cast iron.

3. Fasten plates with set screws.

4. Plates are not required in pipe shafts or furred spaces.

3.10 PIPE AND FITTING SCHEDULE

A. Abbreviations: The following abbreviations are applicable to the Pipe and Fitting Schedule:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>Black steel.</td>
</tr>
<tr>
<td>CI</td>
<td>Cast iron.</td>
</tr>
<tr>
<td>FRP</td>
<td>Fibrous glass reinforced plastic piping.</td>
</tr>
<tr>
<td>GE</td>
<td>Grooved end.</td>
</tr>
<tr>
<td>GGE</td>
<td>Galvanized grooved end.</td>
</tr>
<tr>
<td>GMI</td>
<td>Galvanized malleable iron.</td>
</tr>
<tr>
<td>GS</td>
<td>Galvanized steel.</td>
</tr>
<tr>
<td>HDPE</td>
<td>High density polyethylene pipe.</td>
</tr>
<tr>
<td>MI</td>
<td>Malleable iron.</td>
</tr>
<tr>
<td>PE</td>
<td>Polyethylene pipe.</td>
</tr>
<tr>
<td>SE</td>
<td>Screwed end.</td>
</tr>
<tr>
<td>ST</td>
<td>Steel.</td>
</tr>
<tr>
<td>SW</td>
<td>Standard weight.</td>
</tr>
<tr>
<td>WE</td>
<td>Weld end.</td>
</tr>
<tr>
<td>XH</td>
<td>Extra heavy weight.</td>
</tr>
</tbody>
</table>

B. Where options are given, choose only one option for each piping service. No deviations from selected option will be allowed.

C. Schedule of Pipe and Fittings for the different piping services is as follows:

1. Condensate Returns (LPR, MPR and Pumped Returns) 125 psig and less:
   a. 1-1/2 inch and less: XH BS pipe, with SE XH CI fittings, or WEXH ST
fittings. Condensate Returns (LPR, MPR and Pumped Returns) 125 psig and less:
  b. 4 inch and less: XH BS pipe, with SE XH CI fittings, or WE XHST fittings.
  c. 5 inch and Up: XH BS pipe with WE XH ST fittings.

2. Domestic Hot Water and Circulating (DHW & DHWC) 125 psig and less:
   a. 3 inch and less: Type L hard drawn copper tubing, with wrot copper or cast copper alloy solder fittings, and Type 3 solder, or hydraulic press joints.
   b. 4 inch and up: SW GS pipe with GGE fittings.

3. Refrigerants (RS, RL, HG & RD) 350 psig and less:
   a. All Sizes: Type ACR hard drawn copper tubing with wrot copper fittings, and brazing alloy, unless otherwise specified.
   b. 3/4 inch o.d. size and Less (for final connection within 24 inches of refrigerant equipment): Soft annealed Type ACR copper tubing with refrigerant tube type flared fittings.

4. Drain Piping:
   a. Condensate Drain Piping: Type M hard drawn copper tubing with wrot copper or cast copper alloy solder fittings, and Type 3solder.
   b. Overflow Drain Piping (Deaerator, Return Tank, and Condensate Return Unit): XH BS pipe with WE XH ST fittings.
   c. Drain Piping other than Condensate and Overflow Drains: SWBS pipe, with SE SW CI fittings, or WE SW ST fittings.

END OF SECTION 232000
### Energy Analysis for Alteration / Climate Zone 4

#### NOTES

1. All drawings, specifications, and the data presented herein are for the purpose of review and approval only. They are not to be used for any purpose except in the context of the project and in no way imply approval by the Architectural Review Board.

2. Architectural Energy Analysis was conducted as per New York City requirements.

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#### ECCNYC Note

In the event of an emergency, please contact the Architectural Review Board and comply with the New York City Energy Conservation Code.
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WAINSCOTING INTERIOR BEADBOARD

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1/4"notches in moulding receive beadboard
wainscoting cap
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(5/8" x 3-1/2" x 96")
door & window casing
(5/8" x 2-3/4" x 96")
chair rail
(13/16" x 1-5/8" x 96")
baseboard
(5/8" x 3-1/2" x 96")
crown moulding
(1/2" x 3-1/2" x 96")
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