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**PART 1 - GENERAL**

1.1 Related Sections

- .1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Section 05 12 50 - Architecturally Exposed Structural Steel

1.2 References

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 A36/A36M-05, Standard Specification for Carbon Structural Steel.
  - .2 A 325-04B, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - .3 ASTM A780 / A780M - 09 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - .4 ASTM F2329 - 05 Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
  - .2 CAN/CSA-S16-01, Limit States Design of Steel Structures.
  - .3 CAN/CSA-S136-01, North American Specification for the Design of Cold Formed Steel Structural Members.
  - .4 CSA-S136.1-01, Commentary on CSA Standard S136.
  - .5 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel Structures.
  - .6 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7 CSA W55.3-1965 (R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
  - .9 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .10 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).
  - .1 CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel.
- .5 The Society for Protective Coatings (SSPC)
  - .1 SSPC SP-2-04, Hand Tool Cleaning.
  - .2 SSPC SP-6/NACE No. 3-00, Commercial Blast Cleaning.

1.3 Design Requirements

- .1 Design details and connections in accordance with requirements of CAN/CSAS16 and CAN/CSA-S136 with CSA-S136.1 to resist forces,

moments, shear and allow for movements indicated.

- .2 Shear connections:
  - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
  - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
  - .3 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Province of Ontario, Canada for non standard connections.

#### 1.4 Shop Drawings

- .1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:
  - .1 Description of methods.
  - .2 Sequence of erection.
  - .3 Type of equipment used in erection.
  - .4 Temporary bracings.
- .3 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the province of Ontario, Canada.

#### 1.5 Samples

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit 200 x 300 mm sample panel, hot dip galvanized, on the following substrate materials:
  - .1 6 mm plate steel.
- .3 When approved, samples shall become acceptable standard of quality for appropriate in-shop surface with one of each sample retained in-shop.

#### 1.6 Quality Assurance

- .1 Submit 4 copies of mill test reports 4 weeks prior to fabrication of structural steel.
  - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
  - .2 Provide mill test reports certified by metallurgists qualified to practice in province of Ontario, Canada.

#### 1.7 Waste Management and Disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and/or corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused paint material from landfill to official hazardous material collections site approved by Departmental Representative.
- .6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

**PART 2 - PRODUCTS**

2.1 Materials

- .1 Structural steel: to CAN/CSA-G40.20/G40.21
  - .1 Grade 350W for wide flange (W and WWF).
  - .2 Grade 350W for angles, channels and plates.
  - .3 Grade 350W, Class C, for hollow structural sections.
- .2 Anchor rods: to CAN/CSA-G40.20/G40.21, Grade 300W, or ASTM A36/A36M.
- .3 Galvanized bolts, nuts, and washers: to ASTM A325 or ASTM A 325M and ASTM F2329-05 unless indicated otherwise on drawings.
- .4 Welding materials: to CSA W48 Series or CSA W59 and certified by Canadian Welding Bureau.
- .5 Hot dip galvanizing: galvanize steel to CAN/CSA-G164, minimum zinc coating of 600 g/m.
- .6 Primer: zinc-rich, ready mix to CAN/CGSB- 1.181.

2.2 Fabrication

- .1 Fabricate structural steel in accordance with CAN/CSA-S16, CAN/CSA-S136 and in accordance with reviewed shop drawings.
- .2 Continuously seal members by continuous welds unless noted otherwise.
- .3 Orientate straight beams which are to be fabricated from rolled shapes having cambers within allowable mill tolerances so that resulting beam camber is up.

**PART 3 - EXECUTION**

3.1 General

- .1 Structural steel work: in accordance with CAN/CSA-S16 and CAN/CSA-S136.

- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

### 3.2 Marking

- .1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

### 3.3 Erection

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and CAN/CSA-S136 and in accordance with reviewed erection drawings.
- .2 Galvanize individual members before erection.
- .3 Field cutting or altering structural members: to approval of Departmental Representative.
- .4 Re-galvanize in accordance with ASTM A780 any member that has been modified by cutting or welding before erection.
- .5 Continuously seal members by continuous welds where indicated.

### 3.4 Field Quality Control

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.
- .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .3 Submit test reports to Departmental Representative within 1 week of completion of inspection.
- .4 Departmental Representative will pay costs of tests as specified in Section 01 45 00 - Quality Control.

### 3.5 Field Painting

- .1 After delivery of structure touch up damaged surfaces with zinc rich primer in accordance with SSPC SP-2 and ASTM A780.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Institute of Steel Construction (CISC) - Code of Standard Practice, 2012.
- .2 ASTM: ASTM A780 / A780M - 09 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- .3 ASTM A123 / A123M - 12 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- .4 American Welding Society - AWS D1.1/D1.1M: 2004

1.2 RELATED SECTIONS

- .1 Section 05 12 23 - Structural Steel for Buildings

1.3 SUBMITTALS

- .1 Submit each item below according to Section 01 33 00 - Submittal Procedures.
  - .1 Product Data for each type of product specified.
  - .2 Shop Drawings detailing fabrication of AESS components.
    1. Provide erection drawings clearly indicating which members are considered as AESS members.
    2. Include details that clearly identify all of the requirements listed in sections 3.1 "Fabrication" and 3.6 "Erection" of this specification. Provide connections for exposed AESS consistent with concepts shown on the Architectural and Structural drawings.
    3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.
    4. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections.
    5. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
    6. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.
    7. Indicate mounting holes for equipment provided by other trades, as indicated.

#### 1.4 QUALITY ASSURANCE

- .1 AESS2, as defined by the CISC Code of Standard Practice, is the standard for all AESS in this work.
- .2 Mockups: At least four weeks prior to fabricating AESS, the contractor shall construct mockups to demonstrate aesthetic effects as well as qualities of materials and execution. A mockup for each of the following elements shall be constructed:
  - .1 Typical welded connections;
  - .2 Typical guard, beam, picket, deck assemblies.
- .3 Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
  - .1 Locate mockups on-site or in the fabricator's shop as directed by Departmental Representative. Mockups shall be full-size pieces unless the Departmental Representative approves smaller models.
  - .2 Notify the Departmental Representative one week in advance of the dates and times when mockups will be available for review.
  - .3 Demonstrate the proposed range of aesthetic effects regarding each element listed under the fabrication heading below.
  - .4 Mockup will have finished surface (including surface preparation and galvanizing).
  - .5 Obtain Departmental Representative's approval of mockups before starting fabrication of final units.
  - .6 Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work. Approved mockups in an undisturbed condition at the time of Interim Completion may become part of the completed work.
- .4 Pre-installation Conference: The Contractor shall schedule and conduct conference at the project site to comply with requirements of Division 1 Section "Project Meetings." As a minimum, the meeting shall include the General Contractor, Fabricator, Erector, and the Departmental Representative. Coordinate requirements for shipping, special handling, attachment of safety cables and temporary erection bracing, touch up painting and other requirements for AESS.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver AESS to Project site in such quantities and at such times to ensure continuity of installation.
- .2 Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.
- .3 Erect pieces using padded slings or other methods such that galvanizing is not damaged. Provide padding as required to protect while rigging and aligning member's frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Departmental Representative during the pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Departmental Representative prior to erection.

### 1.6 PROJECT CONDITIONS

- .1 Field Measurements: AESS is required to fit against existing masonry walls and other construction. Assume walls are constructed with significant deviations from a perfectly flat plane (+/- 75mm over tower height, minimum). Verify dimensions by field measurements before preparation of shop drawings. Discuss findings of field measurements with Departmental Representative, and propose alternate detailing options if required.
- .2 Coordinate fabrication schedule with construction progress to avoid delaying the work.

### 1.7 COORDINATION

- .1 Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation.
- .2 Coordinate fabrication of the mounts for light fixtures to suit the thread of the fixtures.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- .1 General: Meet requirements of Section 05 12 23 - Structural Steel for Buildings
- .2 High-Strength Stainless Steel Bolts, Nuts, and Washers: Per Section 05 12 23.
- .3 Isolation System: Resilient laminated fabric pad isolation pads, bushing sets, and washers comprised of layers of tightly twisted, closely woven lightweight duck impregnated with an elastomeric compound. Provide between new stainless steel fasteners and galvanized steel.

### PART 3 - EXECUTION

#### 3.1 SCHEDULE

- .1 The following items are AESS:
  - .1 Rest platform structural framing depicted on drawing S-8
  - .2 Ladders and cages
  - .3 Grated floors
  - .4 Guard rails
  - .5 Other items identified on architectural drawings as AESS

#### 3.2 FABRICATION

- .1 Fabricate and assemble AESS in the shop. All field joints in AESS assemblies are to be bolted. Detail AESS assemblies to minimize field handling and expedite erection. Provide slotted connections to enable on-site adjustments without cutting or welding.
- .2 Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the approved mock up. Use special care in handling and shipping of AESS both before and after shop painting.
- .3 In addition to special care used to handle and fabricate AESS, employ the following fabrication techniques.
  - 1. Fabrication Tolerance: Fabricate steel to one half the normal tolerance as specified in the Code of Standard Practice Section 3.
  - 2. Welds ground smooth: Fabricator shall grind welds of AESS smooth. For groove welds, the weld shall be made flush to the surfaces each side and be within +1.5mm, -0mm of plate thickness.
  - 3. Contouring and blending of welds: Where fillet welds are indicated to be ground-contoured, or blended, oversize welds as required and grind to provide a smooth transition and to match profile on approved mock-up.

4. Continuous Welds: Where welding is noted on the drawings, provide continuous welds of a uniform size and profile.
5. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
6. Coping and Blocking Tolerance: Maintain a uniform gap of  $3\text{mm} \pm 1\text{mm}$  at all copes and blocks.
7. Joint Gap Tolerance: Maintain a uniform gap of  $3\text{mm} \pm 1\text{mm}$ .
8. Piece Marks Hidden: Fabricate such that piece marks are fully hidden in the final structure or made with such media to permit full removal after erection.
9. Mill Mark Removal: Fabricator shall deliver steel with no mill marks (stenciled, stamped, raised etc) in exposed locations. Mill marks shall be omitted by cutting of mill material to appropriate lengths where possible. Where not possible, the fabricator can fill and/or grind to a surface finish consistent with the approved mock up.
10. Grinding of sheared edges: Fabricator shall grind all edges of sheared, punched or flamecut steel to match approved mockup.
11. Rolled Members: Member specified to be rolled to a final curved shape shall be fully shaped in the shop and tied during shipping to prevent stress relieving. Distortion of the web or stem, and of outstanding flanges or legs of angles shall be visibly acceptable to the Departmental Representative from a distance of 8m under any lighting condition determined by the Departmental Representative. Tolerances for the vertical and horizontal walls of rectangular HSS members after rolling shall be the specified dimension  $\pm 13\text{mm}$ .
12. Seal weld open ends of round and rectangular hollow structural section with 9mm closure plates. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.

### 3.3 SHOP CONNECTIONS

- .1 Bolted Connections: Make in accordance with Section 05 12 23 - Structural Steel for Buildings. Provide bolt type and finish as noted herein and align bolt heads as indicated on the approved shop erection drawings.
- .2 Weld Connections: Comply with AWS D1.1 and Section 05 12 23 - Structural Steel for Buildings. Appearance and quality of welds shall be consistent with the mock up. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this section.

### 3.4 GALVANIZING

- .1 Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to all AESS in accordance with ASTM A 123. Fabricate such that all connections of assemblies are made in the field with bolted connections. Provide galvanized finish on members and assemblies within the range of color and surface textures presented in the mock ups.
  - .1 Surface Preparation: Clean all surfaces. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC Specifications as follows:
    - .1 SSPC-SP 6 "Commercial Blast Cleaning."

### 3.5 EXAMINATION

- .1 The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections which might result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.

### 3.6 PREPARATION

- .1 Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Departmental Representative. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

### 3.7 ERECTION

- .1 Set AESS accurately in locations and to elevations indicated, and according to AISC specifications referenced in this Section.
- .2 In addition to the special care used to handle and erect AESS, employ the following erection techniques:
  - 1. AESS Erection Tolerances: Erection Tolerances shall meet the requirements of CISC Code of Standard Practice.

### 3.8 FIELD CONNECTIONS

- .1 Bolted Connections: Install bolts of the specified type and finish in accordance with Section 05 12 23 - Structural Steel for Buildings

### 3.9 FIELD QUALITY CONTROL

- .1 Structural requirements: The Departmental Representative will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports. Refer to Section 05 12 23 - Structural Steel for Buildings for detailed bolt and weld testing requirements.
- .2 AESS acceptance: The Departmental Representative shall observe the AESS steel in place and determine acceptability based on the mockup. The Testing Agency shall have no responsibility for enforcing the requirements of this section.
- .3 Arrange and pay for the removal and replacement of any AESS members not deemed to have been constructed in compliance with this specification, as determined by the Departmental Representative.

### 3.10 ADJUSTING AND CLEANING

1. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

**PART 1 - GENERAL**

1.1 RELATED REQUIREMENTS

- .1 Section 10 28 10 - Washroom Accessories
- .2 Section 26 27 26 - Wiring Devices
- .3 Section 22 42 03 - Commercial Plumbing Fixtures

1.2 REFERENCES

- .1 ASTM International
  - .1 ASTM A 167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2 ASTM B 456-03, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
  - .3 ASTM A 653/A 653M-09, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .4 ASTM A 924/A 924M-09, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
  - .5 ASTM B254 - 92(2009) Standard Practice for Preparation of and Electroplating on Stainless Steel

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Provide a description of the methods proposed for custom modifications and disassembly/reassembly methods for electroplating. Provide details of proposed modifications to assemblies.
- .3 Samples:
  - .1 Submit samples for review.
  - .2 Samples will be returned for inclusion into work.
  - .3 Provide samples of electroplating on representative substrate materials. Departmental Representative will provide a sample of existing nickel plating to serve as a guide.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect toilet accessories from nicks, scratches, and blemishes
  - .3 Replace defective or damaged materials with new.

- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- .1 Sheet steel: to ASTM A 653/A 653M with ZF001 designation zinc coating.
- .2 Stainless steel sheet metal: to ASTM A 167.
- .3 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields: fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

### 2.2 FABRICATION

- .1 Provide all washroom accessories supplied under Section 10 28 10 - Washroom Accessories and switch and receptacle cover plates supplied under Section 26 27 26 - Wiring Devices with matching, post-fabrication nickel plating. For disassembly and re-assembly of manufactured items for electroplating, see 3.2 below.
- .2 Assume waste receptacle is constructed with simple folded corners with exposed seams and open corners requiring welding and grinding to provide a seamless finish.
- .3 Shop assemble components and package complete with anchors and fittings.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrates and surfaces to receive custom finishes are acceptable.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Departmental Representative.

### 3.2 DISASSEMBLY/REASSEMBLY

- .1 To enable electroplating of pre-manufactured stainless steel and other metal products to proceed, disassemble using fabrication methods similar to those used in their manufacture. Remove hinges, locksets, and other hardware that cannot be placed in the electroplating bath. Where rivets or other non-removable fasteners are found, drill out and replace with stainless steel machine screws and nuts of a similar size. Introducing countersunk and/or oval-headed fasteners may be acceptable to suit the application provided the resulting installation is neat and orderly in appearance, while maintaining the functionality of the accessory.

- .2 Weld and grind smooth all exposed joints.
- .3 Re-assemble after electroplating, taking care to protect the finishes.

### 3.3 ELECTROPLATING

- .1 Nickel plating: to ASTM B 456, bright, decorative finish. Exact colour and texture of plating to match sample provided by Departmental Representative.
- .2 Assume a minimum of Service Condition 2 (Moderate) for electroplating.
- .3 Mockup: One extra toilet paper dispenser will be supplied by Section 10 28 10 for use in mocking up and evaluating finishes and colours.
- .4 Allow for alternate undercoatings to adjust for dissimilar substrate materials on different components, to achieve a uniform colour and general appearance among all accessories in the same room.

### 3.2 ADJUSTING

- .1 Adjust toilet and bathroom accessories components, plumbing fixtures, and systems for correct function and operation in accordance with manufacturer's written instructions. Modify sub-assemblies and components as required to maintain correct operation after electroplating.
- .2 Lubricate moving parts to operate smoothly and fit accurately, if required.

### 3.3 SCHEDULE

- .1 For washroom accessories refer to drawings for quantities and types.
- .2 For electrical cover plates allow for a total of 6.
- .3 For plumbing and plumbing fixtures allow for all exposed piping, faucets, and metal devices specified in Section 22 42 03.

END OF SECTION