

## SECTION 09210

### PLASTER REPAIRS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plaster for repairs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 General: Materials shall comply with ASTM C 841 and C 842 unless otherwise specified.

2.2 Finish Plaster shall be gypsum plaster or Keene's cement.

2.3 Lath and Furring shall be wood, gypsum, or metal to match existing. Paper backing shall be used on metal lath except when applied over masonry or concrete. Lath for Portland cement plaster shall comply with ANSI A42.3.

2.4 Portland Cement: ASTM C 150, Type I or Type II. Only one type and brand shall be used in the work.

2.5 Portland Cement Plaster: ANSI A42.2.

2.6 Metal Trim: New metal trim required for replacement of damaged or deteriorated trim shall be compatible with the existing metal trim.

2.7 Gypsum Wallboard for repair of solid but severely cracked plaster shall be 1/4 inch thick, 4-foot by 8-foot sheets.

2.8 Color: FED. STD. 595A.

#### 3.0 EXECUTION:

3.1 Preparation: Appropriate measures shall be taken to contain dust and protect adjacent surfaces during removal and replacement. Damaged or deteriorated plaster and accessories shall be removed and disposed of as required. Surfaces to which old plaster was applied shall be cleaned of all loose or foreign materials which might inhibit bonding or proper fitting of new plaster, lathing, and accessories. Concrete or masonry surfaces to be replastered shall be coated with a continuous film of bonding agent.

3.2 Environmental Conditions: A temperature of not less than 55 F shall be maintained in the building for 24 hours before, during, and after plaster application.

3.3 Plaster Installation: Plaster shall be installed in compliance with ASTM C 842. Portland cement plaster shall be installed for all exterior surfaces and all interior surfaces subject to high humidity. Gypsum plaster shall be installed for all remaining interior surfaces. Color, texture, finish, and thickness of plaster shall match adjacent, undamaged plaster or designated areas.

3.3.1 Plaster over Existing Work: Where replacement of the top or finish coat only is required, only the damaged or deteriorated finish coat shall be removed. New finish coat shall be applied, allowed to dry, and sanded to bring smooth with existing adjacent surfaces.

3.3.2 Ornamental Plaster: New plaster shall be run full, straight, and true with molding plaster using clean cut metal conforming to the existing profiles. Rough spots shall be sanded and left ready for painting.

3.3.3 Restoration: The Contractor shall replace or reinstall to the original condition all materials removed to get to the repair work. Materials damaged during removal or reinstallation shall be replaced with similar new materials.

SECTION 09260

GYPSUM WALLBOARD (DRY WALL)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gypsum wallboard (dry wall). Products shall match the existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Scope: Provide all labor, materials and equipment necessary to install all new gypsum wallboard, including all metal framing where required. Complete, as shown on the submitted drawings and specified herein or on the SOW.

1.2 Applicable Publications: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Federal Specifications (Fed. Spec.):

FF-B-575C	Bolts, Hexagon and Square
FF-B-588C & Am-1	Bolt, Toggle; and Expansion Sleeve, Screw
FF-N-105B & Int Am-4	Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
FF-S-325 & Int Am-3	Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) (GSA-FSS)
QQ-S-698 & Am-3	Steel Sheet and Strip, Low-carbon
QQ-S-775E & int Am-1	Steel Sheets, Carbon, Zinc-coated (Galvanized) by the Hot-dip Process
SS-L-30D & Int Am-3	Lath, and Board Products, Gypsum
APR 88-25	MFE Design & Construction Management

B. Gypsum Association Publication:

GA-216-79 Recommended Specifications for the Application and Finishing of  
Gypsum Wallboard

1.3 General: Except where otherwise indicated or specified, the work shall conform to GA-216. Gypsum wallboard of the types indicated or specified shall be applied in locations as follows.

A. Regular gypsum wallboard shall be applied on exterior walls and will be indicated and specified on the room finish schedule or the shop drawings.

B. Fire-retardant/resistant (Type X or better) gypsum wall board shall be applied on partitions or otherwise indicated or specified and will be indicated and specified on the room finish schedule or the shop drawings.

C. Water Resistant (WR) gypsum wall board (GWB) shall be used in bathrooms and laundry areas and other areas subject to conditions of humidity or direct contact with water.

D. Steel framing, where indicated, for non-load-bearing partitions included in this section. Gypsum wallboard shall be screw-applied to steel members.

E. Steel furring for walls and optional steel studs and runners are included in this section. Gypsum wallboard shall be screw applied to steel members.

F. Wood framing, furring, blocking, and nailers for attaching wallboard are specified under SECTION 06100: ROUGH CARPENTRY.

#### 1.4 Materials:

A. Embedding Compound for Joint and Fastener Concealment: Embedding and finishing compounds shall be mixed in accordance with the manufacturer's printed instructions. Ready-mixed compounds are delivered in original unopened containers.

B. Ceiling and floor runner channels shall be not less than 0.021 inch nominal thickness with 1-1/4 inch flanges and channel web sized to nest with comparable steel studs hereinafter specified.

C. Furring channel shall be not less than 0.021 inch nominal thickness, hat-shaped in section with 1-3/8 inch wide crown for wallboard attachment. Hat crown shall be 7/8 inch deep and brim shall be formed with 1/2 inch flanges stiffened with 1/8 inch folded edge. Flanges may be 3/8 inch when 1/8 inch stiffened edge is upturned 90 degrees from the brim. Crown shall be slightly sloped for nesting channels.

#### D. Fasteners:

1. Bolts shall conform to Fed. Spec. FF-B-575.

2. Expansion shields shall conform to Fed. Spec. PF-S-325, Group I, 11, or 111, of the type and class applicable.

3. Nails shall conform to Fed. Spec. FF-N-105. Wallboard nails shall be Type 11, Style 19, with mechanically deformed shank, 1-1/4 inch length for 1/2-inch wallboard and 1-3/8 inch length for 5/8-inch wallboard.

4. Power-driven fasteners may be used only when approved in writing.

5. Screws for wallboard attachment shall be shouldered flat-head design for use with special power driven tools.

a. Wood screws shall be not less than 1 1/8 inches long.

b. Metal screws shall be not less than 1 inch long with self tapping threads and self-drilling points.

6. Toggle bolts shall conform to Fed. Spec. FF-B-588, type and class best suited for the purpose.

E. Gypsum wallboard shall conform to Fed. Spec. SS-L-30, Type III and II, Class 1, Style 3, tapered, and of the grade and form hereinafter specified. Wallboard shall be supplied in 48-inch widths and in such lengths as will result in a minimum of joints.

1. Regular wallboard shall be Grade R, Form A, 1/2 inch or thicker for single-ply application.

2. Fire-retardant wallboard shall be Grade X, Form A, 1/2 inch or thicker.

F. Metal trim features for wallboard shall be formed from zinc-coated steel not lighter than 0.0217 inch nominal thickness (26 gage) and shall conform to Fed. Spec. QQ-S-775, Type I, Class D or E. Metal trim shall be in the following shapes and sizes.

1. Casing beads shall be channel shaped with a concealed wing not less than 7/8 inch wide and an exposed wing. Exposed wing may be covered with paper cemented to metal and shall be suitable for joint treatment.

2. Corner beads shall be angle-shaped with wings not less than 7/8 inch wide and perforated for nailing and joint treatment or with combination metal and paper wings bonded together, not less than 1-1/4 inches wide, and suitable for joint treatment.

G. Reinforcing tape shall be as recommended in writing by the manufacturer of the wallboard.

1.5 Delivery and Storage: Wallboard delivered prior to use shall be stored within a completely enclosed structure or off the ground and completely enclosed within a weathertight covering. Wallboard shall be dry, free of warpath, and with bundling tape intact immediately prior to use. Application shall commence only after the structure is completely weathertight.

1.6 Framed Openings:

A. Wall Openings: Frames shall be provided for wall openings such as required for doors and access panels as specified in other sections. Steel frames shall be securely attached through built-in anchors to the nearest stud on each side of the opening with wallboard screws. Wood frames or bucks shall be securely attached to the nearest studs with wallboard screws. A ceiling runner: channel section cut 24 inches longer than the rough-opening width shall be installed horizontally over the framed opening. Runner ends shall be bent, nested, and attached as specified for open-end partitions. Partitions shall be strengthened for rigidity at door openings, with angle or channel bracing from each jamb location anchored to the roof structure.

1.7 Application: Wallboard shall be applied with the separate boards in moderate contact but not forced into place. At internal and external corners the cut edges of the boards shall be concealed by the overlapping covered edges of the abutting boards. The boards shall be so staggered that the corners of any four boards will meet at a common point except in vertical corners. Wallboard abutting dissimilar materials shall terminate in a casing bead.

A. Walls:

1. Single-ply Horizontal Application: The long dimension of the panels shall be placed at right angles to the furring or framing members. End joints, where required, shall be made over furring or framing members.

2. Single-ply Vertical Application: The long dimension of the panels shall be placed parallel to the furring or framing members. The panels shall be of the length required to reach from the ceiling line to the floor line in one continuous length. Joints shall be made over framing or furring members.

1.8 Attachment:

A. General: Except as specified herein, nailing shall conform to GA-216. If the paper surface is broken in nailing, another nail shall be driven approximately 2 inches from the faulty nailing. Attachment of wallboard to steel furring and steel framing shall be by screw fasteners only. Nailing or screw attachment shall proceed from central portion of wall board towards ends and edges.

B. Standard Nailing Methods: Nailing shall be spaced 8 inches on centers along nailing members.

C. Double nailing method shall be used only for single-ply non-fire rated application. Nailing on walls shall begin at the top center and proceed alternately in rows outward to the end or edges. Nailing to each nailing member shall be completed before proceeding to the next nailing member. End joints shall be made over nailing members.

D. Screw method shall be used for wallboard attachment to steel furring and to steel framing. Screws shall be driven with clutch-controlled power screwdrivers and spaced 16 inches on centers on walls.

1.9 Joint and Fastener Concealment:

A. Areas to be treated shall be inspected to ascertain that wallboard fits tightly against supporting framework, and these areas shall be heated to not less than 55 degrees F. for 24 hours prior to commencing treatment, during treatment, and until adhesive compounds have dried. Application shall be by machine or hand tool. A minimum drying time of 24 hours shall be allowed between adhesive coats. Additional drying time may be necessary in poorly ventilated areas.

B. Embedding compound shall be applied to wallboard joints and fastener heads in a thin uniform layer. Compound shall be spread not less than 3 inches wide at joints and reinforcing tape shall be centered on the joint and embedded in the compound. A thin layer of compound shall then be spread over the tape. After this treatment has dried, a second coat of embedding compound shall be applied to wallboard joints and fastener heads. Compound shall be spread in a thin uniform coat and be not less than 6 inches wide at joints. Treated areas shall be sanded to eliminate ridges and high points.

C. Finishing Compound: After embedding compound has dried, a coat of finishing compound shall be applied to joints and fastener heads. Finishing compound applied at joints shall be feathered out to not less than 12 inches wide. After compound has dried, the treated areas shall be sanded as necessary to obtain uniformly smooth surfaces. Care shall be taken not to scuff the paper surface of the wallboard.

1.10 Corner Treatment:

A. Internal corners shall be treated in the manner specified herein-before for joints, except that the reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.

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B. External corners shall have a corner bead fitted neatly over the corner and secured with the same type fasteners used for applying wallboard. The fastener shall be spaced approximately 6 inches on centers and driven through the wallboard into the framing member. After the corner piece has been secured in place, the corner

shall be treated with joint compound in the manner here in before specified for joints. The joint compound shall be feathered out from 8 to 10 inches on each side of corner.

## SECTION 09315

### TILE FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic tile flooring, ceramic mosaic tile flooring, conductive ceramic tile flooring, quarry tile flooring, slate flooring, and quarry tile by the acid-resistant installation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Glazed Ceramic Tile: TCA 137.1 Section 6.

2.2 Ceramic Mosaic Tile: TCA 137.1, Section 5.1.

2.2.1 Natural Clay Tile.

2.2.2 Porcelain Body Tile.

2.2.3 Slip-Resistant Tile: TCA 137.1, Section 5.1.1.2.10.

2.2.4 PregROUTED Sheets of ceramic tile, factory-assembled and grouted with manufacturer's standard polyurethane material.

2.3 Conductive Ceramic Tile: Complying with Fed. Spec. SS-T- 308, Type I, Class F.

2.4 Quarry Tile: TCA 137.1, Section 5.2. Wax-coated top surface for acid-resistant installation.

2.4.1 Slip-Resistant Quarry Tile shall comply with TCA 137.1, Section 5.2.1.2.9.

2.5 Slate: Grade A, unfading slate flooring.

2.6 Base Units: Cove type, round top.

2.7 Trim Pieces: For base shall be cove or bullnose.

2.8 Mortar and Grout Materials:

2.8.1 Portland Cement: ASTM C 150, Type 1.

2.8.2 Aggregate: Sand, ASTM C 144.

2.8.3 Dry-Set Mortar and Grout: ANSI A118.1, TCA Formula 759 or 763 (as applicable).

2.8.4 Conductive Dry-Set Mortar: Conforming to ANSI A118.2 and TCA Formula 756.

2.8.5 Conductive Latex Mortar: Conforming to ANSI A118.2.

2.8.6 Liquid Latex: ANSI A118.4 except latex shall be nonremulsifiable in water.

2.8.7 Epoxy Mortar and Grout: TCA Formula AAR-11, two-component epoxy resin, hardener, and mineral filler complying with ANSI A118.3.

2.8.8 Furan Mortar.

2.8.9 Furan Grout.

2.8.10 Water shall be clean, fresh, potable water approved by Public Health authorities for domestic consumption.

2.8.11 Commercial Cement Grout: Proprietary compound of Portland cement and additives, factory-blended to decrease shrinkage.

2.9 Adhesives:

2.9.1 Epoxy Adhesive: TCA Formula C150, two component epoxy resin and hardener.

2.9.2 Organic Adhesive: ANSI A136.1 with TCA certification of conformance.

2.10 Sealants:

2.10.1 Polysulphide: Fed. Spec. TT-S-230, Type I. single component, synthetic-rubber base.

2.10.2 Polyurethane: Fed. Spec. TT-S-230, Type I. single component.

2.10.3 Silicone: Fed. Spec. TT-S-001543 Class A and TT-S-00230, single component.

2.11 Adhesive and Joint Sealant: Fed. Spec. TT-S-00230C, Type 2, Class B.

2.12 Cleavage Membrane: One of the following:

2.12.1 Saturated Felt: ASTM D 250, 15-pound type.

2.12.2 Polyethylene Film: ASTM D 2103, Type 0, 0.004 inch thick.

2.13 Marble Thresholds: Group A per ANSI A94.1, with rounded edges and sand rubbed finish.

2.14 Reinforcing-Mesh: ASTM A 185.

2.15 Plywood: PS-1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA," 3/4 inch thick unless otherwise noted.

2.16 Nails: Fed. Spec. FF-N-105 annular, screw or ring type, zinc-coated.

2.17 Backer Rod: Fed. Spec. HH-F-341, Type I, Class A and B, expanded, closed cell polyethylene, rod shaped.

2.18 Elastomeric Sheet: 40 mil complying with ASTM D 2103.

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3.0 EXECUTION:

3.1 General: Comply with ANSI standard installation specifications A108.1 through A108.7 except as otherwise indicated and with TCA Installation Handbook.

3.2 Portland Cement Mortar Bed: Install in accordance with ANSI standard A108.1, as modified herein.

3.2.1 Mix Mortar in proportion on one part Portland cement to five parts dry sand or six parts damp sand.

3.2.2 On Wood and Framed Concrete Slab Floors provide a cleavage membrane before placing setting bed, with edges of sheets lapped.

3.2.3 On Cleavage Membrane lay welded wire mesh reinforcing, lapping three inches at all edges.

3.2.4 Install Mortar and tamp heavily to compact bed to depth of 3/4 inch to 1-1/4 inches.

3.3 Dry-Set Portland Cement Mortar Bed: Install in accordance with ANSI A108.5 except as modified below.

3.3.1 Carefully Work Sufficient Water into dry-set mortar to obtain desired consistency.

3.3.2 Mix Mortar Ingredients thoroughly before adding latex. Carefully work in sufficient latex to obtain desired consistency.

3.3.3 Rework Mixes from time to time to maintain proper consistency, but do not add additional ingredients.

3.3.4 Apply Layer of Mortar to form a thickness of at least 1/8 inch.

3.4 Organic Adhesive Application: Install in accordance with ANSI A108.4.

3.5 Install Conductive Ceramic Tile in accordance with ANSI A108.7.

3.5.1 Testing: Conductive ceramic tile floors shall be tested in accordance with NFPA Std. No. 56.

3.5.2 Replacement: Floors that have not met requirements of NFPA 56 within six months after they are installed shall be removed and replaced with properly conductive floor by this Contractor at no additional cost to the Government.

3.6 Install Quarry Tile and Slate in accordance with ANSI A108.3.

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SECTION 09320

CERAMIC WALL TILE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic wall tile. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

### 2.1 Tile:

2.1.1 Ceramic Tile: Tile shall be standard grade conforming to ANSI A137.1. Containers shall be grade-sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate.

2.1.2 Ceramic Mosaic Tile and Trim shall be unglazed natural clay or porcelain with cushion edges. Tile size shall be 1 inch by 1 inch, 1 inch by 2 inches, 2 inches by 2 inches, or a mixture of standard sizes in a stock pattern, as selected.

2.1.3 Glazed Wall Tile and Trim shall be cushion-edged with bright or matte glaze. Tile shall be 4-1/4 inches by 4-1/4 inches, 4-1/4 inches by 6 inches, or 6 inches by 6 inches and, as selected.

2.1.4 Accessories: Accessories shall be the built-in type of the same materials and finish as the wall tile.

2.2 Setting Bed: Metal lath shall be flat expanded type conforming to ANSI A42.3 or A42.4, and weighing not less than 2.5 pounds per square yard.

2.3 Water shall be potable.

2.4 Mortar, Grout, and Adhesive shall conform to the following:

2.4.1 Dry-Set Portland Cement Mortar: ANSI A118.1.

2.4.2 Organic Adhesive: ANSI A136.1. Type I.

2.4.3 Epoxy Resin Grout: ANSI A118.3.

2.4.4 Furan Resin Grout: ASTM C 395.

## 3.0 EXECUTION:

3.1 Preparation: Surface to receive tile shall conform to the requirements ANSI A108.1 for surface conditions for the type setting bed required and for workmanship.

### 3.2 Installation:

3.2.1 General: Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation.

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#### 3.2.2 Installation of Wall Tile:

3.2.2.1 Plastic or Cured Mortar Bed: Tile shall be installed over a plastic mortar bed or a cured mortar bed. A 4-mil polyethylene membrane, metal lath, and scratch coat shall also be installed. Plastic mortar bed, materials, and installation of tile shall conform to ANSI A108.1. Cured mortar bed and materials shall conform to ANSI A108.1. Dry-set method of installing tile over a cured mortar bed shall conform to ANSI A108.5.

3.2.2.2 Dry-Set Mortar: Dry-set mortar shall be used to install tile directly over clean, sound, dimensionally stable masonry in accordance with ANSI A108.5.

3.2.2.3 Organic Adhesive: Organic adhesive installation of ceramic tile shall conform to ANSI A108.4.

3.3 Cleaning: Upon completion, tile surfaces shall be thoroughly cleaned in accordance with ANSI A108.1. Acid shall not be used for cleaning glazed tile.

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SECTION 09405

TERRAZZO

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for terrazzo floors and stairs. Products shall match existing materials and/or shall be as directed by the

Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Terrazzo Materials and Installation shall comply with specifications and recommendations of The National Terrazzo and Mosaic Association, Inc. (NTMA)

2.2 Underbed Reinforcement shall be 2-inch by 2-inch by 16-gauge welded wire mesh, ASTM A 185, galvanized.

2.3 Isolation Membrane shall be polyethylene film, complying with ASTM D 2103, not less than 4.0 mils thick.

### 2.4 Cast-In-Place Terrazzo Materials:

2.4.1 Portland Cement shall conform to ASTM C 150, Type I, except as modified to comply with NTMA requirements for compressive strength. Provide non-staining white cement for terrazzo matrix. Provide standard gray cement for underbed.

2.4.2 Sand shall conform to ASTM C 33.

2.4.3 Aggregate shall be natural, sound, crushed marble chips without excessive flats or flakes, complying with NTMA requirements.

2.4.4 Monolithic Terrazzo shall be 1/2-inch total thickness over concrete slab.

2.4.5 Bonded Terrazzo shall be 1/2-inch terrazzo over a 1-1/4 inch minimum underbed.

### 2.5 Thinset Epoxy and Polyester Materials

2.5.1 Polyacrylate-Modified Cementitious Terrazzo Matrix: Polyacrylate and color pigment complying with NTMA "Guide Specification for Polyacrylate Modified Terrazzo"

2.5.2 Polyester Resin Terrazzo Matrix: Two-component polyester resin and hardener, mineral filler, and color pigment, complying with NTMA "Guide Specification for Polyester Terrazzo."

2.5.4 Epoxy Resin Terrazzo Matrix: Thermosetting, amine-cured epoxy resin and hardener, mineral filler, and color pigment, complying with NTMA "Guide Specification for Epoxy Terrazzo"

2.5.5 Conductive Terrazzo with Resinous Matrix: Electricity conductance shall conform to resistance levels established by the UL 779.

2.6 Precast Terrazzo: Precast terrazzo base and stair units shall comply with NTMA.

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2.7 Sealer: Colorless, slip-and stain-resistant, non-yellowing penetrating sealer that will not disturb color or physical properties of terrazzo surface; pH factor between 7 and 10.

2.8 Plywood: PS-1, IC-C EXT-APAO or "Underlayment C-C Plugged EXT-APA", 3/4 inch thick unless otherwise noted.

2.9 Nails: Fed. Spec. FF-N-105 annular, screw or ring type.

2.9 Elastomeric Sheet: 40 mil thick extruded, homogeneous, waterproof, impervious, nonplasticized chlorinated polyethylene sheet, complying with ASTM D 2103.

2.11 Curing Materials:

2.11.1 Polyethylene Film: Non-staining type.

2.11.2 Paper: Non-staining, heavy building paper.

2.11.3 Curing Compound: Liquid membrane-forming compound, complying with ASTM C 309, Type I.

2.12 Cleaner: Neutral liquid chemical cleaner, biodegradable, free from crystalline salts, phosphate or water soluble alkaline salts, formulated for terrazzo, pH factor between 7 and 10.

3.0 EXECUTION:

3.1 Preparation: Clean and prepare substrate to comply with NTHA specifications for type of terrazzo application indicated. Clean area to receive terrazzo of loose chips and all foreign matter. Grind concrete substrate as required to provide surfaces within tolerances required by NTMA.

3.2 Installation:

3.2.1 Comply with NTMA and manufacturer's recommendations for proportioning mixes, for installation of strips, and for placing, curing, grinding, grouting, and finishing.

3.2.2 Provide terrazzo bases, thresholds, stair treads, and landings as required.

3.2.3 Install Divider and Accessory Strips in an adhesive setting bed, without voids below strips. Provide mechanical anchorage for adequate attachment of strips to substrate.

3.2.4 Provide Control Joints by installing angle type divider strips back-to-back with neoprene rubber filler cemented between strips, flush with finish floor.

3.2.5 Provide for Expansion Joints by installing angle type divider strips back-to-back, with removable filler of the width shown (but not less than 1/4 inch wide) between strips.

3.2.6 Install Abrasive Inserts where required.

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## SECTION 09510

### ACOUSTICAL CEILINGS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of acoustical units in suspended ceilings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

### 2.1 Acoustical Units shall conform to Fed. Spec. SS-S-118, Class A, and the following requirements:

2.1.1 Acoustical Panel Units for Exposed Grid System shall be the type and pattern required, NRC grade of 55 minimum when tested on mounting No. 7, trimmed and butt, with a LR grade of 1 and a STC range of 40-44. Nominal size shall be 24 inches by 48 inches or 24 inches by 24 inches. Finish shall be factory-applied white finish.

2.1.2 Acoustical Panel Units for Semi-Exposed Grid System shall be the type and pattern required, NRC grade of 55 minimum when tested on mounting No. 7, trimmed and butt, with a LR grade of 1 and a STC range of 40-44. Nominal size shall be 12 inches by 24 inches or 12 inches by 12 inches. Finish shall be factory-applied white finish.

2.1.3 Acoustical Tile Units for Concealed Grid System shall be the type and pattern as required, NRC grade of 55 minimum when tested on mounting No. 7. LR grade shall be 1, and STC range shall be 40-44. Edge detail shall be beveled or square, and joint detail shall be kerfed and rabbeted or as required. Nominal size shall be 12 inches by 12 inches, and finish shall be factory-applied white finish.

2.1.4 Metal Ceiling System: Pans shall be type required, and acoustical insulation pads shall be NRC grade 55 minimum when tested on mounting No. 7. The pattern shall be "c," with a nominal size of 12 inches by 24 inches. Edge detail shall be manufacturer's standard, and joint detail shall be beveled or cross-scored to simulate 12-inch by 12-inch units. Finish shall be factory-applied white baked enamel, two coats on exposed surfaces, one coat on edges and backs. Pads shall be completed enclosed, of material and thickness required for acoustical and fire test ratings, with a LR grade of 2.

2.1.5 Fire Resistive Ceilings: Acoustical fire resistive ceiling systems shall be rated for fire endurance when tested in accordance with ASTM E 119. Suspended ceiling shall have been tested with a specimen roof and/or floor assembly representative of the construction, including mechanical and electrical work within ceiling space openings for light fixtures, air outlets, and access panels.

2.1.6 Ceiling Sound Transmission Class and Test: STC range of acoustical units, when required, shall be determined in accordance with Ceiling Sound Transmission Test by Two-Room Method and reported in accordance with the appendix to ASTM E 90 for 11 frequency data or ASTM E 413 for 16 frequency data.

2.2 Suspension System shall be of the type required and shall conform to ASTM C 635 for intermediate- or heavy-duty systems. Surfaces exposed to view shall be aluminum or steel with a factory-applied white baked enamel finish, aluminum with a clear anodized finish as required or aluminum with colored factory-applied vinyl paint finish. Wall molding shall have a flange of not less than 15/16 inch and shall be provided with inside and outside corner caps.

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2.3 Hangers shall be galvanized steel wire. Hangers and attachment shall support a 300-pound vertical load without failure of supporting material or attachment.

2.4 Access Panels shall match adjacent acoustical tiles and shall be designed and equipped with suitable framing and fastenings for removal and replacement without damage. Panel shall be not less than 12 inches by 12 inches or more than 12 inches by 24 inches. An identification plate of 0.032-inch thick aluminum, 3/4 inch in diameter, stamped with the letters "AP" and finished the same as the unit shall be attached near on corner on the face of each access panel.

2.5 Fire Hazard Classification: All acoustical unit materials shall bear the UL label and marking, indicating fire hazard classification of acoustical unit materials as determined by ASTM E 84. Provide materials with the following fire hazard classifications:

Flame spread not more than 25. Smoke developed not more than 50.

3.0 EXECUTION:

3.1 Acoustical Work shall be provided complete with all necessary fastenings, clips, and other accessories required for a complete installation.

3.2 Suspension System shall be installed in accordance with ASTM C 636 and as specified herein.

3.3 Wall Holding shall be provided where ceilings abut vertical surfaces.

3.4 Ceiling Tiles: Panels in exposed-grid system shall be held in place with manufacturer's standard hold-down clips.

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## SECTION 09530

### ACOUSTICAL INSULATION AND BARRIERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of acoustical insulation and barriers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Leaded Vinyl shall be a loaded vinyl sound barrier product composed of lead vinyl, and fiberglass reinforcing intended for use as a sound attenuation material. The material shall weigh either 72 or 120 ounces per square yard as required. Material thickness shall be 0.025 inch and 0.050 inch for 72 ounce and 120 ounce material, respectively.

2.2 Foil-Reinforced, Kraft-Faced, Mineral-Fiber Insulation shall be a faced insulation product designed to be used for thermal and acoustical insulation. Mineral fiber insulation shall be in accordance with Fed. Spec. HH-I-558, Form A, Class 1 or 2. Noise reduction coefficient (NRC) shall be not less than 0.55 for 1-inch thickness. Vapor transmission rate shall be not more than 0.02 perms. Surface burning characteristics shall be not more than a flame spread classification of 25, a fuel contribution of 50, and a smoke developed rating of 50, when tested in accordance with UL 723.

2.3 Vapor Barrier Facing material shall be in accordance with Fed. Spec. HH-B-100, Type I or II as required. Facing material shall be a laminate of aluminum foil and kraft-reinforced mineral fiber scrim.

2.3 Sheet Lead shall be in acoustical attenuating product weighing 1 pound per square foot, with a thickness of not less than 1/64 inch. Lead sheet shall conform to Fed. Spec. QQ-L-201, Grade B.

2.4 Fire Hazard Classification: All acoustical insulation and barrier materials shall bear markings indicating the fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications:

Flame spread not more than 25. Smoke developed not more than 50.

3.0 EXECUTION: (Section not used.)

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SECTION 09535

SOUND ABSORBING PANELS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound absorbing panels. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Perforated Steel Panels shall be modular units, fabricated of 22 gauge zinc-coated steel, and perforated with holes comprising not less than 10 percent of the panel area. Panels shall be suitably stiffened in both directions in accordance with panel size. Panels shall be filled with 2 inch thick, 1.5 lbs/cu ft acoustical insulation meeting Fed. Spec. HH-I-558, Form B, Type 1, Class 7. Installed panel units with acoustical insulation shall have a minimum Noise Reduction Coefficient (NRC) of .70 when tested in accordance with ASTM C 423. Panel units shall be furnished with two coats of white baked-on polyester paint on exposed surfaces and one coat on non-exposed surfaces.

2.2 Fiberglass Wall Panels shall be modular units, fabricated of 1-1/8 inch glass fiber board laminated to a nonwoven needle-punched fabric. The panels shall have a minimum NRC of .80 according to ASTM C 423. Panels shall be furnished with suitable wall fastening system.

2.3 Sound Attenuation Blankets shall be composed of mineral fiber of 4 lbs/cu ft density for 1 inch thickness, and 3 lbs/cu ft density for greater than 1 inch thickness conforming to Fed. Spec. HH-I-521. Blanket R-value shall be 4 per inch.

2.4 Fire Hazard Classification: A sound absorbing panel unit and sound attenuation blankets shall have a fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications:

Flame spread not more than 25. Smoke developed not more than 50.

### 3.0 EXECUTION:

3.1 Perforated Steel Panels shall be installed on ceiling suspension systems and wall furring systems that are compatible with perforated steel panels and that are already in place.

3.2 Fiberglass Wall Panels shall be installed on substrate wall surfaces that are clean, dry, and continuous, with no surface irregularities.

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## SECTION 09560

### WOOD STRIP FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood strip flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Wood Strip Flooring shall be manufactured from kiln-dried, plain-sawed, red oak lumber. Flooring shall be select grade, tongue and groove, end-matched, with manufacturer's standard channeling of back face of each strip. Size shall be 3/4 inch thick, 2-1/4 inches wide.

2.2 Maximum Moisture Content shall be 9 percent for wood strip flooring and 14 percent for other wood members.

2.3 Finishing Materials for Job Finished Flooring:

2.3.1 Stain: Penetrating type non-fading wood stain.

2.3.2 Wood Filler: Fed. Spec. TT-F-336.

2.3.3 Sealer: Penetrating type, pliable, wood-hardening finish/sealer.

2.3.4 Varnish: Alkyd resin varnish.

2.3.5 Urethane Finish: Fed. Spec. TT-C-542.

2.3.6 Floor Wax: Liquid, solvent-type, slip-resistant, conforming to Fed. Spec. P-W-158.

2.4 Composition Cork Expansion Strip: Fed. Spec. HH-C-576, Type I-B, Class 7

2.5 Nails shall be Fed. Spec. FF-N-105 screw or ring type, zinc coated.

2.6 Asphalt Primer shall comply with ASTM D 41.

2.7 Asphalt Saturated Felt shall be organic, 15-pound, unperforated, complying with ASTM D 226.

2.8 Membrane shall be 6 mil, carbonized polyethylene sheeting, complying with Fed. Spec. L-P-512.

2.9 Wood Sleepers shall be No. 1 common, fir, hemlock, spruce, or yellow pine complying with PS 20, with preservative treatment complying with AWPB LP-2.

2.10 Plywood Subflooring shall be PS 1. "C-D INT- APA." with exterior glue, or "C-C EXT-APA."

2.11 Hardboard shall comply with Fed. Spec. LLL-B-810 and CS251, specially made for underlayment, 1/4 inch thick.

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3.0 EXECUTION:

3.1 Preparation:

3.1.1 Wood Subfloors shall be renailed where loose. Where unsatisfactory wood subflooring is removed, replace with new exterior or underlayment grade plywood. Apply hardboard underlayment just before finish floor is to be installed. Nail plywood subfloors with screw-type nails. Cover ground in crawl space with lapped and sealed 4 mil polyethylene or 55-pound rolled roofing, and cover subfloor with a lapped layer of 15-pound asphalt saturated felt.

3.1.2 Concrete Subfloors. Fill large cracks and holes in concrete structural floor slabs with a one part nonshrinking cement to three part sand grout with a latex or epoxy additive. Test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent). Sand or trowel smooth irregularities to within

allowable tolerances of NOFMA Specification Manual. Apply primer to concrete subfloors avoiding separating the emulsion. Apply two applications of hot asphalt mastic and asphalt saturated felt, then apply an additional layer of asphalt mastic. Provide flat 2 x 4 sleepers, 18 to 30 inches long impregnated with an approved wood preservative and laid in additional asphalt mastic; or apply a polyethylene sheet moisture protection system consisting of two courses of 1 x 2 nailing strips with a layer of polyethylene between, the first course being treated with preservative and adhered to the slab in rivers of mastic supplemented by a 1-1/2 inch concrete nail every 24 inches.

3.1.3 Treated Wood Cuts shall be treated with the original preservative.

3.2. Installation of Wood Strip Flooring:

3.2.1 General: Comply with NOFMA Specification Manual.

3.2.2 Expansion Space: For straight running pattern flooring and depending upon the width of pattern to be laid (usually the width of the room), provide approximately 1/2 inch of expansion space under base and base shoe along length of stripping, with approximately half as much space at ends of pattern.

3.2.3 Machine Sand installed unfinished flooring to remove offsets and non-level conditions.

3.2.4 Field Finish floors by applying a coat of wood paste filler and stain, if needed.

3.2.4.1 Natural Finish: Apply two coats of sealer and two coats of floor wax.

3.2.4.2 Varnish Finish: Apply three coats of floor varnish.

3.2.4.3 Urethane Finish: Apply multiple coats of urethane finish to build a dry film thickness of 1.0 mil.

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SECTION 09566

WOOD BLOCK INDUSTRIAL FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood block industrial flooring. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wood Block Creosoted Flooring shall be yellow pine, Douglas fir, or upland oak, preservative-treated, and in accordance with ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2, 2 1/2, or 3 inches thick, 3 inches wide, and 6 inches long.

2.2 Wood Block Natural Finish Flooring shall be yellow pine or upland oak, preservative-treated. Wood blocks shall be of the species, quality, and size described in ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2 inches thick, 3 inches wide, and 6 inches long.

2.3. Primer, Adhesive, and Filler shall be provided for wood block creosoted flooring.

2.4 Flexible Filler and Clear Industrial Sealer and Finish Coating shall be provided for wood block natural finish flooring.

3.0 EXECUTION:

3.1 Preparation: Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected and all damaged portions of concrete slabs shall have been repaired. If concrete curing compounds or surface sealers have been applied to the concrete slabs, they shall have been entirely removed from the slabs.

3.2 Installation:

3.2.1 For Wood Block Creosoted Flooring, a coat of priming oil shall be applied to the concrete slab. After the priming oil has dried, a squeegee coat of hot adhesive shall be applied. When the adhesive has hardened, the blocks shall be laid tightly together with the grain vertical. After the floor has been laid, two coats of filler shall be applied by squeegee. Expansion joints shall be provided.

3.2.2 For Wood Block Natural Finish Flooring, the joints shall receive filler and multiple coats of clear sealer and finish coating. Number of coats and method of application shall be adjusted to seasonal conditions.

3.3 Marking Lines: Floor surface in areas to receive lines shall be cleaned by scarification or by wire brushing. At least two coats of a marking material compatible with flooring materials shall be applied with suitable brush or spraying machine. The minimum total thickness of the marking lines shall be 4 mils.

## SECTION 09570

### WOOD PARQUET FLOORING

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of wood parquet flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Wood Parquet Flooring shall be kiln-dried, plain-sawed, red oak.

2.2 Laminated (Plywood) Wood Block Flooring shall be prime grade, 12-inch x 12-inch x 1/2-inch nominal size, with manufacturer's standard urethane floor finish. Flooring shall comply with CS233 unless otherwise indicated and shall be tongue and grooved as required for laying in checkerboard pattern.

2.3 Slat Block Flooring shall be clear grade, factory-prefinished with manufacturer's standard penetrating floor sealer treatment. Flooring shall be 9 inches x 9 inches x 5/16 inch, square pattern, tongue and groove, square edge matching and shall comply with PS 27 unless otherwise indicated. Pattern units of flooring shall be factory assembled and adhered to removable paper facing for shipment to the project, or with slats fastened together with metal splines on backs.

2.4 Solid Block Flooring: Wood parquet flooring shall be prefinished in factory. Flooring shall be prime grade, tongue and groove, square edge, matching.

2.5 Plastic Impregnated Parquet Flooring shall be manufacturer's standard fabrication of solid hardwood slat-block parquet flooring, which has been impregnated with acrylic plastic and treated by gamma radiation and factory-finished. Flooring shall be composed of 5/16-inch thick x 6-inch squares fabricated into 12-inch square blocks, square edged, tongued and grooved, with tongue and groove matching.

2.6 Adhesive/Mastic shall be polyvinyl acetate (PVA) or special mastic of type recommended by the flooring manufacturer and complying with flammability and environmental control regulations.

2.7 Finish Materials for Unfinished Flooring:

2.7.1 Stain: Penetrating type non-fading wood stain.

2.7.2 Wood Paste Filler: Fed. Spec. TT-F-336, pigmented if required.

2.7.3 Sealer: TT-S-176, Class I, for white oak and red oak, Class II for beech, birch, and hard maple.

2.7.4 Varnish: Alkyd resin varnish conforming to Fed. Spec. TTV-10930.

2.7.5 Urethane Finish: Moisture curing type, urethane finish conforming to Fed. Spec. TT-C-540.

2.7.6 Floor Wax: Slip-resistant, conforming to Fed. Spec. P-W00158, Type I, Class 2.

2.8 Composition Cork Expansion Strips: Fed. Spec. HH-C-576, Type I-B, Class 2.

2.9 Nails and Screws shall be recommended by NOFMA Specification Manual.

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2.10 Concrete Primer: ASTM D 41.

2.11 Asphalt-Saturated Felt: ASTM D 226.

2.12 Hardboard Underlayment: Fed. Spec. LLL-B-810 and CS251.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 For Adhesive Application on Concrete Slab: Test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent), examine concrete surfaces and grind irregularities to within allowable tolerances of NOFMA Specification Manual, and apply primer to concrete subfloors.

3.1.2 For Adhesive Application on Wood Subflooring or Underlayment: Preparation of subflooring or underlayment shall be in compliance with the printed instructions of the flooring manufacturer.

3.1.3 For Nailed Application on Wood Subflooring or Underlayment: Cover subflooring with a layer of 15-pound asphalt-saturated felt, lap all edges at least 2 inches, and turn felt up at least 2 inches behind baseboards.

3.1.4 For Plastic Impregnated Parquet Flooring: Patch and level concrete subfloors with porous latex cement patching compound. If parquet is to be installed over existing synthetic floor or tongue and grooved subfloor wider than three and one quarter inches, a 1/4-inch plywood or untempered hardboard underlayment.

3.2 Installation:

3.2.1 General: Comply with WSFI specifications for "Mosaic Wood Parquet Flooring," "Laminated Block Flooring," and "Herringbone Flooring" and with CS56 and CS233, as applicable to the flooring type required. Where flammable adhesives are used, provide safety sparkproof fans when natural ventilation is inadequate; prohibit smoking, lighting matches, metal heel caps, or any other flame or spark producing device.

3.2.2 Installation of Wood-Block Flooring on Concrete Slabs shall be by adhesive method.

3.2.3 Installation on Wood Subflooring or Underlayment: Apply one layer of saturated felt over wood or underlayment in troweled adhesive, and apply wood blocks with at least two 7-penny spiral or screw type flooring nails per block.

3.2.4 Installation of Plastic Impregnated Parquet Flooring: Install with special adhesive.

3.2.5 Sanding: Machine sand installed unfinished flooring to remove offsets and non-level conditions.

3.2.6 Field Finishing:

3.2.6.1 Base Finish: On same day that final sanding, buffing, and sweeping have been completed, apply a coat of wood paste filler. Apply stain if needed, then apply two coats of sealer.

3.2.6.2 Natural Finish: When floors are dry apply two coats of wax.

3.2.6.3 Varnish Finish: Apply 3 coats of floor varnish.

3.2.6.4 Urethane Finish: Apply urethane finish to build a dry film thickness of 1.0 mil.

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SECTION 09596

GYMNASIUM FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gymnasium flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Flooring shall comply with MFMA grading rules. Wood strips shall be second grade or better, edge cut, hard maple (acer saccharum), pressure treated, and kiln dried.

2.2 Asphalt Primer: ASTM D 41.

2.3 Asphalt Saturated Felt: Organic, 15 pounds unperforated, complying with ASTM D 226.

2.4 Membrane: 6 mil, carbonized polyethylene sheeting, complying with Fed. Spec. L-P-512.

2.5 Wood Sleepers: No. I common, fir, hemlock, spruce, or yellow pine complying with PS 20, with preservative treatment complying with AWPB LP-2.

2.6 Wood Trim: Provide wood baseboard molding, base shoe molding, and stair risers of same species as the wood flooring. Provide wood stripping, nosings, saddles, and thresholds, of same species and cut as the wood flooring.

2.7 Fibrated Kraft Building Paper: Fed. Spec. UU-B-790, Type 1, Grade D.

2.8 Plywood Subflooring: PS1-74, "C-D INT-APA," with exterior glue; or "C-C EXT-APA."

2.9 Hardboard: Fed. Spec. LLL-B-810 and CS251, specially made for underlayment, 1/4 inch thick.

2.10 Nails: Fed. Spec. FF-N-105 annular, screw or ring type, zinc-coated.

3.0 EXECUTION:

3.1 Installation: Comply with MPHA standards and WSFI standards.

3.2 Expansion Spaces: Provide space at walls and other obstructions, interruptions, and terminations of flooring. Cover spaces with base trim, saddles, and thresholds.

3.3 Resiliently-Mounted Subflooring System: Install two layers of 1/2-inch plywood subflooring over moisture barrier and primed substrate. Nail gymnasium flooring to subflooring.

3.4 Steel Channel Sleeper System: Install moisture barrier over primed substrate. Nail channel sleepers to substrate over resilient channel backer, spaced 12 inches o.c. Lay resilient insulation boards in a continuous course between channel sleepers. Fasten gymnasium flooring with flooring clips.

3.5 Resiliently-Mounted Wood Sleeper System: Install 2 foot or 3 foot wood sleeper units at 12 inches o.c. without anchorage over moisture barrier and primed substrate. Nail gymnasium flooring to wood sleepers.

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3.6 Wood Subflooring and Sleeper System: Anchor sleeper clips to primed substrate, 24 inches o.c., for running sleepers at 16-inch spacing. Flood-coat substrate with 1/8-inch thick pour of hot asphalt. Shim 2 foot or 3 foot wood sleepers level and grout with 1:3 Portland cement-sand grout. Nail clips to sleepers at each

juncture. Nail subflooring on sleepers. Cover subflooring with 30-pound, asphalt-saturated felt, with lapped seams. Install wood strip gymnasium flooring to subfloor.

3.7 Steel Spline Flooring on Vapor Barrier System: Prime concrete slab with asphalt primer before applying two layers of 15-pound, asphalt-saturated felt in asphalt mastic. Cover top layer of felt with a smooth continuous layer of asphalt mastic at least 1/8 inch thick. Lay 12-inch wide continuous strips of finish flooring firmly in asphalt mastic interlocking with aaw-toothed steel splines into the slotted ends.

3.8 Steel Spline Flooring on Cork Underlayment System: Vaporproof slabs on grade as described in Section 3.7. Install 1/2-inch thick corkboard or 1/2-inch thick corkroll underlayment in 1/8 inch of asphalt mastic. Over corkboard, trowel on an additional coat of mastic, 1/8 inch thick. Lay 12-inch wide continuous strips of finish flooring firmly in asphalt mastic interlocking with saw-toothed steel splines into the slotted ends.

3.9 Sanding: Machine sand with coarse, medium, and fine grades of sandpaper, followed by disc sanding with 000 sandpaper. Clean with power vacuum. Proceed immediately with finish.

3.10 Finishing: Apply floor sealer (2 coats). Apply as many coats of gym floor finish as needed to build a minimum dry film thickness of 3 mils. Machine buff with steel wool.

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SECTION 09598

SOFTWOOD FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of softwood flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Douglas Fir wood strip flooring, kiln-dried, vertical grain, complying with the requirements of WCLB for Grade C and better flooring.

2.2 Southern Pine wood strip flooring, kiln-dried, edge grain, complying with the requirements of SPIB for Grade C and better.

2.3 Matching: Tongued and grooved, and end matched.

2.3 Pressure Treatment: Where flooring is exposed to the exterior, provide AWPB LP-2 pressure treatment after manufacture of flooring, followed by drying to required moisture content.

3.0 EXECUTION:

3.1 Plank Flooring: For strip flooring of face width over 3-1/4 inches (plank flooring), install two counter-set nails at each end of each piece and spaced not more than 32 inches along length of each piece. Fill holes with matching wood filler.

3.2 Treated Wood: Whenever treated wood flooring must be cut for installation, treat the cut with the preservative used in the original treatment immediately after cutting.

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SECTION 09651

RESILIENT FLOORING - CEMENTITIOUS UNDERLAYMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious underlayment for resilient flooring. Products shall match existing materials and/or shall be as

directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Cementitious underlayment shall be one of the following factory-mixed types.

2.1 Magnesium Type: Mixture of sand, magnesium, cement, and/or gypsum. Add water before using.

2.2 Latex Type: Mixture of sand, cement, and latex in dry form to which water is added on the job, or two component type in which latex is added as a liquid on job.

2.3 Polyvinyl Acetate Type: Polyvinyl acetate resins, cement, gypsum, and sand mixtures.

2.4 Epoxy Type: Two-component epoxy type that merely requires mixing of the two parts in compliance with manufacturer's instructions.

2.5 Oxychloride Type: Mixture with cement and with or without magnesium.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 On Wood Subfloors lay 15-pound saturated felt in opposite direction to floor boards. Lap edges three inches.

3.1.2 Place Metal Lath nailed at 6-inch centers over felt.

3.2 Installation:

3.2.1 Install Cementitious Underlayment in strict compliance with instructions for the type of system used.

3.2.2 Where Feather Edges less than 1/4 inch thick are required, use a latex type underlayment for such thin parts of the underlayment.

3.2.3 On Concrete Surfaces apply latex or polyvinyl acetate liquid as a bonding agent before installing underlayment.

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## SECTION 09655

### RESILIENT FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer.

Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Critical Radiant Flux: Resilient flooring material shall have an average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with NFPA No. 253.

### 2.2 Resilient Tile Flooring:

2.2.1 Asphalt Tile: Fed. Spec. SS-T-312, Type I, 9 inches by 9 inches by 1/8 inch thick.

2.2.2 Homogeneous Vinyl Tile: Fed. Spec. SS-T-312, Type III, 12 inches by 12 inches by 1/8 inch thick.

2.2.3 Rubber Tile: Fed. Spec. SS-T-312, Type II, 12 inches by 12 inches by 1/8 inch thick.

### 2.3 Resilient Sheet Flooring:

2.3.1 Sheet Vinyl Flooring: Fed. Spec. L-F-475, Type II, Grade A, thickness 0.085 inch, with organic backing, not less than 72 inches wide.

2.3.2 Sheet Rubber Flooring: Solid, integrally colored, 36-inch wide; thickness 1/8 inch.

2.4 Base: -Provide base complying with Fed. Spec. SS-W-40, either Type I rubber or Type II vinyl with matching end stops and preformed or molded corner units with a 4 inch height, 1/8-inch gauge thickness, and standard top-set cove style.

2.5 Resilient Stair Treads: Provide rubber or vinyl stair tread units, full tread width, not less than 1/8 inch at tapered end and 1/4 inch at nosing, with two abrasive strip inserts full width of treads, and curved nosings 1-1/2 inches high.

2.5.1 Resilient Stair Base: Provide rubber or vinyl base, 7-inch cove type, for stair risers to match treads.

2.5.2 Resilient Stringer Skirt: Cut to match riser and tread profile to meet wall base height.

2.6 Resilient Edge Strips shall be 1/8 inch thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, not less than 1 inch wide.

2.7 Metal Edge Strips shall be of width shown and of required thickness to protect exposed edge of resilient flooring. Provide units of maximum available length to minimize number of joints.

### 2.8 Adhesives:

2.8.1 Asphalt Emulsion: Clay type, Fed. Spec. MMM-A-115, Class I.  
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2.8.2 Asphalt Emulsion: Chemical type, Fed. Spec. MMM-A-115, Class II.

2.8.3 Asphalt: Cutback type, Fed. Spec. MMM-A-110.

2.8.4 Adhesives (Cements): As recommended by flooring manufacturer to suit material and substrate conditions.

2.8.5 Cove Base Adhesive: Resin base waterproof adhesive with high initial tack.

- 2.8.6 Lining Felt Adhesive: Fed. Spec. MMM-A-137.
- 2.9 Concrete Slab Primer: Non-staining type.
- 2.10 Asphaltic Slab Primer: Fed. Spec. SS-A-701.
- 2.11 Wax: Fed. Spec. P-W-155.
- 2.12 Latex Underlayment: One-component or two-component factory mixed product containing powdered or liquid latex, cement, and other powders.
- 2.13 Smooth-Linina Felt:
- 2.13.1 Semi-Saturated Felt: Designed for application with vinyl floor covering materials, minimum weight of 0.75 lbs./sq. yd.
- 2.13.2 Asphalt Saturated Organic Felt: ASTM D 226, 15-pound plain.
- 2.14 Crack Filler: Type and brand recommended by floor covering manufacturer.
- 2.15 Hardboard: CS251, untempered type specially made for use as underlayment, 3/16 inch or 1/4 inch thick.
- 2.16 Plywood: PS1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA," 3/4 inch thick unless otherwise noted for subfloors and 1/4 inch thick for underlayment.
- 2.17 Nails: Fed. Spec. FF-N-105, annular, screw, or ring type.
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Concrete Floor Surfaces: Fill large cracks and holes in concrete structural floor slabs with one part nonshrinking cement to three part sand grout with a latex or epoxy additive. Level floors and fill small cracks and holes in concrete or underlayment with a commercial latex or epoxy floor patching compound.
- 3.1.2 Wood Floor Surfaces: Fill knot holes, cracks wider than 1/8 inch, and holes larger than 1/4 inch in diameter with a crack filler as specified for this application. All ridges or other uneven surfaces shall be planed, scraped, or sanded smooth. Nail heads shall be set. Renail wood underlayment and sub-floors where loose using annular or ring type coated nails. Remove and replace rotted, broken, or otherwise unsatisfactory wood subflooring and all other defective materials with new exterior grade plywood of equivalent thickness.

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3.2 Installation:

3.2.1 Environmental Conditions: Spaces in which flooring work is to be performed shall be maintained between 70 F and 90 F at the floor level for at least 48 hours prior to starting the work, during the time work is performed, and for at least 48 hours after the work is completed. A minimum temperature of 55 F shall be maintained thereafter. Adequate ventilation shall be provided to remove moisture and fumes from the area.

3.2.2 Lay Tile From Center Marks established with principal walls, discounting minor offsets, so that tiles at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise indicated.

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#### SECTION 09670

#### FLUID-APPLIED RESILIENT FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fluid-applied resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting

Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

### 2.1. Polyurethane Elastomer Flooring:

2.1.1 Polyurethane Elastomer Flooring shall be a poured-in-place urethane recreational type flooring surface system composed of a two part urethane component system. Components shall be blended and poured as a liquid onto a prepared base. Primer material to provide adhesion of the polyurethane to the base shall be as recommended by the flooring manufacturer. Line paints shall be polyurethane. Flooring color, thickness, durometer hardness, and painted lines shall be as required.

2.1.2 Physical Properties: Material weight shall be approximately 0.83 pound per square foot per 1/8-inch thickness. Tensile strength shall be 200-600 psi in accordance with ASTM D 412. Hardness range shall be 55-65 Shore A-2 in accordance with ASTM D 2240. Elongation shall be limited to 150-350 percent in accordance with ASTM D 412. Compression set shall be 90 percent immediate recovery after 72 hours at 50 percent compression at 72 F in accordance with ASTM D 395. The material shall provide complete resistance to fungus.

3.0 EXECUTION: Base surface preparation shall be in strict accordance with polyurethane flooring manufacturer's recommendations. Cracks and construction joints shall be filled flush with materials recommended by the manufacturer.

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## SECTION 09675

### CONDUCTIVE VINYL TILE FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive vinyl tile flooring. Products shall match existing materials and/or shall be as directed by the

Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Certificate of Conductance: Submit one copy of certificate signed by the Contractor, stating: "Conductive floors were tested by method prescribed in ANSI/UL 779 and were found to have a resistance of less than 1,000,000 ohms and greater than 25,000 ohms."

2.2 Conductive Vinyl Tile: Floor covering shall be of solid, unlaminated construction, manufactured from highest grade materials, with surface smooth, and free from foreign matter. Tile shall be resistant to the action of acids and other materials normally encountered in operating rooms. Tile shall comply with Fed. Spec. SS-T312, Type III and shall be listed by Underwriters' Laboratories, Inc. Elements of tile shall be so proportioned that the electrically conductive components will not be more than 1/4 inch apart on the top surface. The tile flooring shall have an average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with NFPA No. 253.

2.2.1 Tile Size: 1/8 inch by 12 inch by 12 inch tiles, microsquared to ensure tight joints.

2.2.2 Slab Size: 1/8 inch by 36 inch by 36 inch slabs.

2.4 Conductive Adhesive: A two-part chemically setting, water resisting, epoxy adhesive specially formulated for installing conductive vinyl tile. Adhesive shall form a conductive field under tile without use of copper foil strips.

2.4 Epoxy Calking Cement used to seal the perimeter joint shall be a material recommended by the manufacturer of the flooring.

## 3.0 EXECUTION:

3.1 Conductive Tile shall be installed by experienced mechanics under the supervision of factory approved personnel. Install with conductive adhesive. Complete electrical grounding in compliance with the manufacturer's instructions.

3.2 Lay Tile-From Center Marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise directed.

3.3 Cleaning: Three days after installation, conductive vinyl tile flooring shall be cleaned thoroughly. Do not apply wax to conductive flooring.

3.4 Testing: After completion of installation, conductive vinyl tile floors shall be tested by qualified technicians employed by the Contractor. Test shall be done in presence of the Contracting Officer. Testing procedure shall comply with ANSI/UL 779.

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SECTION 09685

## CARPETING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of carpeting. Products shall match existing materials and/or shall be as directed by the Contracting Officer.

Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

### 2.1 Carpet Cushions:

2.1.1 Rubberized Fiber-Hair Cushion: Burlap fabric reinforcing between top and bottom feltings of blended India jute fiber and new animal hair, less than 90 percent fiber and more than 10 percent hair, 5 oz/sq yd or more of rubberized coating on top surface and on bottom surface complying with Fed. Spec. DDD-C-1023, Type II. Weight shall be 39 oz/sq yd.

2.1.2 Ripple-Type Rubber: Sponge or foam rubber, molded with a rippled or waffled bottom surface, with an adhered top reinforcement of burlap or other fabric complying with Fed. Spec. ZZ-C-811, Type I, Class 1 (firm), 1/4 inch thick.

2.1.3 High-Density Foam: Open-cell, homogenized latex-rubber, compounded for maximum moisture and aging resistance with ash and filler content not exceeding 50 percent, skinned-over on bottom surface, reinforced on top surface with an adhered fabric. Waffle pattern shall comply with Fed. Spec. ZZ-C-00811, Type I, Class 1, 1/4 inch thick.

2.1.4 Rebonded Polyurethane: Manufacturer's standard formulation of polyurethane foam and binders, to produce a flat carpet cushion complying with Fed. Spec. L-C-1676, Class I, 3/8 inch thick.

### 2.2 Carpet:

2.2.1 Carpet Fiber (Filament) and Yarn: Fed. Spec. DDD-C-95.

2.2.1.1 Wool: Natural, long staple, virgin wool carpet fiber, not less than 97 percent pure; permanently treated for resistance to insects and mildew.

2.2.1.2 Continuous Hollow Nylon: Continuous multiple hollow-core filament, of manufacturer's standard denier, texturized or crimped for "bulk", delustered with maximum of 15 percent delustrant.

2.2.1.3 Continuous Multilobal Nylon: Continuous nylon filament of approximately 18 denier, in tri-lobal or similar cross section (not round or ovular), texturized for "bulk."

2.2.1.4 Continuous Round Nylon: Continuous round nylon filament, of not less than 15 denier, texturized or crimped for "bulk." delustered with maximum of 15 percent delustrant.

2.2.1.5 Continuous Nylon: Continuous nylon filament of type recommended by carpet manufacturer, approximately 15 denier, texturized or crimped for "bulk," delustered.

2.2.1.6 Staple Nylon: Long staple (approximately 7 inches) nylon fiber, of varying denier and crimp to resemble natural wool, delustered.

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2.2.1.7 Acrylic: Long staple (approximately 7 inches) acrylic fiber, of not less than 15 denier average, crimped to increase "bulk."

2.2.1.8 Modacrylic: Long staple (approximately 7 inches) modified acrylic fiber, modified to increase melting temperature, of not less than 15 denier average, crimped to increase "bulk".

2.2.1.9 Bi-Component Acrylic: Long staple (approximately 7 inches) 2-component acrylic fiber with differential shrinkage characteristic, which imparts spiral crimp for very high “bulk.”

2.2.1.10 Polypropylene: Continuous polypropylene (olefin) filament, of 15 denier minimum, textured for “bulk.”

2.2.1.11 High-Denier Polypropylene: Continuous filament or long staple polypropylene (olefin) fiber, of 75 denier minimum, textured for bulk, produced specifically for felted or needlepunched construction of carpet.

2.2.1.12 Polyester: Long staple (approximately 7 inches) fiber, of 15 denier minimum, textured for “bulk,” specifically compounded for high stain resistance.

2.2.1.13 Nylon-Reinforced Vinyl: Continuous filament nylon thread, coated with vinyl to form a carpet yarn, produced specifically for woven (non-pile) carpet construction.

2.2.1.14 Stain-Resistant Polyester: Long staple (approximately 7 inches) fiber, of 15 denier minimum, unless otherwise indicated, textured for “bulk,” specifically compounded for high stain resistance.

2.2.1.15 Destatic Fiber: Metallic carpet fiber, of stainless steel, aluminum, or other metal, either coated or plain, proven by test of round nylon filament pile carpet to be effective in controlling the static buildup in persons to below 3,000 volts when used in one of the following blends of fiber with ambient condition of 20 percent relative humidity and 70 F temperature, with oak-tanned, leather-soled shoes:

- a. 0.33 percent of stainless steel filament.
- b. 3.0 percent blend of plastic coated aluminum filament.

2.2.1.16 Pile Yarn, General: Provide yarn spun in manner recommended by yarn manufacturer and carpet manufacturer.

2.2.2 Carpet Construction:

2.2.2.1 General: Fabricate carpet by the construction method used in manufacturer's standard process.

2.2.2.2 Pile Density; Pitch and Rows: Fabricate carpet with the spacing of tufts both ways, uniformly spaced by manufacturer's standard method.

2.2.2.3 Variation of Yarn and Density: Wherever the texture or pattern of the completed carpet is not affected and also wherever the effect produced is acceptable to the Contracting Officer, the carpet manufacturer may (at his option) vary both the denier of the yarn and the density of the tufts, provided the product of the two remains constant and equal to the product of yarn denier and tuft density indicated (equal density factor maintained.)

2.2.2.4 Pile Height: Provide pile height as designated.

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2.2.2.5 Primary Backing for Tufting: Provide manufacturer's standard backing material, but not less than one of the following:

2.2.2.5.1 Polypropylene: Woven polypropylene fabric weighing not less than 3.2 oz/sq yd.

2.2.2.5.2 Plastic Fabric: A non-woven fabric of 75 percent polypropylene fibers and 25 percent other plastic fibers, weighing not less than 4.0 oz/sq yd.

2.2.2.5.3 Jute: Woven jute fabric, weighing not less than 9.0 oz/sq yd.

2.2.2.6 Adhesive Binding for Tufting: Provide manufacturer's standard liquid latex or other resinous coating as required to produce the tuft bind strength indicated, but not less than 20 oz coating/sq yd.

2.2.2.7 Backing for Woven Carpet: Provide manufacturer's standard shot (weft), chain (warp), filler, and stuffer yarn, of jute, kraftcord, cotton, or synthetic fibers. Provide the number of yarns per row or pitch of pile as indicated or, if not indicated, provide manufacturer's standard arrangement as needed for strength and to make up the required carpet weight, but provide not less than 2 shot yarns (3 Axminster) and double chain yarn. Provide woven-through-the-back construction.

2.2.2.8 Back Coating for Woven Carpet: Provide manufacturer's standard liquid latex or other resinous coating, but not less than 10 oz/sq yd.

2.2.2.9 Backing for Knitted Carpet: Provide manufacturer's standard chain (warp) yarns of cotton or synthetic fibers and filler yarns of jute or kraftcord. Provide the number of yarns per row or pitch as indicated or, if not indicated, provide manufacturer's standard arrangement as needed for strength and to make up the required carpet weight, but not less than double chain yarns and double overlapping filler yarns.

2.2.2.10 Back Coating for Knitted Carpet: Liquid latex or other resinous coating, shall be more than 14 oz/sq yd.

2.2.2.11 Backing for Fusion-Bonded Carpet: Provide manufacturer's standard jute or synthetic fabric backing with latex or vinyl plastic coating for fusion-bonding of face pile.

2.2.2.12 Backing for Needle-punched Carpet: Type and weight designated or, if not designated, manufacturer's standard backing fabric produced specifically for needle-punching and felting of staple fibers to produce carpet, complying with Fed. Spec. DDD-C-1173 for construction of needle-punched carpet.

2.2.2.13 Secondary Fabric Backing: Provide, as a minimum, 8ounce burlap or jute fabric, laminated to carpet with liquid latex adhesive, to achieve a stripping bond of not less than 2.0 lbs in. (Fed. Std. 191).

2.2.3 Dyeing Method: Carpet shall meet the requirements of both the wet-method color fastness rating of "Good" or better, per Fed. Spec. DDD-C-95, evaluated by Method 5610 of Fed. Test Method Std. 191 and the fade resistance established by the Association of Textile Chemists and Colorists for carpet when tested on the Atlas Fadeometer for the number of hours indicated. If method of dyeing and fade resistance are not indicated, use manufacturer's standard method, as needed to achieve a fade resistance of 40 hours.

2.2.4 Flame Spread: Carpet shall comply to UL 992 flame propagation index of less than 4.0 and Fed. Test Method Std 372, minimum average critical radiant flux of 0.50 watts per square centimeter. Carpet shall pass the methamine tablet test per DOC-FF-1-70 (pill test).

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### 2.3 Bonded Cushion Carpet:

2.3.1 High Density Foam Backing: Open-cell homogenized latex rubber compound for maximum moisture and aging resistance, with ash or filler content not exceeding 50 percent, skinned-over on exposed surface, complying with Fed. Spec. DDD-C-95, Class I, 38 oz/sq yd, 1/8 inch thick. Compression resistance

shall be 5 pounds minimum. Compression set shall be 15 percent maximum. Provide special formulation, tested with carpet for flame spread rating of less than 75 when by the tunnel test of ASTM E 84, or flame propagation index of less than 4.0 when tested by the UL chamber test, UL 992. Carpeting and cushion shall be tested together.

2.3.2 Primary Backing: Polypropylene weighing 3.5 oz/sq yd minimum.

2.3.3 Bonded Cushion Backing: Provide cushion bonded to carpet to achieve a stripping bond of not less than 2.0 lbs/in (Fed. Std. 191), either cured-in-place or laminated sheet stock. At manufacturer's option, back coating used as tuft binding may be decreased or eliminated with the use of cured-in-place backing, provided required tuft bind strength is achieved.

2.4 Adhesive for Carpet: Waterproof, release type adhesive as recommended by the carpet manufacturer or cushion manufacturer. Provide adhesive that complies with flame spread rating required for the carpet installation, if any.

2.5 Adhesive for Seams: Waterproof, nonstaining adhesive furnished or recommended by the carpet manufacturer that complies with flame spread rating required for the carpet.

2.6 Carpet Edge Guard: Bend-down type of formed or extruded aluminum carpet edge guard stripping. Form units with concealed teeth to grip the carpet from below.

2.7 Tackless Carpet Stripping: Water-resistant plywood stripping, with angular pins protruding from the top. Provide stripping with 2 rows of pins wherever the carpet width is less than 20 feet and with 3 rows of pins wherever carpet width is 20 feet or more. Provide prenailed stripping, ready for anchorage to concrete or similar substrate.

2.8 Tape:

2.8.1 Cushion Tape: Single Face cloth, 2 inches wide.

2.8.2 Carpet Tape: Double-face cloth, 2 inches wide.

2.8.3 Seam Tape: Paperback, for latex sewing, 4 inches wide.

2.8.4 Seam Tape: Heat bonding, 4 inches wide.

2.9 Seam Thread: No. 18 waxed linen.

2.10 Masonry Nails: No. 9 (0.148 inch x 1 inch) hardened masonry nails, Fed. Spec. FF-N-105.

2.11 Latex Underlayment: One- or two-component, factory-mixed product containing powdered or liquid latex, cement, and other powders.

2.12 Crack Filler: Type and brand recommended by carpeting manufacturer.

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2.13 Hardboard: CS251, untempered type specially made for use as underlayment, 3/16 inch or 1/4 inch thick.

2.14 Plywood: PS-1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA", 3/4 inch thick unless otherwise noted for subfloors and 1/4 inch thick for underlayment.

2.15 Nails: Fed. Spec. FF-N-105 annular, screw or ring type.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Fill Large Cracks and Holes in concrete structural floor slabs with a one-part, nonshrinking cement to three-part sand grout with a latex or epoxy additive. All ridges or other uneven surfaces shall be ground smooth; chalky or dusty surfaces shall be primed.

3.1.2 Level Floors and fill small cracks and holes in concrete or underlayment with a commercial latex or epoxy floor patching compound.

3.1.3 Wood Floor Surfaces: Knot holes, cracks wider than 1/8 inch, and holes larger than 1/4 inch in diameter shall be filled with a crack filler as specified for this application. All ridges or other uneven surfaces shall be planed, scraped, or sanded smooth.

3.1.4 Wood Underlayment and Subfloors shall be renailed where loose.

3.1.5 Rotted, Broken or Otherwise Unsatisfactory Wood Subflooring and all other defective materials shall be removed and replaced with new.

3.1.6 Undercut Wood Door Bottoms as required to allow clear door swing over newly carpeted areas.

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3.2 Installation:

3.2.1 Install Carpet Edge Guard at every location where edge of carpet is exposed to traffic, except where another device, such as an expansion joint cover system or threshold, is indicated with an integral carpet binder bar.

3.2.2 Installation On Stairs: Install carpet by nailing or other secure method recognized to be durable and safe for traffic on stairs. Conceal edges. Avoid seams at points of high wear (nosings and treads). Cushion on stairs shall be twice the thickness of cushions on floor.

## SECTION 09710

### MAGNESIUM OXYCHLORIDE FLOORING

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of magnesium oxychloride flooring and base. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Magnesium Oxvchloride Composition: Manufacturer's standard product shall comply with Mil. Spec. MIL-D-16680. Color to be used will be selected by the Contracting Officer from manufacturer's standard colors.

2.1.1 **Mixing Solution:** Magnesium chloride flake in a 22 degree Baume solution.

2.1.2 **Physical Properties** when tested in compliance with Mil. Spec. MIL-D-16680:

Fire Resistance: Incombustible

Water Absorption: Less than 7 percent

Abrasion Resistance: 0.072 inch

Impact Resistance: 0.031 inch; no chipping, crackling or detachment.

2.2 Saturated Felt: ASTM D 250, 15-pound type.

2.3 Expanded Metal Lath: Fed. Spec. QQ-L-101, diamond mesh pattern, expanded copper alloy steel, weighing 3.4 pounds per square yard.

2.4 Bonding Agent: Trowel-applied bonding medium made by manufacturer of magnesium chloride.

#### 3.0 EXECUTION:

3.1 Environmental Conditions: Installation shall not be started unless ambient temperature of area in which the work occurs is at least 50 F and rising and is maintained above 50 F without interruption while the work is being done and for at least three days after the completion of the work.

#### 3.2 Preparation:

3.2.1 Concrete Floors shall be clean and free from all grease, dirt, paint ' and all other foreign matter and shall be completely dry prior to flooring installation.

3.2.2 Wood Floors shall be structurally sound, firmly nailed, free of vibration, and broom clean. Lay felt over wood in opposite direction to joints in wood and overlap edges 3 inches.

3.3 Installation: Apply flooring and base to a uniform 1/2-inch thickness and steel-trowel to a uniform smooth density. Where cover base is installed over wood, trowel material on metal lath. Light traffic may be permitted 24 hours after installation and heavy traffic after 3 to 5 days.

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SECTION 09720

## EPOXY FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of epoxy flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 General: Component materials for any one flooring type shall be from a single manufacturer. Cove bases of flooring material shall be provided if required.

2.2 Epoxy Quartz Chip Flooring, shall be decorative floor surfacing system consisting of primer; topping including epoxy resin, hardener, and ceramic-coated quartz aggregate; and finish coat or coats. Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,800 psi (ASTM C 579), a flexural strength of 6,000 psi (ASTM C 580), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.06 percent (ASTM C 413). Tests of chemical resistance of cured resin, when immersed for 7 days in reagents (Fed. Std. 406, Method 7011), shall show no effect from ammonium hydroxide, carbon tetrachloride, citric acid, dimethyl formamide, formaldehyde (3 percent), heavy-duty detergent, heptane, hydrogen peroxide (28 percent), lactic acid, oleic acid, phenol solution, sodium carbonate (20percent), sodium chloride (10 percent), sodium hydroxide (60 percent), sodium hypochlorite, sulfuric acid (30 percent), and urine.

2.3 Epoxy Flooring shall be industrial floor surfacing system consisting of primer; topping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Physical properties of topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 7,500 psi (ASTM C 579), a tensile strength of 1,750 psi (ASTM C 307), a flexural strength of 3,000 psi (ASTM D 790), and a maximum thermal coefficient of linear expansion of 20 by 101-61 in/in/degrees F (ASTM D 696). The extent of burning shall be 0.25 inches maximum (ASTM D 635). Minimum bond strength shall be 200 psi, with 100 percent concrete failure (ACI 503, Appendix A). Abrasive resistance shall be 0.20 grams maximum (ASTM D 1044, 1,000 Grams, 1,000 Cycles). Impact strength, except topping bonded to concrete, shall be 0.05, with no chipping, cracking, or detachment of surfacing from concrete (MIL-D-3134, Para. 4.7.3). Tests of chemical resistance of cured resin when immersed 7 days in reagents (Fed. Std. 406, Method 7011), shall show no effect from acetic acid (5 percent), ammonium hydroxide (10 percent), citric acid (50 percent), cola syrup, fatty acid, motor oil (20W), hydrochloric acid (10 percent), salt water, sodium hydroxide (10 percent), sulfuric acid (10 percent), trisodium phosphate (5 percent), and water (distilled). There shall be only slight softening from ethyl alcohol (95 percent), jet fuel JP-4C, and mineral spirits. There shall be no effect but slight stain from nitric acid (10 percent).

2.4 Chemical-Resistant Epoxy Flooring shall be chemical-resistant floor surfacing system consisting of primer; topping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,500 psi (ASTM C 579), a flexural strength of 2,080 psi (ASTH C 580), an impact strength of 120 in. lbs (ASTM D 2794), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.04 percent (ASTM C 413). Tests of chemical resistance of cured floor urfacing system, when immersed for 7 days in reagents listed (Fed. Std. :06, Method 7011), shall show no effect from acetic acid (100 percent), chromic acid (10 percent), citric acid (20 percent), formaldehyde (37 percent), heavy-duty detergent, hydrochloric acid (37 percent), hydrogen peroxide (28 percent), lactic acid (85 percent), mineral spirits, nitric acid (40 percent), oleic acid, oxalic acid (10 percent), phosphoric acid (85 percent), potassium hydroxide (50 percent), sulfuric acid (75 percent), tannic acid (20 percent), tartaric acid (10 percent), and urine.

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2.5 Epoxy Terrazzo Flooring shall be decorative floor surfacing consisting of primer, thermosetting epoxy resin matrix, decorative mineral aggregate, epoxy grout, and sealer. Heavy brass, 1/4-inch divider strips, and

expansion joints shall also be provided as required. Materials shall conform to applicable National Terrazzo and Mosaic Association (NTMA) publications. Flooring, when tested in accordance with the standards, shall show no toxicity. Epoxy terrazzo flooring shall be self-extinguishing when tested in compliance with ASTM D 635.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Concrete Surfaces shall comply with ASTM C 811 unless otherwise indicated or required by manufacturers, instructions.

3.1.2 Wood Floors shall have contaminants removed by sanding, solvent cleaning, detergent cleaning, or other methods as required.

3.1.3 Primer Shall Be Applied over prepared substrate.

3.2 Installation:

3.2.1 Epoxy Quartz Chip Flooring, Epoxy Flooring and Chemical Resistant Epoxy Flooring shall have a topping mix of aggregates and/or fillers trowel-applied to the following thicknesses:

- a. Epoxy quartz chip flooring: 1/4 inch.
- b. Epoxy flooring: 3/16 inch.
- c. Chemical-resistant epoxy flooring: 1/4 inch.

Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations indicated to form base with cove of radius and height designated. All interior and external corners of base shall be rounded.

3.2.2 Epoxy Terrazzo Flooring shall be applied according to NTMA recommendations and as follows. A 1/4-inch thick aggregate/filler topping mix and recommended curing compound shall be applied and the surface shall then be ground, rinsed, grouted, and reground. Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations designated to form base with cove of radius and height indicated. All interior and external corners of base shall be rounded.

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SECTION 09731

CONDUCTIVE ELASTOMERIC LIQUID FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive elastomeric liquid flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Carbon Black shall comply with ASTM D 561.

2.2 Acrylic/Urethane shall be water dispersed acrylic resin mixed with dry components and aggregates. Material shall comply with Mil. Spec. MIL-D-3134. Factory pre-mixed with carbon black.

2.3 Acrylic shall be modified high strength acrylic resin mixed with dry component powders with tensile strength of 4,890 psi, bond strength of 290 psi, and flexural strength of 1,650 psi, minimums, complying with Mil. Spec. MIL-D-3134.

2.4 Neoprene Rubber shall be water-phase neoprene rubber composition complying with NTMA Specifications, with tensile strength of 245 psi, bond strength to concrete of 255 psi, and compressive strength of 2,600 psi, minimums.

2.5 Latex shall be specially formulated, emulsion resin mixed with dehydrated powders. Comply with Paragraphs 3.4 through 3.22 of Mil. Spec. MIL-D-3134, except Paragraph 3.7 shall not apply.

2.6 Epoxy Emulsion shall be 100 percent non-volatile, thermosetting, two-part epoxy resin matrix with tensile strength of 4,000 psi, bond strength of 200 psi, and compressive strength of 14,000 psi.

2.6.1 Water-Emulsified Epoxy Resin shall have the following characteristics:

Viscosity: 180 centipoises at 25 C.  
Specific weight: 9.2 pounds per gallon.  
Color: opaque white.  
Solids (minimum): 59 percent.  
Stable after five freeze-thaw cycles.

2.6.2 Water Emulsified Hardener shall have the following characteristics:

Viscosity: 160-190 centipoises at 50 C  
Specific weight: 8.6 pounds per gallon.  
Solids (minimum): 75.0 percent.  
Stable after five freeze-thaw cycles.

2.7 Polyacrylate: A polyacrylate hydraulic cement copolymer and dry coreactant composite shall comply with requirements of Mil. Spec. MIL-D-3134.

2.8 Polyester: Thermosetting polyester topping resin, catalyst, and premixed fillers shall all comply with MIL-A-52767, with tensile strength of 5,000 psi, compressive strength of 14,000 psi, and bond strength of 200 psi, minimums.

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2.9 Fillers: Inert mineral or cellulosic material best suited for the resin binders shall be used. Filler in quantity necessary to impart required physical characteristics shall be furnished with particle size not greater than

3/16 inch in any dimension and shall contain sufficient fines to provide an even-textured, nonslip type of surface on the finished topping.

2.10 Primer shall be material that will penetrate into pores of substrate. Primer shall bond with topping to form a permanent monolithic bond between the substrate and the topping.

3.0 EXECUTION:

3.1 Environmental Conditions: Elastomeric liquid flooring installation shall not be started unless ambient temperature of area in which the work occurs is at least 50 F. and rising, and is maintained above 50 F. without interruption while the work is being done and for at least three days after the completion of the work.

3.2 Installation: Renail wood subfloors where loose, using annular or ring type zinc-coated nails. Remove and replace rotted, broken, or otherwise unsatisfactory wood subflooring and all other defective materials.

3.3 Installation of Concrete Floors: Roughen surfaces that are glossy, painted, or have loose surface material. Fill large cracks and holes.

3.4 Cleaning: Thoroughly clean all surfaces to receive flooring to remove all grease, oil, wax, dirt, dust, and other foreign matter.

3.5 Topping: Install topping 1/8 inch thick for epoxy type and 1/8 to 3/8 inch thick for other types.

3.6 Bases shall be cover type cast-in-place with 1-inch radius cover and shall be 6 inches high.

3.7 Finish or Sealer Coat shall be applied.

3.8 Testing: After completion of installation, test conductive floors. Test must prove that conductive floors comply with all requirements of ANSI/UL 779.

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SECTION 09740

## HEAVY-DUTY CONCRETE FLOOR TOPPING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of heavy-duty concrete floor topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Portland Cement: Comply with ASTM C 150, Type I or Type III.

2.2 Aggregate: Selected, clean, hard, and tough material, either crushed or natural, as approved by the Contracting Officer. Trap rock, granite, quartz, corundum, or manufactured products such as silicon carbide or heat-treated aluminum oxides are acceptable. They shall comply, in all respects except gradation, with ASTM C 33.

2.3 Water shall be clean, fresh, potable water approved by public health authorities for domestic consumption.

### 3.0 EXECUTION:

3.1 Preparation: Roughen surfaces of present concrete that are glossy, painted, or have loose surface material. Clean and sweep thoroughly to remove all grease, oil, wax, dirt, sand, dust, and all other foreign matter.

3.2 Installation: Nominal mixture shall be one part of Portland cement, one part of fine aggregate, and two parts of coarse aggregate by volume. Not more than four gallons of mixing water shall be used for each bag of Portland cement in the mixture. Mixing of concrete shall continue for at least one minute after all ingredients are in mixer.

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SECTION 09741

## ARMORED FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of armored flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Premixed Topping: Specially factory formulated topping mix of Portland cement, ASTM C 150 Type I or III, iron aggregate and plasticizer designed to produce 28 day compressive strength of over 8,000 psi.

2.2 Water: Water shall be clean, fresh, potable water approved by public health authorities for domestic consumption.

### 3.0 EXECUTION:

3.1 Preparation: Roughen surfaces of present concrete floor that are glossy, painted, or have loose surface material. Clean and sweep thoroughly to remove all grease, oil, wax, dirt, sand, dust, and all other foreign matter.

3.2 Installation: Mix premixed topping and water in a paddle type mixer for three minutes. Place topping over prepared concrete slab to a thickness of 3/4 to one inch. Float and machine trowel as recommended by manufacturer. A shake of premixed topping shall be added. Hand trowel to a smooth hard finish. Cure by applying curing membrane complying with ASTM C 309.

## BRICK FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of brick flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

#### 2.1 Brick Materials:

2.1.1 Light Traffic Paving Brick: ASTM C 902, Class SX, MX, or NX, Type 1, II, or III, Application PS, PX, or PA.

2.1.2 Chemical-Resistant Brick: Solid brick, ASTM C 279, Type H or L.

2.1.3 Industrial Floor Brick: Solid brick, ASTM C 410, Type T, H, M, or L.

2.1.4 Base: Matching base shall be provided at walls and vertical elements, including stretcher units, internal and external corners, stops, and other locations as required. Type shall be squaretop cove, round-top cove, or turn-up base.

2.1.5 Lining Units shall be brick units matching floor brick for lining pits and trenches and for curbs and pads occurring in floor brick field. Provide special trim shapes for continuous coverage of substrates.

2.1.6 Temporary Coating: Wax shall be compatible with cleaning method required to remove wax without damage to grout or brick.

#### 2.2 Setting Materials:

##### 2.2.1 Mortarless Applications:

2.2.1.1 Roofing Felt: ASTM D 226, 15-pound asphalt-saturated felt.

2.2.1.2 Fine Aggregate for Setting Bed: ASTM C 144 or stone screenings.

2.2.1.3 Sand for Joints: ASTM C 144, free of clay particles.

##### 2.2.2 Portland Cement Applications:

2.2.2.1 Portland Cement: ASTM C 150. Type I, natural color or white, to produce the required color of mortar or grout.

2.2.2.2 Aggregate: ASTM C 144 or C 404, or both.

2.2.2.3 Liquid Admixture for Setting Bed and Grout: Liquid latex mortar additive with a compressive strength of 3,000 psi, bond strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at an ozone concentration of 200 pphm and water absorption of 4 percent maximum.

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2.2.2.4 Bond Coat Admixture: High strength liquid latex mortar additive with a compressive strength of 5,000 psi, bond strength of 500 psi, tensile strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at 200 pphm, and water absorption of 4 percent maximum.

2.2.2.5 Pigments: Commercial iron oxide, manganese dioxide, ultra-marine blue, chromium oxide, or carbon black, suitably compounded for use in mortar mixes.

2.2.2.6 Water: Clean and free of deleterious materials which would impair strength or bond.

2.2.3 Chemical-Resistant Mortar and Grout:

2.2.3.1 Sulfur Mortar: ASTM C 287, with silica or carbon filler.

2.2.3.2 Resin Mortar: Liquid resin and filler material shall comply, with ASTM C 395. Resin shall be phenolic, furan, polyester, epoxy, or vinyl ester. Filler shall be silica or carbon.

2.2.3.3 Resin Grout: ASTM C 658, epoxy or furan.

2.2.3.3 Chemical-Resistant Membrane: Multiple-component asphaltic system consisting of asphalt primer and bituminous-coated glass fiber cloth-embedded in hot-melt asphalt compound.

2.2.3.5 Expansion Joint Filler: Elastomeric sealant of type recommended and produced by mortar/grout manufacturer for type of application indicated. Include primer and backer rod where required.

2.2.4 Miscellaneous Materials:

2.2.4.1 Cleavage Membrane: 15-pound asphaltic felt, ASTM D 226. Type I. or 4-mil polyethylene sheeting, ASTM C 171.

2.2.4.2 Setting Bed Reinforcement: 2 inches by 2 inches, 16/16, welded wire fabric.

2.2.4.3 Sealer: Phenolic type or acrylic base non-slip material.

3.0 EXECUTION:

3.1 Expansion and Control Joints: Provide sealant-filled joints at locations and widths required. Install expansion joint filler where sealant type joints are required in chemical-resistant flooring.

3.2 UngROUTED Mortarless Brick Flooring:

3.2.1 Cushioning Material: Install roofing felt, two layers with edges butted to achieve uniform thickness, and fine aggregate setting bed screeded to depth required.

3.2.2 Lay Bricks and fill joints with sand. After all bricks are in place and all joints are filled, remove excess sand.

3.3 Latex-Modified Portland Cement Applications:

3.3.1 Apply Cement Slush Coat not to exceed 1/16 inch thickness.

3.3.2 Mix Portland Cement, Sand, and Liquid Admixture.  
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3.3.3 Spread and Screed Setting Bed to uniform thickness at subgrade elevations required.

3.3.4 Place Brick before initial set of cement occurs. Tamp and beat bricks to obtain full contact with setting bed.

- 3.3.5 Grout Joints as soon as possible after initial set of setting bed and cure grout.
- 3.4 Chemical-Resistant Sulfur Mortar Applications shall comply with ASTM C 306 unless otherwise directed.
- 3.5 Chemical-Resistant Resin Mortar Applications:
  - 3.5.1 Bricklaying: Except as otherwise directed, bricklaying shall comply with ASTM C 399.
  - 3.5.2 Tile Setting: Except as otherwise directed, tile setting shall comply with ANSI/ASTM C 723.
  - 3.5.3 Chemical-Resistant Membrane: Provide chemical-resistant asphaltic membrane system over concrete substrates under chemical resistant mortar applications where directed.
  - 3.5.4 Set Bricks on Vertical Surfaces in compliance with ASTM C 399, using either resin mortar or sulfur as bed joint material, as required.
- 3.6 Chemical-Resistant Cement Mortar and Resin Grout Applications:
  - 3.6.1 Application of brick in hydraulic cement mortar setting bed shall comply with ASTM C 398. Grouting joints with resin grout shall comply with ASTM C 723, unless otherwise directed.
  - 3.6.2 Install Cleavage Membrane as required.
  - 3.6.3 Reinforce Setting Bed with welded wire fabric as required.

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SECTION 09751

LIGHT-DUTY BRICK FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of light-duty brick flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Floor Brick (Brick Pavers): ASTM C 62, Grade SW, solid uncored brick, 1-1/4 inches thick by 3-1/4 inches by 8 inches.

2.2 Paving Brick: ASTM C 902, solid uncored brick of size selected by the Contracting Officer.

2.3 Masonry Mortar: ASTM C 270, Type M.

2.4 Portland Cement: ASTM C 150, Type I.

2.5 Aggregate for Masonry Mortar: ASTM C 144.

2.6 Hydrated Lime: ASTM C 207, Type S.

2.7 Aggregate for Cement Setting Beds: Sand as recommended in ASTM C 404.

2.8 Aggregate for Grout: Sand as recommended in ASTM C 404.

2.9 Pigments: Inert mineral oxides or carbon black.

2.10 Sand Setting Bed: ASTM C 33.

2.11 Commercial Cement Grout: Proprietary compound of Portland cement and additives.

2.12 Cleavage Membrane: 15-pound asphalt felt or 4-mil polyethylene sheeting.

2.13 Setting Bed Reinforcement: 2-inch by 2-inch, 16/16, welded wire fabric, ASTM A 185.

3.0 EXECUTION:

3.1 General Requirements: Do not use brick with chips, cracks, voids, discolorations, and other defects. Cut brick shall have clean, sharp, unchipped edges. Use full units without cutting wherever possible. Set brick with uniform joints.

3.2 UngROUTED Applications: Place sand setting bed and compact by tamping. Set brick closely together, and sweep fine sand over surface to fill joint irregularities.

3.3 Portland Cement Applications:

3.3.1 Preparation of Subbase: Clean subbase to remove dirt, dust, debris, and loose particles.

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3.3.2 Install Cleavage Membrane and provide folded membrane material at overlapping edges to form lock joints.

3.3.3 Apply Slush Coat of cement grout over surface of concrete subbase about 15 minutes prior to placing setting bed.

3.3.4 Setting Bed: Mix one bag of Portland cement to 3 cu. ft. of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of brick. Install reinforcing mesh if over a wood substrate.

3.3.5 Wet Brick several hours before laying. Do not lay bricks with free water on the surface.

3.3.6 Set Brick before initial set of cement bed occurs. Do not set brick on dry bed. Set and level each brick immediately.

3.3.7 Grout Joints as soon as possible after initial set of setting bed. Force grout into joints, strike flush, and tool slightly concave.

3.3.8 Use Portland Cement Grout mixed in the proportion of one bag of Portland cement to 2 cu. ft. of sand mixed with water to the consistency of heavy cream.

3.4 Masonry-Mortar Applications:

3.4.1 Mix Mortar to comply with ASTM C 270 Proportion Specifications for Type mortar.

3.4.2 Install Brick in bed joints of mortar with vertical joints filled with mortar. Remove excess mortar promptly as the work progresses.

3.4.3 Strike Joints flush with top surface of brick and tool slightly concave.

3.5 Pointing: During the tooling of joints, enlarge voids or holes and completely fill with mortar or grout.

3.6 Cleaning: Remove excess mortar/grout from exposed brick surfaces, wash, and scrub clean. Rinse with clean water.

3.7 Sealing and Waxing: After cleaning, apply a neutral sealer to brick flooring, and when dry, apply a suitable floor wax recommended for brick floors.

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SECTION 09791

STANDARD FLOOR TREATMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for standard floor treatments for terrazzo, ceramic tile, oxychloride, concrete, and resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Cleaning Compound: A liquid chemical cleaner containing nonionic and anionic type detergents, non-reactive to flooring. Compound shall have no free metal alkalies, no artificial coloring, and no fatty acids. Compound shall be UL listed as "slip-resistant."

2.2 Stripper: An ammoniated stripper that will penetrate and loosen wax films without damaging flooring. Stripper shall be nonflammable and phosphate-free with a flash point of none to boiling.

2.3 Wax: Water-emulsion type, self polishing, made from 100 percent No. I prime Carnauba wax, UL listed as "slip-resistant."

2.4 Polish: Metal cross-linked copolymer, slip-resistant polish. Polish shall dry to clear gloss without buffing.

2.5 Sealer: Penetrating type seal that will fill pores and leave a clear, hard, non-flaking, non-tracking finish. Sealer shall be UL listed as to slip resistance.

## 3.0 EXECUTION

### 3.1 Preparation and Installation:

#### 3.1.1 Terrazzo and Oxychloride Floors:

3.1.1.1 Clean floors with a neutral liquid cleaner with pH factor as near seven as possible.

3.1.1.2 Apply two coats of sealer, and buff with electric polishing machine.

3.1.2 Ceramic Tile Floors: Scrub thoroughly using a neutral liquid cleaner, and apply one coat of Penetrating sealer.

#### 3.1.3 Concrete Flooring:

3.1.3.1 Scrub thoroughly using a neutral liquid cleaner. Apply stripper to remove stubborn grease, waxes, and polishes.

3.1.3.2 When floor is clean and dry, apply two coats of penetrating sealer.

#### 3.1.4 Resilient Flooring:

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3.1.4.1 Scrub with a light solution of neutral chemical cleaner. Use a stripper to remove build-up of old wax and polishes. Rinse clean, and allow to dry.

3.1.4.2 Apply two coats of wax and machine polish.

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## SECTION 09792

### FLOOR TREATMENT NON-SLIP COATINGS ON CONCRETE FLOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for non-slip coatings on concrete floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: A combination of pigmented two-part high solids urethane resin and a select gradation of sand shall be used. Color shall be selected from manufacturer's standard colors.
- 2.1 Tensile Strength and Elongation: Tensile strength shall be 580 psi, and elongation shall be 57 percent all complying with ASTM D 412.
- 2.2 Water Absorption: Coatings shall not absorb water, in accordance with ASTM D 570.
- 2.3 Coefficient of Friction shall comply with ASTM D 1894.
- 2.4 Abrasion Resistance shall be ASTM D 1044 Taber Abraser, H-18 wheel, 1 kg load. Weight loss shall be 0.20 grams after 1,000 cycles.
- 2.5 Impact shall be by a 2-pound falling ball at 150 inch-pounds pressure, 0.05 inch maximum indentation with no cracking.
- 2.6 Chemical Resistance shall be non-staining to most common chemicals, such as 10 percent acetic acid, 10 percent citric acid, 10 percent sodium hydroxide, and ethyl alcohol.
- 3.0 EXECUTION: Concrete Floors shall be either acid etched or sand blasted. Surface to be coated shall be clean, dry, and free from surface contaminants.

## SECTION 09793

### FLOOR TREATMENT - REFINISHING WOOD FLOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for refinishing wood floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Cleaning Compound: A liquid chemical cleaner containing nonionic and anionic type detergents, non-reactive to wood flooring. Compound shall have no free metal alkalies, no artificial coloring and no fatty acids. Compound shall be UL listed as "slip-resistant."

2.2 Varnish Remover: Non-flammable paint and varnish remover.

2.3 Stain: Penetrating type non-fading wood stain.

2.4 Wood Filler: Paste type wood filler, pigmented if necessary to match sample, complying with Fed. Spec. TT-F-336.

2.5 Floor Sealer: Penetrating type, pliable, wood-hardening finish/sealer.

2.6 Floor Varnish: Alkyd resin varnish, specially compounded for floor finish, Fed. Spec. TT-V-109.

2.7 Urethane Finish: Specially compounded for wood floor finish, moisture curing type, for multiple-coat application.

2.8 Floor Wax: Liquid, solvent-type, slip-resistant, Fed. Spec.P-W-158, Type I, Class 2.

#### 3.0 EXECUTION:

##### 3.1 Preparation:

3.1.1 Cleaning: Scrub thoroughly with cleaning compound and warm water. Rinse with clean water, mop dry, and buff with polishing machine.

3.1.2 Varnish Removal: Apply paint and varnish remover as required.

3.1.3 Sanding: Traverse floors two times with an electric powered sanding machine. A rotary disc sander may be used for the final cut, but first cut shall be made with a drum-type machine. The first cut may be made crosswise of the grain or at a 45-degree angle. Make second cut in direction of grain. Use No. 1/2 sandpaper for first traverse and No. 0 for second traverse. Use an electric edger or hand sander for sanding areas near walls, in corners, and small closets.

##### 3.2 Installation:

3.2.1 Apply Wood Paste Filler, followed by wiping cross-grain to work into pores and cracks.

3.2.2 Apply Stain if needed to match selected finish.

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3.2.3 Apply Sealer (2 coats) complying with Fed. Spec. TT-S-176. Use Class I for white oak and

red oak floors and Class II for beech, birch, and hard maple floors.

3.2.4 Apply Floor Varnish, (3 coats) buffing after each coat. First coat may be thinned as a sealer.

3.2.5 Apply Urethane Finish. Apply as many coats as needed to build a dry film thickness of 1.0 mil.

3.2.6 When Floors are Dry, apply two coats of wax complying with Fed. Spec. P-W-155; concentration 12 percent. Spread the wax at the rate of 1,500 square feet per gallon and polish the floors with a weighted floor brush or an electric polisher.

3.2.7 Protection: Upon completion of work, cover all traffic areas immediately with nonstaining kraft paper or polyethylene, taped along edges, and maintain floor protection until acceptance.

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SECTION 09910

## EXTERIOR PAINTING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of paint to exterior surfaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Painting materials for the exterior surfaces indicated shall conform to the following Federal and Military Specifications:

2.1 Concrete:

TT-P-19 Paint, Acrylic Emulsion, Exterior

2.2 Concrete Masonry Units:

TT-F-1098 Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.).

TT-P-19 Paint, Acrylic Emulsion, Exterior.

TT-P-55 Paint, Polyvinyl Acetate Emulsion.Exterior.

TT-P-97 Paint, Styrene-Butadiene Solvent Type, White (for Exterior Masonry).

TT-P-1181 Paint Styrene-Acrylate Solvent Type, Tints and Deep Tones (for Exterior Masonry).

2.3 Stucco:

TT-F-1098 Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.).

TT-P-19 Paint, Acrylic Emulsion, Exterior.

TT-P-55 Paint, Polyvinyl Acetate Emulsion, Exterior.

TT-P-97 Paint, Styrene-Butadiene Solvent Type, White (for Exterior Masonry).

TT-P-1181 Paint Styrene-Acrylate Solvent Type, Tints and Deep Tones (for Exterior Masonry).

2.4 Asbestos Cement:

TT-P-19 Paint, Acrylic Emulsion, Exterior

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2.5 Wood, Unpainted:

TT-P-001984 Primer Coating, Latex Base,  
Exterior (Undercoat for Wood), White and Tints.

MIL-P-28582 Primer Coating, Exterior, Lead Pigment-Free (Undercoat for  
Wood, Ready-Mixed, White and Tints).

2.6 Wood, Primed:

TT-P-19 Paint, Acrylic Emulsion, Exterior.

TT-P-31 Paint, Oil: Iron-Oxide, Ready Mixed, Red and Brown.

TT-P-37 Paint, Alkyd Resin, Exterior Trim, Deep Colors.

TT-P-102 Paint, Oil, Alkyd Modified, Exterior, White and Tints.

TT-P-1510 Paint, Latex, Exterior, for Wood Surfaces, White and Tints

2.7 Wood, Decks and Porches, Primed and Unpainted:

TT-E-487 Enamel: Floor and Deck.

2.8 Wood, to Receive Stain:

TT-S-708 Stain, Oil; Semi-Transparent, Wood, Exterior.

TT-S-001992 Stain, Latex, Exterior for Wood Surface.

2.9 Concrete Walls and Floors Of Swimming Pools:

TT-P-95 Paint, Rubber: For Swimming Pools and Other Concrete  
and Masonry Surfaces.

2.10 Ferrous Metals, Ungalvanized

TT-P-86 Paint, Red-Lead-Base, Ready-Mixed.

TT-P-615 Primer Coating: Basic Lead Silico Chromate, Ready Mixed.

TT-P-645 Primer, Paint, Zinc-Chromate,  
Alkyd Type.

2.11 Ferrous Metals, Galvanized, but Unpainted:

TT-P-641 Primer Coating: Zinc Dust-Zinc  
Oxide (for Galvanized Surfaces).

MIL-P-26915 Primer Coating, Zinc Dust Pigmented, for Steel Surfaces.

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2.12 Ferrous Metals, Primed:

TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces).

TT-E-1593 Enamel, Silicone Alkyd Copolymer, Gloss (for Exterior and Interior Use).

TT-P-31 Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown.

TT-P-37 Paint, Alkyd Resin; Exterior Trim, Deep Colors.

TT-P-38 Paint, Aluminum, Ready-Mixed.

TT-P-102 Paint, Oil, Alkyd Modified, Exterior, White and Tints.

2.13 Aluminum or Aluminum Alloy, Unpainted:

TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type

2.14 Aluminum or Aluminum Alloy, Primed:

TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces).

TT-E-1593 Enamel, Silicone Alkyd Copolymer, Gloss (for Exterior and Interior Use).

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Concrete, Concrete Masonry Units and Stucco: Remove all glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of iron, and other foreign matter. Apply a filler to areas of irregular surface profile.

3.1.2 Asbestos Cement: Remove stains with solvent. Do not wire brush.

3.1.3 Wood: Clean off foreign matter. On seasoned knots, scrape, clean, and apply thin coat of knot sealer. Scrape off or remove pitch with mineral spirits or turpentine. Set nails and prime and fill nail holes and other surface imperfections with putty, exterior spackling compound, or plastic wood filler. Allow to dry and sand smooth.

3.1.4 Ferrous Metals, Ungalvanized: If not shop-coated, solvent clean. Remove loose rust, mill scale, and other foreign matter by power wire brushing or sandblasting.

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3.1.5 Ferrous Metals, Galvanized, and Aluminum and Aluminum Alloy: Solvent clean and treat

with vinyl type wash coat conforming to Military Specification DO-P-15328.

3.2 Application: Provide complete hiding and uniform thickness of coats.

3.2.1 Concrete Masonry Units: Apply filler coat to bare concrete masonry units and allow to dry. Follow with finish coats.

3.2.2 Wood to Receive Paint: Prime bare wood prior to application of finish coats.

3.2.3 Ferrous Metals: Prime bare metal prior to application of finish coats.

3.2.4 Aluminum and Aluminum Alloy: Prime bare metal prior to application of finish coats.

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SECTION 09920

## INTERIOR PAINTING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of paint to interior surfaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Painting materials for the interior surfaces indicated shall conform to the following Federal and Military Specifications.

### 2.1 Concrete:

#### 2.1.1 Walls and Nontextured Ceilings:

TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-543	Enamel, Interior, Undercoat, Tints and White.
TT-E-545	Enamel, Odorless, Alkyd, Interior Undercoat, Flat, Tints and White.
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-95	Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces.
TT-P-1511	Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

#### 2.1.2 Textured Ceilings:

TT-C-555	Coating, Textured (for Interior and Exterior Masonry Surfaces).
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#### 2.1.3 Floors:

TT-P-91	Paint, Rubber-Base, for Interior Use (Concrete and Masonry Floors).
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### 2.2 Concrete Masonry Units:

TT-C-535	Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete, and Masonry.
TT-C-542	Coating, Polyurethane, Oil-Free, Moisture Curing.
TT-C-550	Coating System Glaze, High <u>Performance</u> , (Solvent Base) for Interior Surfaces.
TT-E-505	Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.
TT-E-506	Enamel, Alkyd, Gloss, Tints and White (for Interior Use).
TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-543	Enamel, Interior, Undercoat, Tints and White.
TT-E-545	Enamel, Odorless, Alkyd, Interior Undercoat, Flat, Tints and White.
TT-F-11098	Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.).
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-95	Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces.
TT-P-1511	Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

2.3 Asbestos Cement:

TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-543	Enamel, Interior, Undercoat, Tints and White.
TT-E-545	Enamel, Odorless, Alkyd, Interior Undercoat, Flat, Tints and White.
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-1511	Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

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2.4 Gypsum Wallboard and Plaster:

TT-C-535	Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete, and Masonry.
TT-C-542	Coating, Polyurethane, Oil-Free, Moisture Curing.
TT-C-550	Coating System Glaze, High Performance, (Solvent Base) for Interior Surfaces.
TT-E-505	Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.
TT-E-506	Enamel, Alkyd, Gloss, Tints and White (for Interior Use).
TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-543	Enamel, Interior, Undercoat, Tints and White.
TT-E-545	Enamel, Odorless, Alkyd, Interior Undercoat, Flat, Tints and White.
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-650	Primer Coating, Latex Base, Interior, White (for Gypsum Wallboard).
TT-P-1511	Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).
TT-S-179	Sealer Surface: Pigmented Oil for Plaster and Wallboard.

2.5 Wood Other Than Floors:

2.5.1 Painted Surfaces:

TT-E-505	Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.
TT-E-506	Enamel, Alkyd, Gloss, Tints and White (for Interior Use).
TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-543	Enamel, Interior, Undercoat, Tints and White.
TT-E-545	Enamel, Odorless, Alkyd, Interior Undercoat, Flat, Tints and White.
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
	09920-3
TT-P-1511	Paint, Latex (Gloss and Semigloss, Tints and White) (for interior Use).

2.5.2 Stained, Varnished, or Natural Finishes Surfaces:

TT-S-176	Sealer, Surface, Varnish Type, Floor, Wood and Cork.
TT-S-711	Stain; Oil Type, Wood, interior.
TT-V-85	Varnish, Oil, Low Sheen. Brush or Spray Application.
TT-V-109	Varnish. Spar, Alkyd-Resin.
TT-V-119	Varnish, Spar, Phenolic-Resin.
TT-V-121	Varnish. Spar, Water-Resisting.

2.5.3 Furniture:

TT-S-711	Stain: Oil Type, Wood, Interior.
T-V-86	Varnish, Oil, Rubbing (for metal and Wood Furniture).

2.6 Wood Floors:

2.6.1 Painted Surfaces:

TT-E-487	Enamel: Floor and Deck
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2.6.2 Stained or Natural Finished Surfaces:

P-W-155	Wax., Floor, Water-Emulsion.
P-W-158	Wax, General Purpose, Solvent Type.
TT-C-542	Coating, Polyurethane, Oil-Free, Moisture Curing.
TT-S-176	Sealer, Surface, Varnish Type, Floor, Wood and Cork.

2.7 Ferrous Metals:

2.7.1 Ungalvanized and Unpainted:

TT-P-86	Paint, Red-Lead-Base, Ready-Mixed.
TT-P-615	Primer Coating: Basic Lead Silicon Chromate, Ready Mixed.
TT-P-645	Primer, Paint, Zinc-Chromate, Alkyd Type.
TT-V-51F	Varnish: Asphalt. 09920-4

2.7.2 Galvanized but Unpainted:

DOD-P-15328 Primer (Wash), Pretreatment, (Formula No. 117 for Metals) (Metric).

2.7.3 Primed:

TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces).

TT-E-505 Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.

TT-E-506 Enamel, Alkyd, Gloss, Tints and White (for Interior Use).

TT-E-508 Enamel, Interior, Semigloss, Tints and White.

TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.

TT-E-543 Enamel, Interior, Undercoat, Tints and White.

TT-E-545 Enamel, Odorless, Alkyd, Interior Undercoat, Flat, Tints and White.

TT-P-30 Paint, Alkyd, Odorless, Interior, Flat, White and Tints.

TT-P-38 Paint, Aluminum, Ready-Mixed.

2.8 Fire Retardant Paint:

2.8.1 Non-Metallic Surface

TT-P-26C Paint, Interior, White, Tints and Black, Fire Retardant.

2.8.2 Metallic Surfaces:

TT-P-001932 Paint, Latex Base, Interior, White, Tints and Black, Fire Retardant.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Concrete and Concrete Masonry Units: Remove all glaze, efflorescence, laitance, dirt, grease, oil, asphalt, and surface deposits of iron and other foreign matter.

3.1.2 Asbestos Cement: Remove stains with solvent. Do not wirebrush.

3.1.3 Gypsum Wallboard: Remove dirt and dust prior to application of first coat.

3.1.4 Plaster: Age at least 30 days. Clean, remove loose matter, and repair surface irregularities. Instrument-measured moisture content shall not exceed 8 percent.

3.1.5 Wood: Remove foreign matter. On seasoned knots, scrape, clean, and apply thin coat of knot sealer. Scrape off or remove pitch with mineral spirits or turpentine. Set nails, and prime and fill nail holes and other surface imperfections with putty or plastic wood filler. Allow to dry and sand smooth.

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3.1.6 Ferrous Metals, Ungalvanized: If not shop-coated, clean with solvent. Remove loose rust, mill scale, and other foreign matter by proper wire brushing or sand blasting.

3.1.7 Ferrous Metals, Galvanized: Clean with solvent.

3.2 Application: Provide complete hiding and uniform thickness of coats.

3.2.1 Concrete Masonry Units: Apply filler coat to bare concrete masonry unit surfaces where required and allow to dry. Follow with finish coats.

3.2.2 Gypsum Wallboard and Plaster: Touch up suction spots or overall application of base coat or sealer to produce a uniform color or gloss prior to application of finish coats.

3.2.3 Wood to Receive Stain: Sand lightly after application of stain. On open-grain wood surfaces, apply wood filler after staining as required. Sand smooth. Sand lightly between coats of varnish.

3.2.4 Ferrous Metals: Prime bare metal prior to application of finish coats.

09920-6

SECTION 09941

## PAINTING OF WATER STORAGE TANK INTERIOR SURFACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for painting water storage tank interior surfaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The following materials form a part of this section of the specification: Mil. Spec., MIL-P-15328, SSPC Paint 8, and MIL-P-15930.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Respirators: Respirators shall be worn by all persons engaged or assisting in spray painting. Air-fed respirators will be worn by all persons engaged in spray painting in confined areas (water thinned coatings excluded).

3.1.2 Forced Ventilation: Whenever surface preparation or painting operations include the use of volatile organic solvents, the enclosed space shall be made safe at all times from fire and explosion as determined by a calibrated explosimeter or organic vapor analyzer. During the painting operation, sufficient exhaust ventilation shall be provided to exchange the air in the enclosed spaces with fresh air at the rate of 5,000 cfm for each spray gun in operation. All parts of the enclosed spaces shall be swept by moving air. Exhaust ducts shall discharge clear of working areas and away from sources of possible ignition. If the ventilation fails, operations shall be stopped and the compartment evacuated until sufficient exhaust ventilation is provided.

3.1.3 Blast Cleaning: Ferrous surfaces shall be dry blast cleaned to near white metal grade, which shall be in compliance with Steel Structures Painting Council Specification SSPC-SP 5 (White Metal Grade Blast Cleaning), except that paragraphs 3.1, 3.2, 3.3, and 3.10 shall not be applicable and except that a limited relaxation from the uniform white metal grade of surface cleanliness will be permitted, as follows. The metal shall be cleaned to such a degree that were a large surface to be divided into 6-inch squares, at least 75 percent of the subdivisions would meet the white metal grade of cleanliness and the remaining subdivisions would be randomly distributed. Within these small, randomly distributed areas a minor relaxation from white metal cleanliness would be permitted, consisting only of very slight shadows, stains, and discolorations stemming from very thin, adherent, sparsely scattered residues of mill scale and corrosion products. No relaxation from the white metal grade will be permitted on surface irregularities such as edges, interior angles, welds, rivet lines, and junctions of joining members. The overall blasting effort expended shall be not less than two-thirds (2/3) of that which would be required to accomplish the white metal grade of cleanliness on the specific surfaces involved, but this limitation shall not be construed as a waiver of any of the requirements above. Remove weld spatter not dislodged by blasting with impact or grinding tools. Surfaces shall be dry at the time of blasting.

3.1.4 Surface Protection: Within 8 hours after cleaning but in any event prior to the deposition or formation of any detectable moisture, contaminants, or corrosion, all ferrous surfaces that have been blast cleaned to the near-white metal grade shall be cleaned of dust and abrasive particles by brushing, vacuum cleaning, and/or blowdown with clean, dry compressed air, and shall be given the pretreatment and first coat of paint.

3.1.5 Pretreatment: All sandblasted surfaces shall receive a washcoat pretreatment complying with MIL-P-15328. Application shall be by spray, and all requirements of the specification concerning mixing, thinning, application, and spreading rate shall be followed. All materials not applied within a maximum of eight hours after mixing shall be discarded and must not be used.

09941-1

3.2 Installation:

3.2.1 Primer Paint: All pretreated surfaces shall receive two coats of vinyl paint complying with MIL-P-15930. Application shall be by brush or spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding primer coat (or initial finish coat) shall not be applied until the primer is dry to touch. The color of alternate coats shall provide contrast to assist in obtaining complete coverage.

3.2.2 Finish Paint: All primed surfaces shall receive a minimum of two coats of Aluminum Vinyl Finish Paint complying with SSPC Paint 8. The paint shall be formulated as specified except that high boiling Solvents such as cyclohexanone shall not be used in the formulation. High boiling solvents may be substituted for the ketones specified in the thinner only if ambient temperatures at the time of application exceed 75 F (24 C). Application shall be by spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding coat shall not be applied until the first coat is dry to touch.

3.2.3 Thickness Requirements: Apply the washcoat pretreatment to a dry film thickness of at least 0.3 mils but not exceeding 0.5 mils. Apply the primer paint to produce a dry film of approximately 2.5 mils. Apply the finish paint such that the resulting total system has a minimum dry film thickness of at least 5 mils at its thinnest point. If this thickness is not obtained in the specified number of coats, apply additional coats of the finish paint to meet the minimum thickness requirement at no additional cost to the Government. Final thickness measurements shall be made by the Contractor in the presence of the Contracting Officer using a magnetic thickness gauge as specified in SSPC PA 2.

3.2.4 Final Drying Time: After the final coat of paint has been applied, the tank shall remain open and forced ventilation shall be continued for a minimum of three days prior to being flooded with water.

3.2.5 Washing: After the final work has been completed in the tank, but prior to any disinfecting operations, wash the tank with clean water to remove all dust and overspray. Washing may take place during the final dry time provided the coating is sufficiently cured to withstand the abuse.

3.2.6 Disinfection of Tank: A4--r painting and all other interior work has been completed, disinfect the tank before it is replaced in service. If the local medical facility or health department requires a specific procedure for disinfection, follow that procedure. Otherwise the following procedure shall be followed: Place water containing 50 ppm chlorine in the tank to such a depth that when the tank is filled the resultant chlorine concentration shall be no less than 2 ppm. Hold the water containing 50 ppm chlorine in the tank for 24 hours before the tank is filled. Allow the full tank, in turn, to stand for 24 hours, after which the tank may be put into service without draining the water used to disinfect it.

09941-2

SECTION 09942

## PAINTING OF WATER STORAGE TANK EXTERIOR SURFACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for painting water storage tank exterior surfaces. Product shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The following materials form a part of this section of the specification: Fed. Spec. TT-P-86, TT-P-320, TT-V-81, and SSPC Paint 101.

### 3.0 EXECUTION:

#### 3.1 Preparation:

3.1.1 All Exterior Surfaces to be Painted shall be cleaned using power tools in compliance with SSPC-SP 3 or, at the option of the Contractor, surfaces may be blast cleaned in compliance with SSPC SP/7. In addition, the following operations shall be implemented.

3.1.2 Mildew shall be removed from all surfaces to be painted by scrubbing the surface with a solution consisting of 1/2 pound of trisodium phosphate and 1 pound of hypochlorite bleach per gallon of warm water. Additional bleach may be beneficial in heavily mildewed areas. Rinse surfaces to remove cleaning materials and allow to dry completely before repainting.

3.1.3 Surface Glaze remaining on existing coatings shall be removed either by lightly abrading the surface or through the use of a chemical deglosser.

3.1.4 Removal of Vines and Trimming of Plantings: Remove all ivy vines and tentacles interfering with the contract work from the exteriors of the structure and haul from the site of the work. Remove ivy in such a fashion that the remaining growth shall all be live and connected to the root system. Other types of plantings that interfere with the contract surfaces shall be trimmed or tied back.

#### 3.2 Installation:

3.2.1 All Paints shall be mixed, thinned, and applied in compliance with the procedures and requirements set forth in SSPC-PA 1. The following paint system shall be used.

3.2.2 Primer: The primer shall consist of one coat of a material complying with Fed. Spec. TT-P-86, Type II.

3.2.3 Finish Coats: The finish coats shall consist of a minimum of two coats of one of the following paints: Paint I - job-mixed alkyd aluminum paint in compliance with SSPC Paint 101 Type I or Paint 2 aluminum paint consisting of aluminum paste and a mixing varnish in compliance with Fed. Spec. TT-V-81, Type II and mixed in the proportions of two pounds of aluminum paste complying with Fed. Spec. TT-P-320 per gallon of mixing varnish.

3.2.4 Thickness Requirements: Apply the primer paint to a dry film thickness of approximately 1.5 mils. Apply the finish paint such that the resulting total system has a minimum dry film thickness of at least 3.5 mils at its thinnest point. If this thickness is not obtained in the specified number of coats, apply additional coats of the finish paint to meet the minimum thickness requirement. Final thickness measurements shall be made by the Contractor in the presence of the Contracting Officer, using a magnetic thickness gauge as specified in SSPC-PA 2.

3.2.5 Respirators: Respirators shall be worn by all persons engaged or assisting in spray painting. Air-fed respirators will be worn by all persons engaged in spray painting in confined areas (water thinned coatings excluded).

3.2.6 Lettering and Sign Painting: Building number signs, gauges, and other signs that are painted shall have lettering and numbering repainted. Design and color shall match existing.

## SECTION 09952

### WALL COVERINGS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of vinyl, cork, fabric, and flexible wood wall coverings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Vinyl Wall Covering: Wall covering shall conform to Fed. Spec. CCC-W-408, Type I, II, or III as required. A polyvinyl fluoride film, 1/2 mil thick, shall be factory-applied to the wall covering as required. The film shall conform to Fed. Spec. L-P-1040, Type I, Grade B, Class 2.

2.2 Cork Wall Covering shall be either sheet cork in standard 24inch by 36-inch sheet size, or sheeting composed of a cork sheeting material factory-bonded to a fabric backing. Wall covering material shall be either 20 ounces per lineal yard or 24 ounces per lineal yard and 36 inches wide, as required.

2.3 Fabric Wall Covering shall be natural woven fabric bonded to a paper backing. Fabric materials shall be treated for stain and mildew resistance and shall be a minimum of 27 inches wide. All fabric wall coverings shall be Class A flame-rated and tested in accordance with ASTM E 84.

2.4 Flexible Wood Sheets shall be composed of genuine wood veneer bonded to a clay-filled cotton backing fabric to form a flexible wall covering in sheets not less than 12 inches wide, factory matched and numbered in sequence for spaces as required.

2.5 Primer and Adhesive shall be mildew-resistant and nonstaining, as recommended by the wall covering manufacturer.

2.6 Wainscot Caps shall be aluminum extrusions.

2.7 Fire Hazard Classification: Provide wall covering materials bearing UL label and marking, indicating fire hazard classification of wall covering, as determined by ASTM E 84. Provide materials with the following fire hazard classifications:

Flame spread not more than 25. Smoke developed not more than 50.

#### 3.0 EXECUTION:

3.1 Wall Covering Materials shall be acclimatized by removing from packaging in area of installation not less than 24 hours before application.

3.2 Prime and Seal Substrates in accordance with wall covering manufacturer's recommendations for type of substrate. Surface sealer shall be applied to gypsum wallboard to permit future removal of wall covering without damage to paper facing.

## SECTION 10155

### COMPARTMENTS AND CUBICLES FOR SHOWER AND TOILET ROOMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laminated plastic and metal toilet partitions, urinal screens, and shower and dressing compartments. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

##### 2.1 Laminated Plastic Toilet Partitions and Urinal Screens:

2.1.1 Plastic Laminate shall be NEKA Std. LD-3, minimum 0.062 inch thick.

2.1.2 Core Material for Plastic Laminate shall be manufacturer's standard particleboard or plywood, in thickness to provide a nominal dimension of 1 inch for doors, panels, and screens and 1-1/4 inches for pilasters.

2.1.3 Pilaster Shoes shall be ASTM A 167, Type 302 or 304, stainless steel not less than 3 inches high, 20 gauge finished to match hardware.

2.1.4 Stirrup Brackets shall be manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated nonferrous cast alloy or anodized aluminum.

2.1.5 Hardware and Accessories shall be manufacturer's standard design heavy duty operating hardware and accessories of chromium-plated nonferrous cast alloy or chromium plated brass, as required.

2.1.6 Overhead Bracing shall be continuous extruded aluminum tubing in antigrip profile, with clear anodized finish.

2.1.7 Anchorages and Fasteners shall be manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

##### 2.1.8 Fabrication:

2.1.8.1 General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars.

2.1.8.2 One-Piece Face Sheets shall be pressure-laminated to core material with no splices or joints, and with edges straight and sealed. Seal exposed core material at cutouts to protect against moisture.

2.1.8.3 Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.

2.1.8.4 Floor-Supported Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.

2.1.8.5 Ceiling-Hung Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit connection to structural support above finished ceiling. Furnish devices which are designed to support pilasters from structure without transmitting load to ceiling finish. Furnish 3 inch high stainless steel trim piece, finished to match hardware, at each pilaster.

2.1.8.6 Wall-Hung Screens: Furnish panel units of same construction and finish as partition system panels.

2.1.8.7 Floor-Supported Screens: Furnish pilasters not less than 1 inch in thickness, panels and pilasters of same construction and finish as toilet partitions. Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at pilaster to conceal anchorage.

2.1.8.8 Furnish Hardware for each compartment in partition system, as follows:

- a. Cutout inset type hinges, adjustable to hold door open at any angle up to 90 degrees; gravity type, spring-action cam type, or concealed torsion rod type.
- b. Recessed or surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
- c. Coat hook with combination hood and rubber-tipped bumper.
- d. Door pull.

## 2.2 Metal Toilet Partitions and Urinal Screens:

2.2.1 Toilet Enclosures shall conform to Fed. Spec. RR-P-1352, Type I, Style A, B, or C as required. Finish surface of panels shall be baked enamel, in color as required. Panel to receive toilet paper holders or grab bars shall be reinforced for the reception of the items required.

2.2.2 Room Entrance Screens shall conform to Fed. Spec. RR-P1352, Type II, Style A. Finish surface of screens shall be baked enamel.

2.2.3 Urinal Screens shall conform to Fed. Spec. RR-P-1352, Type III, Style A or D, as required. Finish surface of screens shall be baked enamel. Width of Style A screens shall be 24 inches or 36 inches, as required.

## 2.3 Shower and Dressing Compartments:

2.3.1 General: Materials shall be provided which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Shower compartments shall include a shower receptor for each compartment.

2.3.2 Steel Sheets for Baked Enamel Finish shall be ASTM A 591, Class C, galvanized-bonderized, of the following minimum thicknesses:

- a. Pilasters (overhead-braced): 20-gauge.
- b. Panels and Screens: 20-gauge.
- c. Doors: 22-gauge.

2.3.3 Concealed Anchorage Reinforcement shall be minimum 12-gauge galvanized steel sheet.

2.3.4 Concealed Tapping Reinforcement shall be minimum 14-gauge galvanized steel sheet.

2.3.5 Core Material for Metal Partitions shall be manufacturer's standard sound-deadening honeycomb of impregnated kraft paper, in thickness to provide finished dimension of 1 inch minimum for doors, panels, and screens and 1-1/4 inches minimum for pilasters.

2.3.6 Pilaster Shoes shall be ASTM A 167, Type 302/304 stainless steel, not less than 3 inches high, 20-gauge, finished to match hardware.

2.3.7 Stirrup Brackets shall be manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated nonferrous cast alloy or anodized aluminum.

2.3.8 Hardware and Accessories shall be manufacturer's standard design, heavy-duty operating hardware and accessories of chromium-plated nonferrous cast alloy or chromium-plated brass, as required.

2.3.9 Overhead Bracing shall be continuous extruded aluminum tubing in antigrip profile, with clean anodized finish.

2.3.10 Anchorages and Fasteners shall be manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.3.11 Fabrication:

2.3.11.1 Furnish Standard Doors, Panels, Screens, and Pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as required.

2.3.11.2 Door Dimensions: Unless otherwise indicated, furnish 24-inch wide in-swinging doors.

2.3.11.3 Pressure Laminate Seamless Face Sheets to core material and seal edges with continuous interlocking strip or with lapped and formed edges. Weld edges and corners with exposed welds ground smooth.

2.3.11.4 Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.

2.3.11.5 Floor-Supported Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.

2.3.11.6 Furnish Hardware for each dressing compartment as follows:

- a. Cutout inset type hinges, adjustable to hold door open at any angle up to 90 degrees; gravity type, spring-action cam type, or concealed torsion rod type.
- b. Recessed or surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
- c. Coat hook, with combination hook and rubber-tipped bumper.
- d. Door pull.

2.3.11.7 Accessories: Each dressing compartment shall be provided with the following accessories: shower curtain rod, curtain, hooks, soap dish, and wood seat.

2.3.12 Finish for Compartments and Showers shall be baked enamel. Clean galvanized steel surfaces after fabrication and before application of enamel coating system to remove processing compounds, oils, and other contaminants. Prime metal with baked-on rust-inhibitive primer. Apply two coats of thermosetting enamel finish, applied by electrostatic process, and baked in accordance with paint manufacturer's instructions.

2.3.13 Shower Receptor shall be pre-cast terrazzo, made of marble chips cast in white Portland cement. Provide wrought brass drain bodies cast integrally in receptor. Drain bodies shall provide for caulked lead connection not less than one inch deep to a two-inch pipe, with a removable type stainless steel strainer. Shower receptor curb shall be rabbeted 1 inch deep to receive steel shower walls. Receptors shall have an integral steel flange, 6-inch minimum height, on all sides except at threshold location.

### 3.0 EXECUTION:

3.1 Installation: Partitions associated with compartments and cubicles shall be installed straight and plumb with all horizontal lines level and rigidly anchored to the supporting construction. Anchorage to walls shall be by through-bolting or toggle-bolting as required. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work.

## SECTION 10275

### ACCESS AND PEDESTAL FLOORS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of access and pedestal floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 **PRODUCTS:** Provide access flooring that, when installed, complies with NFPA 75, (components shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with NFPA 255 and ASTM E 84) unless otherwise directed.

2.1 **Panels** shall be 24 inches by 24 inches square (+/- 0.015 inch) and shall be capable of with standing a concentrated load of 1,200 pounds with a deflection of not greater than 0.080 inches and a uniform load of 500 pounds per square foot with a deflection not to exceed 0.080 inches.

2.2 **Pedestals** shall be assemblies that are electrically conductive and corrosion-resistant. Each shall be capable of adjustments of 1/64-inch increments, have positive locking, and be capable of supporting a 5,000-pound axial load.

2.3 **Stringers** (on floors 18 inches in height or greater) shall be capable of individual removal and shall support 200 pounds.

2.4 **Accessory Ramps, Handrails, and Fascia Plates** shall be compatible with panels and pedestals.

3.0 **EXECUTION:**

3.1 **Preparation:** No installation of access flooring shall take place until structural floor surfaces are clean and dry.

3.2 **Installation:**

3.2.1 Completed System shall be rigid and free from vibration, with no rocking panels.

3.2.2 Floor shall be level within +/- 0.062 inch in any 10-foot area and 0.125 inch over the entire area.

## SECTION 10290

### PEST CONTROL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for pest control. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: One of the following materials shall be used for pest control:

2.1 Benzene Hexachloride, 0.8 percent gamma isomer concentration in a water emulsion.

2.2 Chlordane, 1.0 percent concentration in a water emulsion.

2.3 Heptachlor, 0.5 percent concentration in a water emulsion.

3.0 EXECUTION:

3.1 Immediately prior to placing concrete floor slabs on grade and basement slabs for structures and immediately prior to backfilling around foundation for structures with basements or crawl spaces, soil treatment shall be applied as hereinafter specified. Soil treatment agents shall be delivered to the jobsite in sealed and labeled containers. Labels shall bear the manufacturer's warnings to be observed in the handling and use of soil treatment materials.

3.2 Soil treatment shall be applied in accordance with the precautions on the label and in the following minimum quantities:

3.2.1 Under Slabs on Grade, 1-1/2 gallons per 10 square feet as overall treatment. In critical areas such as around utility openings for pipes, ducts, and conduits, 0.5 gallon per square foot shall be applied. Along the exterior perimeter of the slab and under expansion joints, 2 gallons per 5 linear feet in a strip 1 foot wide shall be applied.

3.2.2 Foundation Walls of Structures with Basements, 2 gallons per 5 linear feet per foot of depth from finished grade to top of footings in a strip 1 foot wide on exterior side at each elevation as follows: near level of top of footings before any backfill is placed, as each 1-foot lift of backfill is completed, and just below finished grade. Two gallons per 5 linear feet in a strip 1 foot wide shall be applied under the basement slab next to perimeter footings.

3.2.3 Foundation Walls of Structures with Crawl Spaces, 2 gallons per 5 linear feet per foot of depth from finished grade to top of footings in a strip 1 foot wide on exterior, with one-half of the application near level of top of footings before any backfill is placed, and the remainder just below finished grade. Two gallons per 5 linear feet in a strip 1 foot wide shall be applied adjacent to the interior side of the foundation of buildings.

## SECTION 10351

### FLAGPOLES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of flagpoles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Steel Flagpoles shall be constructed from standard weight steel pipe complying with, ASTM A 53, Type S, Grade B, or better.

2.2 Aluminum Flagpoles shall be fabricated from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16 inch.

2.3 Stainless Steel Flagpoles shall be seamless construction, fabricated of AISI 302/304 alloy.

2.4 Bronze Flagpoles shall be fabricated from Copper Development Assoc. No. 230 bronze alloy seamless pipe.

2.5 Flagpole Style shall be cone-tapered, sectionally swaged, or entasis-tapered and shall be of designated height and diameter.

2.6 Two Continuous Halyards shall be provided for each pole and furnished complete with all standard fittings.

2.7 Provide Anchors and Base necessary for the particular installation requirements.

#### 3.0 EXECUTION

3.1 Flagpoles shall have a positive lightning ground for each installation.

3.2 Portions of Ground-Set Flagpoles shall be painted below ground with a heavy coat of bituminous paint.

## SECTION 10410

### DIRECTORY AND BULLETIN BOARDS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of directories and bulletin boards. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Directory Boards shall be grooved and covered with felt, vinyl, or rubber. Boards shall be fabricated of one piece of material. Space grooves at 1/4 inch O.C. to receive changeable letters or changeable name bases, as required.

2.2 Chalkboard Surfaces shall comply with Porcelain Enamel Institute specifications.

2.3 Tack Board Surfaces shall be natural cork, plastic-impregnated cork, or vinyl fabric laminated under pressure to 1/4 inch thick exterior plywood or hardwood backing.

2.4 Visual Aid Boards shall have a white porcelain enamel writing surface.

2.5 Frames shall be constructed of hardwood, chrome-plated steel, aluminum, bronze, or stainless steel of designated design. All units located on the exterior shall be of weatherproof construction.

2.6 Glass for Encased Boards shall be laminated glass, tempered glass, acrylic sheeting, or polycarbonate sheeting.

2.7 Locks and Keys for Glass-Encased Boards shall be of the disk tumbler type with two keys.

3.0 EXECUTION: (Section not used.)

## SECTION 10440

### SIGNS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of signs. Materials shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Cast-Aluminum Letters shall have a satin, polished, clear anodized, colored anodic, or enameled finish.

2.2 Cast-Bronze Letters shall have a satin, polished, or oxidized finish.

2.3 Special Medallion Construction shall be of cast bronze or aluminum, free from pits, scale, second holes, or other defects.

2.4 Adhesive Door Signs shall be fabricated from individually die cut-to-shape letters that are pre-spaced and pre-masked on a high quality plastic film coated with a pressure-sensitive adhesive backing.

2.5 Hard Plastic Door Signs shall be made from high-pressure plastic laminate engraving stock with face and core plies in contrasting colors.

2.6 Frames for plastic door signs shall be made of solid extruded aluminum with an anodized gold or silver finish and concealed mounting holes. Frames shall be designed to allow signs to slide in from the side.

#### 3.0 EXECUTION: (Section Not Used.)

## SECTION 10505

### METAL LOCKERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal lockers. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

##### 2.1 Materials and Finishes:

2.1.1 Stainless Steel: ASTM A 167, Type 302, 304, or 316 alloy. Exposed surfaces shall have a satin finish or a minimum of no. 4 polished finish.

2.1.2 Carbon Steel: ASTM A 366, baked enamel finish.

##### 2.2 Wardrobe Lockers:

2.2.1 Backs and Sides of lockers shall be fabricated of minimum 24-gauge steel with double flanged connections extending full height. Top and bottom shall be of not less than 24 gauge steel with flanged edges. Exposed ends of non-recessed lockers shall be of minimum 16-gauge steel. Provide one 24-gauge steel hat shelf in single-tier units.

2.2.2 Doors shall be one-piece construction of minimum 16-gauge sheet steel, flanged at all edges. Provide extra bracing or reinforcing on inside of doors over 15 inches wide.

2.2.3 Ventilation: Provide stamped, louvered vents in door face. Single-tier lockers shall have not less than 6 louver openings top and bottom. Double-tier lockers shall have not less than 3 louver openings top and bottom. Multi-tier lockers shall have not less than 2 louver openings top and bottom, or 3 louver openings top or bottom.

2.2.4 Hinges shall be heavy-duty, not less than 0.050 inch thick steel, full-loop, 5-knuckle, tight pin, 2 inches high. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners, which are completely concealed and tamperproof when door is closed. Provide at least 3 hinges for each door 42 inches high and over, at least 2 hinges for each door less than 42 inches high.

2.2.5 Standard Hardware Items, including coat hooks, sequential number plates, and arrangements for locking devices, shall be provided.

##### 2.3 Box Lockers:

2.3.1 Tops and Bottoms of lockers shall be fabricated from minimum 16-gauge steel sheet and backs from not less than 18-gauge steel. Sides and intermediate partitions shall be constructed of expanded metal welded to steel hemming. Provide 16-gauge steel shelf in single-tier lockers.

2.3.2 Doors shall be manufacturer's standard of either expanded metal in a steel frame or perforated steel sheet with flanged edges, minimum 16 gauge. Provide extra bracing or reinforcing on inside of doors over 15 inches wide.

2.3.3 Hinges shall be heavy-duty, not less than 0.050 inch thick steel, full-loop, 5-knuckle, tight pin, 2 inches high. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners which are completely concealed and tamperproof when door is closed. Provide at least 3 hinges for each door 42 inches and over, at least 2 hinges for each door less than 42 inches high, or continuous piano hinge at top for multi-tier units. Manufacturer shall provide all necessary hardware including sequential number plates and arrangements for locking devices.

2.4 Basket Locker: Rack shall have legs for fastening to the floor and sway braces. Racks shall be designed to allow bolting together to form double-faced racks.

2.4.1 Uprights on Rack shall be a minimum of 13 gauge, shelves a minimum of 18 gauge, and dividers a minimum of 20 gauge, ribbed for stiffness.

2.4.2 Baskets shall be all wire or wire and minimum 24 gauge steel front with perforations. All baskets shall be zinc plated with a bright finish. Pilfer guards shall be available for all styles of baskets.

2.4.3 Hardware shall be provided as required for installation and functioning including sequential number plates and arrangements for locking.

3.0 EXECUTION: Lockers shall be installed in accordance with the designated arrangement, securely anchored in position, and accurately aligned vertically and horizontally.

## SECTION 10520

### FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire extinguishers, cabinets, and accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Fire Extinguishers shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in compliance with National Fire Protection Association (NFPA) Standard 10 and its appendices. Fire extinguishers shall be clearly marked to indicate extinguisher suitability according to class of fire.

2.2 Fire Extinguisher Cabinets and Accessories shall be in compliance with NFPA 10 and its appendices and shall be of sufficient size to house fire extinguishers of the type and capacity required.

#### 3.0 EXECUTION:

3.1 Fire Extinguishers shall be distributed and maintained in compliance with NFPA 10 and its appendices.

3.2 Fire Extinguisher Cabinets and Accessories shall have the locations of fire extinguishers readily recognizable by the use of markings that are not part of the extinguisher itself.

## SECTION 10550

### POSTAL SPECIALTIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mail chutes and mail boxes. Materials shall match existing materials and/or as shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 General: All products shall comply with U.S. Postal Service requirements for construction and installation of units serviced by USPS carriers.

2.2 Mail Chutes shall have sides and back that are of a continuous one-piece construction extending from floor to ceiling on each floor and extending 4 feet 6 inches above finish flooring on top floor. Back and sides shall be fabricated of aluminum with a 0.105-inch minimum thickness and alloy 6063-T5 extrusions with satin anodized finish complying with NAAMM-M31C21A31. Removable front panels shall be made of 3/16-inch tempered glass, 1/4-inch float glass, or transparent polycarbonate resin plate, set into continuous one-piece frames and covers. Frames and covers shall be fabricated from aluminum with a 0.125 inch minimum thickness, and alloy 6063-T5 extrusions with satin anodized finish complying with NAAMN-M31C21A31, or color anodized, bronze, or standard bronze statuary finish.

2.2.1 Furnish Manufacturer's Standard Cast-Metal Floor and Ceiling Fascia and Lock Band finished to match front frames and covers. Furnish lock band with acceptable locking device and keyed lock which prevents key removal if locking device is not secured.

2.2.2 Mail Slot shall be metal pocket with cigarette ejector and brass finish. Inscribe "U.S. MAIL" on face of mail slot.

2.2.3 Bundled Mail or Package Chute shall be constructed similarly to standard mail chutes. Furnish complete with removable frames, hinged lock band, bottom deflector or baffle slow-down, and mail openings on each floor. Fabricate chute size 14 inches wide and 7 inches deep, unless otherwise indicated. Bundled mail chutes will not require USPS approval. 1

2.2.4 Locked Receiving Mail Box shall be constructed of aluminum alloy 6063-T5 with satin anodized finish complying with NAAMM-M31C21A31 or bronze with statuary finish. Boxes shall be 36 inches by 20 inches by 12 inches.

#### 2.3 Mail Boxes:

2.3.1 Letter Slot shall be metal, designed for flush mounting. The legend "U.S. MAIL" must be plainly inscribed on every mail opening.

2.3.2 Rural Letter Box shall be post-mounted type and shall have a heavy-duty piano hinge and red flag. Doors shall have legend "U.S. MAIL" plainly inscribed. Boxes shall have a polyurethane baked-on finish that resists rust.

2.3.3 Apartment House Keyed Mail Boxes: Mail compartments and wall receptacles shall be of heavy galvanized steel or corrosion resistant metal construction. Each compartment shall be designed to receive name card and shall bear identification numbers as directed.

2.3.4 Letter Box with Combination Lock: Each compartment shall be equipped with a single-dial, 3-digit combination lock and shall be provided with identification numbers.

2.3.5 Letter Box with Keyed Lock: Each compartment shall be equipped with a 5-pin tumbler cylinder lock capable of at least 1,000 key changes, with 2 keys for each box door. Each box shall be keyed differently and a master key shall be provided. Provide identification numbers for each compartment.

3.0 EXECUTION: Install postal specialties so that they comply with U.S. Postal Service requirements.

## SECTION 10605

### WIRE MESH PARTITIONS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of wire mesh partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 **Mesh** shall be 10-gauge crimped steel wire woven into 1-1/2 inch mesh, or heavy-duty type constructed of 6-gauge or 8-gauge steel wire woven into 2-inch mesh, securely clinched to frame members.

2.2 **Frames:** Provide cutouts for pipes, ducts, beams, and other items necessary for partition installation.

2.2.1 Vertical members shall be 1-1/4 inch x 5/8 inch cold-rolled steel C-section channels with 1/4 inch bolt holes approximately 15 inches on center.

2.2.2 Horizontal Members shall be 1 inch x 1/2-inch x 1/8-inch cold-rolled steel channels, mortised and tenoned to vertical members.

2.2.3 Horizontal Reinforcing Members shall be 1-inch x 1/2-inch x 1/8-inch cold-rolled steel channel with wire woven through or two 1-inch x 3/8-inch channels bolted or riveted to each side of mesh and secured to vertical members. Provide number of horizontal reinforcing members to suit panel height.

2.3 **Stiffening Bar:** For free-standing partitions over 8 feet 0 inches in height, provide flat bar stiffener posts between abutting panel frames.

2.4 **Top Capping Bars** shall be 2-1/4 inch x 1-inch cold-rolled steel channels, secured to top framing channel with 1/4-inch U-bolts spaced not more than 28 inches on center.

2.5 **Corner Posts** shall be 1-1/4 inch x 1-1/4 inch x 118-inch angles with 1/4-inch bolt holes to align with bolt holes in vertical frame members and floor plate.

2.6 **Floor Shoes** shall be cast iron, sized to suit vertical framing and to provide approximately 3 inches clear space between finished floor and bottom horizontal frame members. Furnish units with set screw for leveling adjustment.

2.7 **Sheet Metal Base** shall be panels formed to 16-gauge steel Sheet, welded or bolted to frames.

2.8 **Hinged Door:** Door frame shall be of 1-1/4 inch x 1/2-inch x 1/8-inch channels, with 1-1/4 inch x 1/8-inch flat bar cover plate on 3 sides, and matching 1/8-inch thick angle strike bar and cover on lock side. Provide 1-1/2 pair butt hinges riveted or welded to door and frame and bronze mortise type cylinder lock operated by key outside with recessed knob inside. Provide cylinders for lock, keyed and master keyed, if required.

2.9 **Sliding Door:** Door frame shall be of 1-1/2 inch x 3/4-inch x 1/8-inch channels with 1-1/2 inch x 1/8-inch flat bar cover plate on all 4 sides. Provide door with two 4-wheel roller bearing carriers, box track, bottom guide channel, and bronze mortise type cylinder lock operated by key outside and recessed knob inside. Provide cylinders for locks, keyed and master keyed, if required.

2.10 Service Window: Fabricate of same mesh and frames as panel units, arranged to lock in open and closed positions with spring catches.

2.11 Service Window Shelf: Fabricate of 12-gauge steel, flanged front and back, edges finished smooth, with side brackets for support.

2.12 Line Posts: Where partition runs exceed 20 feet without intersection or connection to overhead framing, furnish standard line posts and base plates located at intervals to ensure partition rigidity and stability.

2.13 Finish: Manufacturer's standard shop-applied enamel finish.

2.14 Provide Bolts, Hardware, and Accessories for complete installation.

3.0 EXECUTION:

3.1 Erect Partitions plumb, rigid, properly aligned, and securely anchored in place.

3.2 Provide Additional Field Bracing as necessary for rigid, -secure installation.

## SECTION 10615

### DEMOUNTABLE PARTITIONS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of demountable partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 **General Requirements:** Movable partitions shall be floor-to-ceiling type, designed for erection on finished floors, and shall include doors, windows, fasteners, and accessories required for the installation. The partition system shall be capable of accommodating electrical wiring, outlets, and switches and shall be readily demountable without damage to panels, framing, electrical work, and other major components.

2.2 **Fire-Resistive Rating and Test:** Partitions shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Fire-resistance rating shall be determined in accordance with ASTM E 119.

2.3 **Sound Transmission Class and Test:** Where sound-rated partitions are required, partition assemblies shall have a minimum STC of 40. STC range shall be determined in accordance with Sound Transmission Test by Two-Room Method and reported in accordance with the appendix to ASTM E 90 for 11 frequency data or ASTM E 413 for 16 frequency data.

2.4 **Panel Units** shall be manufacturer's standard construction except that gypsum wallboard shall be a minimum of 5/8 inch thick and shall conform to ASTM C 36. Gypsum backing board, if used, shall conform to ASTM C 442.

2.5 **Framing System:** The framing system shall consist of extruded anodized aluminum or roll-formed steel components that include ceiling runners, floor track, starting units, studs or posts, post covers if applicable, bracing, and suitable treated fasteners to prevent corrosion. The framing system when assembled with panel units shall form a rigid, stable partition.

2.6 **Doors, Frames, and Hardware:** Doors shall be 1-3/4 inch flush hollow metal of a size to provide 3/32-inch clearance at jambs and head. Door frames shall provide a compatible appearance with other trim components, shall be a minimum 18-gauge cold-rolled steel or extruded anodized aluminum constructed to incorporate a cushion door stop at the head and both jambs, and shall allow for variations in floor level. Door hardware shall be the manufacturer's standard type hardware, except all doors shall receive 1-1/2 pairs of 4-1/2 inch by 4-1/2 inch butts.

2.7 **Finishes:** Exposed steel or aluminum surfaces shall be prefinished. Gypsum wallboard shall be painted or finished with a minimum 6-mil vinyl wall covering, as required..

2.8 **Base Trim** shall be 4-inch PVC without exposed fasteners, 4inch vinyl cover base with snap-on capabilities, 4-inch vinyl cover base applied with adhesive, or 4-inch metal clip on base cover, as required.

3.0 **EXECUTION:** Partitions shall be erected plumb and straight after floor covering and finished ceiling are in place. Doors shall be hung to swing freely and hardware shall be carefully fitted and adjusted. Glass for glazed openings shall be installed on shims in a vinyl or polyurethane foam gasket. Glass stops shall be installed without exposed fastenings.

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SECTION 10618

## SECURITY SCREENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of security screens for doors and windows. Products shall match existing materials and shall be as directed by the Contracting Officer. Installations shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Mesh shall be 9-gauge crimped steel wire woven into 2-inch mesh securely clinched to frame members.

2.2 Standard Diamond Pattern Expanded Metal shall be 1-1/2 inch, 9-gauge, carbon steel conforming to Mil. Spec. MIL-M-17194 Type I Class 1.

2.3 Flattened Diamond Pattern Expanded Metal shall be 1-1/2 inch, 9-gauge carbon steel conforming to Mil. Spec. MIL-M-17194 Type II Class 1.

2.4 Frame Bars and Center Stiffeners shall be not less than 1/2inch in diameter cold finished steel bars conforming to AISI 1018, ASTM A 108, and AMS 5069.

2.5 Frame Channels shall be hot rolled low carbon bar channels not less than 1-inch by 1/2-inch by 1/8-inch conforming to AISI M1020.

2.6 Center Stiffeners where frame channels are used, shall be not less than two 3/4-inch by 3/8-inch channels, conforming to AISI M1020, bolted to each side.

2.7 Subframes for Hinged Security Screens shall be not less than 1-1/4 inch by 1-1/4 inch by 1/8-inch medium carbon steel angles conforming to ASTM A 36.

2.8 Finish: Manufacturer's standard shop-applied enamel finish or hot dipped galvanized as directed.

2.9 Provide Bolts Masonry Anchors, Hardware, and Accessories for complete installation. Hardware shall include all padlock hasps and staples, hinges, and locking devices. Provide cylinders for locks, keyed and mastered keyed, if required.

### 3.0 EXECUTION:

3.1 Erect Security Screens plumb, rigid, properly aligned, and securely anchored in place for a rigid installation.

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SECTION 10630

## MOVABLE METAL PARTITIONS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of movable metal partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Freestanding Partition Systems shall consist of individual panels, connector posts, and framing components. Nominal panel height shall be 5 feet-0 inches.

2.2 Panels shall be of manufacturer's standard width and height, constructed of 1/8-inch S2S tempered hardboard facing laminated to a core material. Total thickness shall be 1-9/16 inches.

2.3 Panel Face Coverings shall be vinyl, plastic laminate, fabric, natural hardwood, or baked enamel on steel substrate.

2.4 Panels shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84 when tested as a composite unit.

2.5 Framing Members shall be extruded aluminum shapes in 6063-T5 Alloy and 22-gauge pre-finished steel.

2.6 Exposed Components shall have anodized or baked acrylic paint finish.

2.7 Panel Frame Design shall provide connection and attachment of connector posts and various framing components with the use of simple hand tools. Each panel unit shall be able to be individually freestanding or connected to other panels.

2.8 Sound-Absorbing Panels shall be constructed of flame resistant decorator fabric applied over a reinforced wood frame and fiberglass core. Flame-resistant fiberglass insulation shall be held in place by galvanized steel wire netting. Total panel thickness shall be 2-1/2 inches providing a minimum noise reduction coefficient (NRC) of 0.75.

3.0 **EXECUTION:** Additional framing components shall be provided as required to assemble the freestanding partitions. Components include, but are not limited to, vinyl edge inserts and filler caps, individual panel supports, and wall connectors.

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SECTION 10671

METAL STORAGE SHELVING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal storage shelves. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal Storage Shelvings: Fed. Spec. AA-S-1048, Carbon Steel, baked enamel finish or ASTM A 167, stainless steel, a minimum no. 3 polished finish or a satin finish.

2.1.1 Shelves: Form of 0.0478-inch thick steel with front and rear faces double flanged and box channeled.

2.1.2 Brackets: Cantilever design, steel not less than 0.1046 inch thick and of hook-in-lift-off design, adjustable without use of tools.

2.1.3 Anchorage: 1/4-inch size bolts with standard nuts and lock washers.

3.0 EXECUTION: Storage shelvings shall be installed in accordance with the designated arrangement, securely anchored in position, and accurately aligned vertically and horizontally.

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SECTION 10805

TOILET ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of toilet accessories other than porcelain type tile wall accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Finishes: Finishes on metal shall be provided as follows:

2.1.1 On Stainless Steel: No. 4 general-purpose polished.

2.1.2 On Carbon Steel, Copper Alloy, and Brass: Chromium-plated, bright.

2.2 Miscellaneous Accessory Items:

2.2.1 Mirror, Glass (MG): Glass mirror shall conform to Fed. Spec. DD-M-411.

2.2.2 Mirror, Metal (MM): Metal mirror shall be stainless steel or chromium-plated steel, mirror quality, 0.037-inch minimum thickness, edges turned back 1/4 inch and recessfitted with fiberboard backing, mounted with concealed theft proof fastening. Size shall be as required.

2.2.3 Grab Bar (GB): Grab bar shall conform to Fed. Spec. WW-P- 541. Grab bar shall be form and length as required. Flange shall have screw mounting holes concealed on the lip of the flange. Installed bars shall be capable of withstanding a 500-pound vertical load without becoming loose from the fastenings and without obvious permanent deformation.

2.2.4 Shelf, Glass (SG): Glass shelf shall conform to Fed. Spec. WW-P-541 and shall be supported between brackets or on brackets. Shelf shall be plate or float glass, width and length as required. Separate supports shall be stainless steel.

2.2.5 Shelf, Metal, Heavy-Duty (SMHD): Heavy-duty metal shelf shall be stainless steel supported between brackets or on brackets not more than two feet on center. Thickness of shelf and brackets shall be not less than 0.07 inches Shelf shall have rounded corners with minimum 1/2-inch lipped front edge, designed to support 60 pounds per linear foot. Width and length shall be as required.

2.2.6 Shelf, Metal, Light-Duty (SMLD): Light-duty metal shelf shall conform to Fed. Spec. WW-P-541. Shelf shall be supported between brackets or on brackets. Width and length shall be as required. Shelf and separate supports shall be stainless steel.

2.2.7 Soap and Grab Bar Combination, Recess-Mounted (SGR): Recess-mounted soap and grab bar combination shall conform to Fed. Spec. WW-P-541, stainless steel, modified to provide a grab bar. Plastic insert dish shall be furnished.

2.2.8 Towel Bar (TB): Towel bar shall conform to Fed. Spec. WWP-541, stainless steel, length as required. Bar shall be minimum 3/4 inch in diameter.

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2.2.9 Towel Pin (TP): Towel pin shall have concealed wall fastenings; pin shall be integral with or permanently fastened to wall flange, approximately 4-inch projection.

2.3 Dispensers and Receptacles:

- 2.3.1 Paper Towel Dispenser (PTD): Paper towel dispenser shall conform to Fed. Spec. WW-P-541.
- 2.3.1.1 Mounting S, Surface: Style N or O.
- 2.3.1.2 Mounting R, Recessed: Style P, Q, or T.
- 2.3.2 Sanitary Napkin and Tampon Disposer (SND): Sanitary napkin and tampon disposer shall conform to Fed. Spec. WW-P-541, stainless steel. Reusable liner of the type standard with the manufacturer shall be provided.
- 2.3.3 Sanitary Napkin and Tampon Dispenser (SNTD): Sanitary napkin and tampon dispenser shall conform to Fed. Spec. WW-P-541.
- 2.3.4 Waste Receptacle (WR) shall conform to Fed. Spec. WW-P-541.
- 2.3.5 Facial Tissue Dispenser (FTD) shall conform to Fed. Spec. WW-P-541.
- 2.3.6 Toilet Tissue Dispenser (TTD) shall conform to Fed. Spec. WW-P-541.
- 2.3.7 Toilet Paper Holder (TPH) shall conform to Fed. Spec. WW-H- 1911, Type 1.
- 2.3.8 Toothbrush and Tumbler Holder (TTH) shall conform to Fed. Spec. WW-P-541.
- 2.3.9 Soap Dispenser (SD) shall be liquid typo consisting of a stainless steel tank with hold capacity of 40 fluid ounces.
- 2.3.10 Soap Holder (SH) shall conform to Fed. Spec. WW-P-541.
- 2.4 Medicine Cabinets:
- 2.4.1 Medicine Cabinet (MC) shall conform to Fed. Spec. WW-P-541. Width, height, and depth of cabinet shall be as required.
- 2.4.2 Sliding Door Cabinet, Class 1, assembly shall be surface mounted vanity or recessed cabinet with design and lighting arrangement as required.
- 2.4.3 Swinging Door Cabinet, Class 2, Design and assembly, including the lighting arrangement, shall be as required. Assembly shall be surface or recess-mounted.
- 2.5 Shower Curtains and Rods:
- 2.5.1 Shower Curtain (SC) shall conform to Fed. Spec. L-C-780, size as required to suit conditions.
- 2.5.2 Shower Curtain Rods (SCR) shall be stainless steel 1 inch OD by 0.049 inch minimum, straight or bent as required to meet installation conditions.
- 2.6 Hand Dryer shall be electrically operated conforming to Fed. Spec. W-H-50. Unit shall be surface-mounted, semi-recessed or flush mounted as required. Cover face shall be polished aluminum, cadmium plated, polished chrome, stainless steel, or porcelain. Fan shall deliver a minimum of 150 cfm at the discharge end of the nozzle.

2.7 Ash Urn shall be wall-mounted, paraboloidal shape, two quart capacity conforming to Fed. Spec. RR-A-1255. Urn shall be 22-gauge type 304 stainless steel with satin finish or satin bronze finish.

2.8 Janitorial Material:

2.8.1 Mop and Broom Holder shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths required.

2.8.2 Utility Shelf with mop and broom holders shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths as required.

2.8.3 Pail or Ladder Hook shall be 12-gauge stainless steel, bright polished finish projecting 8 inches from wall, 6 inches high, and 1 inch wide.

2.9 Hospital Accessories

2.9.1 Foot Operated Soap Dispenser: Dispensing mechanism shall be non-corroding containing a stainless steel hood and shatter-proof container. The unit shall contain a molded rubber foot pump with non-slip base.

2.9.2 Bed Pan Storage Rack: Rack shall be stainless steel surface-mounted providing storage for bed pans and urinals.

3.0 EXECUTION: Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Where exposed fasteners are permitted, they shall have oval heads and finish to match the accessory, except exposed fasteners in designated areas shall be of tamper-proof design.

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SECTION 10900

WARDROBES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood or steel wardrobes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Design: Wardrobes shall be constructed of either wood or steel at the Contractor's option except when necessary to match existing or where one type is better suited for locality and intended usage. The material selected shall be used throughout the project. Design of wardrobes shall be by the Contractor using specified requirements as a minimum of acceptability. Each wardrobe shall be a complete unit capable of relocation without modifying or adding components, except for anchors and scribes. Common sides or backs between adjacent units are not permissible. The dimensions indicated are for the purpose of establishing general layout. Minor variations necessary to coordinate the details of construction will be permitted. All parts shall be manufactured to standards that will permit replacement without modifying of remaining parts.

## 2.0 PRODUCTS

### 2.1 Hardware:

2.1.1 Hinges shall be brass or steel, not less than 0.062 inch thick, 5 knuckle, tamper-proof institutional type, joint length not less than 2-1/2 inches, chromium finish or primed for paint finish. When doors are closed, only a smooth beveled and rounded joint shall be exposed. Doors 42 inches and less on the hinged side shall have two hinges; doors more than 42 inches on the hinged side shall have three hinges.

2.1.2 Latches: The active door of double doors on the clothes hanging compartment shall be provided with a three-point latching and locking mechanism. The handle shall be of the lever type, of cast brass or bronze, and shall be designed to permit locking by padlocking the handle to a steel keeper with a matching hole. A 14-gauge rectangular corrosion resisting steel shield shall be provided to protect the door from damage at the handle and padlock area. The interior components of the mechanism shall include locking bars or rods not less than 1/2-inch thick, two steel upper guides and two steel lower guides, three-finger cam, and applied strikes or reinforced openings for latching. The handle, keeper, and locking bars or rods shall have a chromium finish, and all other components shall have a chromium, nickel, zinc, or cadmium plated finish. Doors to overhead storage compartment, when separate from clothes hanging compartment doors, shall be provided with a heavy-duty catch and strike which will latch automatically when the overhead storage compartment is closed and which can be released manually when the clothes hanging compartment doors are open.

2.1.3 Clothes hanging rods shall be chromium plated or zinc-coated steel tubing approximately 1 inch in diameter and with a minimum wall thickness of 0.083 inch. Clothes hanging rods with exposed ends shall be provided with plastic caps to prevent marring the finish on the inside of the wardrobe.

2.1.4 Drawer Slides shall be heavy duty 14-gauge steel mating channels equipped with replaceable nylon-tired rollers or self-lubricating double-prong plastic glides located to insure that the drawer will operate freely and smoothly throughout its travel. Slides shall have integral cushioned stops at both ends of the travel, shall permit removal of drawers without tools, and shall be free of excessive play or sag.

2.1.5 Silencers of rubber or similar resilient material shall be provided on door frames at close proximity to each latching point to minimize noise when the door is closed. Silencers shall be replaceable.

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2.1.6 Astragals: Active door of double doors shall be provided with an astragal, full height of the door.

2.2 Steel Sheets shall be cold-rolled, commercial quality, stretcher level degree of flatness and of manufacturer's standard gauges specified.

### 2.3 Steel Wardrobe Construction:

2.3.1 Workmanship: Form bends accurately. Cut edges straight and smooth. Holes shall be accurately punched or drilled and have all burrs removed. Extend butt welds the full width of joining edges; grind smooth and flush with adjacent surfaces when on exterior of wardrobes. Resistance welds shall be 3/16-inch minimum diameter and maximum spacing of 8 inches on center. Welds shall be thoroughly fused and sound and free from cracks, fissures, pits, holes, gas pockets, porosity, and undercuttings. Leave no sharp corners or protrusions of any kind in the final assembled wardrobes. Use of mechanical fasteners exposed to exterior of unit shall be limited to those required for application of hardware and scribes.

2.3.2 Base shall be closed type, formed to provide a bearing surface at the floor, and provided with floor mounting holes. Bases constructed as part of the framing and panel members shall be of the same gauge as those members. Bases constructed as separate components shall be not lighter than, 16-gauge steel.

2.3.3 Back and Side Panels shall each be formed of sheet steel not lighter than 22 gauge and shall be reinforced if necessary to impart rigidity to unbroken spans.

2.3.4 Front shall be not lighter than 18-gauge steel and multichannel formed as required to provide strength and rigidity to side panels, top, and bottom without exposing fasteners. Front shall be reinforced as necessary to serve as a stable mount and frame for doors and hardware. Fronts formed as part of side panels shall be equivalent to the specified 18-gauge steel multichannel construction. With the door closed, clearance between door edge and frame shall be uniform and shall not exceed 1/8 inch and door face shall be flush with the face of the front.

2.3.5 Top shall be not lighter than 22-gauge steel, flat exterior surface, and formed as required for securing to back, front and sides.

2.3.6 Bottom shall be not lighter than 18-gauge steel and formed as required for securing to back, front and sides.

2.3.7 Hat Shelf and Upper Storage Shelf shall be not lighter than 18-gauge steel and formed as required for securing to back and sides.

2.3.8 Doors shall be of double-wall type with not lighter than 22-gauge steel inside panel and not lighter than 20-gauge outside panel separated by not less than 3/4 inch of rigid mineral insulation cemented between the panels. Doors shall be reinforced or otherwise prepared for the reception of hardware and to provide strength and rigidity to the doors.

2.3.9 Scribes and Closures shall be not lighter than 20 gauge.

2.3.10 Chest Unit shall have top and side of not lighter than 20-gauge steel firmly attached to the wardrobe. Shelves shall be constructed of not lighter than 18-gauge steel. Drawer bodies shall be of not lighter than 22 gauge, and drawer fronts shall be of not lighter than 20 gauge with the top formed to provide a full length integral pull.

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2.3.11 Finish shall be an approved factory-applied baked-enamel, semigloss finish in accordance with manufacturer's standard finishes. Color will be selected from manufacturer's standard colors.

#### 2.4 Wood Wardrobe Construction:

2.4.1 General: Except as otherwise shown or specified, wood wardrobes shall conform to AWI-02 and AWI-01. Plywood for transparent finish shall be hardwood plywood, and one species shall be used throughout. Plywood for paint finish shall be hardwood plywood, or have a medium density impregnated fiber overlay.

2.4.2 Wood Scribes and Closures shall be 3/8-inch minimum, thickness and shall match wardrobes. Moldings used in conjunction with scribes and closures and for joints between adjacent wardrobes shall be 5/16-by 1-1/16 inch flat members or 3/4-inch quarter round.

2.4.3 Wood Finishes: interior surfaces shall be given an approved transparent finish, and exterior surfaces shall be given an approved paint finish of the color as selected from manufacturer's standard colors or an approved transparent finish. Surfaces to receive a transparent finish shall be stained to an approved shade and all wood surfaces to be finished shall be filled, sanded smooth, and given not less than two coats of an approved finish coating. Finishing of interior and exterior surfaces shall be part of a continuous shop operation to and including at least the first finish coat in order to minimize warpage.

### 3.0 EXECUTION

3.1 Installation: Wardrobes shall be assembled and positioned in accordance with the layout shown, not level, and secured in place. Wardrobes with backs to walls shall be secured to the wall with not less than four fasteners, using one fastener near each corner. Free standing or island-type installations shall be secured to the floor with not less than four fasteners, using one fastener near each corner. Back-to-back or side-to-side wardrobes shall be secured to each other. Securing of adjacent wardrobes shall be with three fasteners located high, low, and intermediate when a side is involved. Securing of adjacent wardrobes shall be with four fasteners located near the corners when a back-to-back installation is involved. Fasteners to secure metal wardrobes in place shall penetrate two thicknesses of metal at each wardrobe or shall be provided with washers. There shall be no sharp corners or protrusions in the final assembled wardrobes that could be considered harmful to the user or the stored items. Scribes over 14 inches wide shall be secured to the building construction with concealed fasteners at intervals not to exceed 12 inches on center. Hardware shall be adjusted and left in good working order. Doors and drawers shall not stick or bind, but shall operate smoothly and easily. Wardrobes shall be cleaned and protected from damage until acceptance.

## SECTION 11161 PLATFORM

### AND DOCK LEVELERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock levelers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

##### 2.2 Replacement Components:

2.2.1 General: Replacement components shall be new and of matching quality and construction. Every replacement part shall be made to definite standards, tolerances, and clearances and to fit in the existing equipment.

2.2.2 Structural Components: All replacement parts of the equipment to be repaired shall be of such design, size, material, and strength as required to carry and sustain the maximum allowable load placed upon it.

2.2.3 Hydraulic System Components: The hydraulic system shall consist essentially of a hydraulic pump, hydraulic rams, pressure relief valve, fluid reservoir, hydraulic control valves including necessary continuous-duty solenoid valves and check valves, and connections. The system shall be installed as a separate and complete system in each platform unit.

2.2.4 Electrical System Components: All electrical components shall comply with the National Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec. JC-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall be not less than 1 megohm.

2.3 Permanent, Self-Forming, and Free Standing Adjustable Dock Levelers: Levelers shall comply with NBS Commercial Standard CS 202 for Class A loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.

2.4 Permanent Manually Operated Dockboards: Permanent manually operated dockboards shall comply with NES Commercial Standard CS 202 for Class B loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.

#### 3.1 EXECUTION:

3.2 Repair: Repair shall consist of removal and replacement of various defective equipment components. Installation of hydraulic system-components shall be such that no leaks exist in any part of the system. All electrical work shall comply with the National Electrical Code.

3.3 Installation of Equipment: The equipment shall be installed by, or under the supervision of, the manufacturer or his licensee. After installation is complete and equipment is properly adjusted, perform operational and load tests per manufacturer's instructions to ensure that the equipment functions properly and has the specified capacity.

## SECTION 11162 PLATFORM

### AND DOCK LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

##### 2.2 Replacement Components:

2.2.1 Structural Components: All replacement parts of the equipment to be repaired shall be of such design, size, material, and strength as required to carry and sustain the maximum allowable load placed upon it.

2.2.2 Hydraulic System Components: Pipe, tubing, fittings, and hydraulic hose shall be designed and constructed with a minimum safety factor of three based on bursting pressure. Cylinders, pumps, and control valves shall be designed to withstand test pressures of 150 percent of the design operating pressure.

2.2.3 Electrical System Components: All electrical components shall comply with the National-Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec. JC-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall not be less than one megohm.

2.3 Dock Lifts shall comply with NBS Commercial Standard CS 202. The replacement lift shall have the same capacity, travel, minimum lowered level, and nominal raising and lowering speed as the existing lift.

2.4 Truck Levelers: The truck leveler shall have a capacity of 40,000 pounds. Leveler shall have a total travel of 36 inches, divided as follows: 18 inches up, 18 inches down.

#### 3.1 EXECUTION:

3.2 Repair: Installation of hydraulic system components shall be such that no leaks exist in any part of the system. All electrical work shall comply with the National Electrical Code.

3.3 Installation of Equipment: The equipment shall be installed by, or under the supervision of the manufacturer or his licensee. After installation is complete and equipment is properly adjusted, perform operational and load tests per manufacturer's instructions to ensure that the equipment functions properly and has the specified capacity.

## SECTION 11164

### PLATFORM AND DOCK ENCLOSURES

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock enclosures. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Fabric shall be hypalon-coated nylon, 5.1 oz. per sq. yd. with 65 percent coating on front and 35 percent on back face. Total weight with coatings shall be 16 oz. per sq. yd.

2.3 Thread shall be polyester, heavy-duty minimum-size FF (Size 139) bonded, complying with Fed. Spec. V-T-285.

2.4 Wood Framing: Lumber shall be air-dried and well seasoned, to contain not more than 19 percent moisture at time of finishing, identified by official grade marks and shall be Douglas Fir-Larch No. 2 or better, Hemlock-Fir, No. 1 or better, or Southern Pine No. 2 or better. Lumber shall be smooth on all sides.

2.3 Pads shall be polyurethane foam with a minimum density of 1.25 pounds per cubic foot and a 35-pound compression factor, open cell construction of an ether base. Foam shall be resilient from -50 F to +180 F. Pads shall be bonded to framing members.

2.5 Bottom Pads and Bumpers: Three polyurethane foam pads with cover fabric and two laminated or extruded rubber dock bumpers mounted to a continuous 2-inch by 12-inch wood frame.

#### 3.0 EXECUTION: (Section not used.)

## SECTION 11165

### PLATFORM AND DOCK BUMPERS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of platform and dock bumpers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Timber Bumpers shall be dense red oak. Ends shall be smooth and edges rounded to a radius of approximately 1/2 inch. All bolt holes shall be countersunk. Bumpers shall be treated in compliance with Fed. Spec. TT-W-550. Treating process and results shall comply with Fed. Spec. TT-W-571. Retention shall be a minimum of 0.23 pounds of oxide per cubic foot of treated wood.

2.3 Laminated Rubber Bumpers shall be resilient rubber material made from rubberized fabric truck tires cut to uniform size pads and punched to receive 3/4-inch supporting rods. The bumpers shall be closed with 3-inch by 2-1/2 inch by 1/4-inch structural steel angles under approximately 1,500 pounds of pressure. Angles shall be welded to 3/4-inch rods at one end and closed with threaded rod and nuts at the other end. Anchor leg of angle shall extend a minimum of 2-1/2 inches beyond rubber, surface at either end and contain 2 or 3 anchor bolt holes.

2.4 Extruded Rubber Bumpers shall be manufactured of extruded ethylene propylene diene monomers (EPDM) hydrocarbon rubber of 70 durometer hardness or higher and with a minimum tensile strength of 2,400 psi. All mounting holes shall be countersunk.

#### 3.1 EXECUTION:

3.2 Removal of Existing Bumpers: Remove existing bumpers in a manner to prevent damage to the surface on which they are mounted. All existing anchor bolts that have deteriorated or are not in proper position to facilitate mounting of new bumpers shall be cut off flush with the base surface. Existing bumpers that have been mounted by welding shall be removed by cutting torch and the resultant mounting surface power ground smooth and flush prior to installation of the new bumper.

3.3 Installation of New Bumper: All mounting hardware shall be new except existing., expansion shields that are properly located and in suitable condition for reuse. Final installation shall be properly aligned, tight and flush against mounting surface.

## SECTION 11166

### PLATFORM AND DOCK WARNING DEVICES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock warning devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Pavement Marking Paint shall comply with Fed. Spec. TT-P-115.

2.3 Glass Spheres shall have at least 42 percent reflectivity and shall comply with the State Standard Specifications.

2.4 Reflectors shall be acrylic plastic prismatic reflectors complying with the State Standard Specifications.

3.1 EXECUTION:

3.2 Preparation: Thoroughly clean all pavement areas to be painted by use of hand brooms, rotary brooms, air blast, scrapers, or other acceptable means that will not damage the surface.

3.3 Installation:

3.3.1 Pavement Marking: Apply paint and glass spheres with mechanical equipment. Apply the paint and glass spheres uniformly to form markings of the dimensions and shapes required. Lines shall be true with sharp edges and ends. The length of lines shall be within plus or minus 3 inches; width shall be within plus or minus 1/8 inch.

3.3.2 Reflectors: Install reflectors at the locations and by the method required. Align and orient reflectors so that proper reflectivity is obtained.

## SECTION 11167

### PLATFORM AND DOCK GUARDRAILS AND POSTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock guardrails and posts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall, be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Steel Guardrail: Steel plate beam guardrail, end sections, and splice plates shall comply with AASHTO M180. Steel posts, restraints, braces, and plates shall be galvanized.

2.3 Materials or Timber Guardrail and Cable Guard Construction: Treated timber shall comply with the NFPA requirements for 1850F dense southern pine or 1900F dense Douglas fir. Wire rope cable and fastenings shall comply with AASHTO M30, Class A.

2.3.1 Offset Spring Brackets shall have a deflection of one inch under a compression load of not less than 3,500 pounds and not more than 6,000 pounds applied for one minute perpendicular to the line of the cables with the cables in place. The offset spring brackets shall not collapse under a compression load of 10,000 pounds.

2.3.2 Special Offset Spring Brackets of the blunt, slotted, overlapping nose type shall be fabricated from spring steel, tempered, and drawn. The brackets with steel stay pins shall be slotted for 3 cables. Special offset spring brackets shall have a minimum deflection of one inch under a compression load of 15,000 pounds applied for one minute perpendicular to the line of the cables at the points of attachment of the cables and the bracket with the cables in all slots.

#### 3.1 EXECUTION:

3.2 Guardrail Removal: Sections of guardrail shall be removed as required to provide access to damaged or deteriorated components.

3.3 Guardrail Fabrication and Erection: New guardrail shall be erected in compliance with AASHTO M180 and the construction requirements for the type of guardrail being erected.

3.3.1 Steel Plate Beam Fabrication shall comply with AASHTO M180. Roll or round the edges of the plates so that they present no sharp edges.

3.3.2 Setting Timber and Steel Posts: Set posts in compacted soil to a minimum depth of 3 1/2 feet. Backfill the holes in minimum 6inch layers with approved materials. Compact each backfill layer in a manner not to displace the posts from correct alignment.

3.3.3 Painting: Steel surfaces that have not been galvanized shall be shop-coated with rust inhibitive primer paint. Give primed surfaces to be painted two coats of white or aluminum paint after erection. Where the surface will be inaccessible after erection, paint before installation.

3.3.4 Cable Guard: The offset brackets shall be attached to each post by means of one or more bolts not less than 3/4 inch in diameter inserted through the bracket and the post with the threaded end of the bolts at the back of the post. All bolts except adjustment bolts shall be drawn tight, and all bolts shall be sufficiently long to extend at least 1/4 inch beyond the nuts. After the posts and offset brackets have been set, the cables shall be erected and stretched taut by an approved mechanical device. The completed assembly shall provide a smooth, continuous platform and dock guard conforming to the required line and grade. After the cable has been stretched in its final position, the takeup on adjustment bolts, intermediate anchors, and end anchors shall be made as necessary.

## SECTION 11220

### MIXING CHAMBERS AND EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant mixing chambers and equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Concrete Repair Material shall be epoxy type grout in compliance with Fed. Spec. MMM-A-001993.

2.3 Baffle Repair and Replacement Parts: Material and accessories for baffle repair or replacement parts shall be chemically resistant to the chemicals being mixed in the mixing chamber.

2.4 Air Agitation System Repair and Replacement Parts such as diffuser pipe, and fittings shall match the existing equipment.

2.5 Mixing Chamber-Drive Equipment: Multiple V-belt drives shall be furnished in matched sets.

#### 3.1 EXECUTION:

3.2 Preparation: Alternate Mixing Chamber and appurtenances shall be furnished, installed, and removed after completion of work by the Contractor.

#### 3.3 Installation:

3.3.1 Static Mixer shall be cleaned and repaired.

3.3.2 Mixing Chamber Baffles: Drain the mixing chamber and repair or replace the baffles as required.

3.3.3 Mixing Chamber Drive Equipment:

3.3.3.1 Gear Drive: Maintenance and Repair Procedures shall be such that they will result in the equipment being able to operate at its rated capacity.

3.3.3.2 Cleaning: Accumulated dirt, oil, grease, and debris shall be removed from the parts.

3.3.3.3 Testing: Repaired equipment shall be placed and tested to ensure that it operates at design conditions and rated capacity. Re-test equipment failing to meet test conditions.

## SECTION 11221

### FLOCCULATORS AND SCRAPERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of flocculators and scrapers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Coal-Tar Epoxy Coating shall comply with SSPC-PAINT 16.

2.2 Concrete Repair Material shall be grout in compliance with Fed. Spec. MMM-G-650.

#### 3.0 EXECUTION:

##### 3.1 Preparation:

3.1.1 Cleaning: Prior to removing parts or components of flocculators and scrapers, clean dust, dirt, grime, and other foreign matter from the surfaces of the flocculators and scrapers.

3.1.2 Interruption of Treatment: Not more than one flocculator and scraper unit shall be taken out of service at a time.

##### 3.2 Installation:

3.2.1 Clean interior concrete surfaces with high pressure water or steam to remove all dirt and residue, allow to dry, and brush sandblast in compliance with SSPC-SP 7.

3.2.2 Fill holes and voids in the concrete surfaces left from the blast cleaning by means of troweling and squeeze application of an epoxy filler. Allow the surfacing material to cure overnight, and then apply two coats of coal-tar epoxy to a dry film thickness of 10 mils per coat.

## SECTION 11225

### CLARIFIERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant clarifiers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Epoxy Filler Compound for Concrete Surfaces shall comply with Fed. Spec. MMM-A-001993.

2.3 Coal-Tar Epoxy shall comply with SSPC-PAINT 16.

2.4 Epoxy Paint shall comply with Mil. Spec. MIL-P-24441.

2.5 Red-Lead Base Paint shall comply with Fed. Spec. TT-P-86, Type 1.

2.6 Finish Coat Paint shall comply with Fed. Spec. TT-P-38.

#### 3.1 EXECUTION:

##### 3.2 Preparation:

3.2.1 Cleaning: Prior to removing parts or components of the clarifier or appurtenant equipment, clean dust, dirt, grime, and other foreign matter from the surfaces.

3.2.2 Interior Concrete Surfaces of the clarifier tank shall be cleaned with high pressure water or steam to remove all dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPC-SP 7.

3.2.3 Interruptions of Treatment: Not more than one clarifier shall be taken out of service at a time.

##### 3.3 Installation:

3.3.1 Holes and Voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. The surfacing materials shall be allowed to cure overnight, and then two coats of coal-tar epoxy shall be applied.

3.3.2 Submerged Ferrous Metal Surfaces, such as piping, ladders, structural steel, equipment, and metal roof surfaces that are exposed to the sludge shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar epoxy.

3.3.3 Clean Exterior Concrete Surfaces of the clarifier by means of brush sandblast in compliance with SSPC-SP 7, blow down the surfaces with air to remove the blasting residue and dust, and apply two coats of epoxy-polyamide paint.

3.3.4 Ferrous Metal Surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 6. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP 3. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of aluminum finish paint shall be applied.

3.3.5 Startup: After completion of maintenance and repairs, the clarifier shall be started up and operating adjustments shall be made by the Contractor as required to achieve the design flow rate and quality of the effluent.

SECTION 11230

AERATION EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant aeration equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Media for tray type aeration equipment shall be coke, stone, or factory-made ceramic balls, 2 to 6 inches in diameter.

2.3 Trays: Tray repair and replacement parts shall be of the same kind of material or shall be compatible with existing trays.

3.1 EXECUTION:

3.2 Preparation: Pipe, valves, and fittings to install a bypass around the aerator shall be provided.

3.3 Installation:

3.3.1 Enclosure Repairs: Repair or replace screens, screen frames, and structural parts of the aeration equipment as required.

3.3.2 Defective Media shall be removed and new media added, or the defective media shall be replaced with new media.

3.3.3 Repair and Replacement of Trays: Repair or replace trays as required. Drain and clean trays. Remove media, if necessary, to accomplish the repairs, and replace media after the repairs are complete.

3.3.4 Flame Cutting: No cutting by torch or flame shall be done without written authorization from the Contracting Officer.

3.3.5 Testing: After repairs are completed, test the equipment to ensure that it will operate at design conditions.

## SECTION 11239

### CHEMICAL BYPASS FEEDERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of chemical bypass feeders for water treatment systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS: Bypass feeders shall be used to control corrosion, inhibit lime scale formation, and remove dissolved iron in small water systems.

2.2 In-Line Mount Unit shall be equipped with built-in bypass and shutoff valves and hold pressures up to 125 psi.

2.3 Floor Mount Unit shall be equipped with 5-, 10-, or 12-gallon capacity feeder tanks, lockable filler cap, one short and one long slotted strainer, flow indicator, drain cock, and shutoff valves. The flow indicator shall consist of a transparent pyrex glass cylinder. The unit shall hold pressures up to 175 psi.

3.1 EXECUTION:

3.2 In-Line Mount Unit Feeder shall be installed before the pressure tank to prevent rust deposition. To prevent corrosion, the unit shall be installed on the inlet line to the heater.

3.3 Floor Mount Unit Feeder Unit shall be installed in a bypass on the cold water line to the equipment to be protected against corrosion or lime scale problems.

3.3.1 Water Heater Protection: Feeder shall be placed before a water heater but far enough away so that hot water will not flow back into the feeder.

3.3.2 Private Well Systems: The feeder shall be installed before the water storage tank.

3.3.3 Pressure Relief Valve: A pressure relief valve shall be installed on either the inlet or outlet line between the shutoff valve and the feeder when feeding chemicals that generate excess heat and pressure upon contact with water.

## SECTION 11240

### CHEMICAL STORAGE EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant chemical storage equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Solution Tank Repair Material shall be PVC in compliance with ASTM D 1784, polyethylene in compliance with ASTM D 1248, or fiberglass.

2.3 Manhole Gasket material shall be chemically resistant to the material stored in the bin.

#### 3.1 EXECUTION:

3.2 Repair and Replacement of Parts: The equipment shall be cleaned and repaired, parts shall be replaced as required, and the equipment lubricated and adjusted to operate properly.

3.3 Stored Material shall be removed from the chemical storage bin, the bin cleaned and repaired, and the stored material replaced in the bin.

3.4 Manhole Cover and Gasket shall be removed, gasket sealing surfaces cleaned, new gasket installed, and the manhole cover reinstalled.

3.5 Welding shall comply with AWS D1.1.

3.6 Testing: After repairs are completed, the equipment shall operate at design conditions.

## SECTION 11241

### WATER TREATMENT PLANT SCALES AND WEIGHING EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant scales and weighing equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: (Section Not Used.)

3.1 EXECUTION:

3.2 Testing and Adjustment: Test and adjust controls to have same accuracy as originally guaranteed by the manufacturer.

3.3 Sealing: After testing and adjustment, the scale shall be sealed by the Contractor to prevent unauthorized tampering that might affect its accuracy.

SECTION 11250

ION EXCHANGE EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant ion exchange equipment. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Exchange Column Vessels: Welding rods and shell material that are compatible with the steel of the vessel shall be used for leak repair. Welding rods shall comply with ASME Boiler and Pressure Vessel Code, Section II.

2.3 Vessel Lining or coating repair material shall be compatible with the existing lining or coating.

2.4 Ion Exchange Resins, cation, or anion used for replacement shall be as originally specified by the equipment manufacturer or approved equivalent.

3.1 EXECUTION:

3.2 Exchange Column:

3.2.1 Vessel Repair Welding shall comply with the applicable requirements of ASME Boiler and Pressure Vessel Code, Section IX.

3.2.2 Structural Welding shall comply with the applicable requirements of AWS D1.1.

3.3 Controllers and Analyzers: The following equipment shall be cleaned and shall have defective ports repaired or replaced to restore the items to their original operating condition:

- Flow Control
- Totalizer
- Sequence Controller
- Time Delay Relay
- Drum Controller
- Automatic Analyzer
- Conducting Meter
- Sample Conditioning Equipment

## SECTION 11255

### SOFTENING EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant softening equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Concrete Repair Material for chemical storage bins and sedimentation basins shall comply with Fed. Spec. MMK-A-001993.

2.3 Manhole Gasket Material shall be as recommended by the bin fabricator and shall be chemically resistant to the material stored in the bin.

2.4 Bin Vent System repair and replacement parts shall be as recommended by the manufacturer, or equivalent.

2.5 Replacement Parts for the sedimentation tank mechanism, drive system, and appurtenances shall be as recommended by the manufacturer of the equipment, or equivalent.

#### 3.1 EXECUTION:

3.2 Carbon Dioxide Diffusion System: Maintenance and repair shall result in the recarbonation system being restored to its design capacity.

3.3 Manhole Gasket: Manhole cover and gasket shall be removed, seated surfaces shall be cleaned, a replacement gasket shall be put in place, and the manhole cover shall be reinstalled.

3.4 Bin Vent System: Parts shall be cleaned and repaired or replaced.

3.5 Testing: Mixers shall be tested to ensure that they operate at their rated capacity. The diffusion system shall be tested for leaks, carbon dioxide flow rate, and pH change in the water. Bin(s), Vent system, and appurtenances shall be tested to ensure operation at design conditions. Tanks and connecting lines shall be examined for leaks after being filled to operating level, and leaks shall be repaired.

3.6 Access: Softening equipment parts or appurtenances that interfere, with access to or performance of the work shall be removed and replaced after the work has been completed.

## SECTION 11260

### CHLORINE CONTACT TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant chlorine contact tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Bolts, Nuts, and Screws removed due to repair work shall be replaced with new bolts or screws of the same type, size, and finish, complying with ASTM A 193, Grade B8. Replacement nuts of the same type, size, and finish shall comply with ASTM A 194, Class 8F.

2.3 Finishes: Items replacing existing items that are galvanized, plated, painted, or otherwise finished, shall be finished with like finish.

2.4 Concrete Repair Material shall be epoxy type grout in compliance with Fed. Spec. MMM-A-001993.

#### 3.1 EXECUTION:

3.2 Tank shall be cleaned and repaired with the corroded parts replaced as required.

3.3 Testing: After repairs are completed, test the equipment to ensure that it operates at designed conditions.

## SECTION 11261

### DISINFECTION EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for water and sewage treatment plant disinfection equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Chlorinator: The chlorinator shall be wall- or cabinet mounted, shall be a vacuum-operated solution-feed type, and shall include an integral manifold trap complete with a built-in electric heater. The manifold shall have a removable chlorine filter with a 5square inch filtering area. A positive tight shutoff valve shall be provided within the chlorinator to isolate gas under pressure from the control system should there be a loss of vacuum. An easily removable basket with filter screen shall be included upstream of the inlet valve. A spring-operated pressure relief valve shall be provided to prevent the buildup of pressure within the gas control system. An excess vacuum shutoff valve, which isolates the regulator and gas supply system from the ejector on loss of gas pressure shall be supplied. Provisions for automatic changeover shall be incorporated within the vacuum regulator without the need for an external valve. An indicator shall provide a visual signal when the chlorine gas supply is exhausted or interrupted.

2.3 Gas Injector: The injector or diffuser shall be polyvinyl chloride (PVC) in compliance with ASTM D 1784. The ejector shall be provided with dual check valves as well as an emergency drain valve to protect against flooding of the vacuum regulator.

2.4 The Unit shall be supplied with the following accessories: metering tube supply indicator, rate valve, 50 feet of 5/8-inch polyethylene tubing for vent and vacuum lines, insect screen, bottle of ammonia solution, spare gaskets, thread lubricant, a flexible connector, and a universal wrench.

#### 3.1 EXECUTION:

3.2 Installation: The chlorine feeding machines and all equipment appurtenances shall be installed in accordance with the Chlorine Manual and CI Pamphlet 6 so as to provide a complete and integrated system.

3.3 Testing: After installation,of the chlorine feeding machine and evaporators is complete, operating tests shall be carried out to ensure that the chlorine feeding installation operates properly. All piping shall be tested hydrostatically and for leaks. If any deficiencies are revealed during any tests, such deficiencies shall be corrected, and the tests shall be reconducted.

SECTION 11262

GASEOUS CHEMICAL METERING EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of gaseous chemical metering equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Gas Injectors shall be PVC plastic in compliance with ASTM D 1784.

2.3 Gas Evaporators:

2.3.1 Electrical Heating Elements shall be flat rod, immersion type.

2.3.2 Wiring, Switch, Thermostat, and Alarm Switch: Load rating of wiring, switch, thermostat, and alarm switch shall be equal to or greater than the load rating of the wiring, switch, thermostat, and alarm switch to be replaced.

3.1 EXECUTION:

3.2 General: The gas injector, gas evaporator, and chemical metering equipment shall be cleaned and repaired.

3.3 Testing: Each piece of equipment shall be tested and adjusted to operate properly over its capacity range.

3.4 Leak Tests: Piping, tubing, vessels, or jackets that are part of the equipment being repaired shall be tested for leaks at one and a half times normal working pressure.

3.5 Calibration: Metering equipment shall be calibrated in compliance with manufacturer's instructions.

3.6 Safety Precautions pertaining to chlorine shall be in compliance with the Chlorine Institute Chlorine Manual.

## SECTION 11304

### SEWAGE EJECTORS, SUBMERSIBLE

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of submersible sewage ejectors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 **PRODUCTS:** The sewage ejectors shall be of the simplex or duplex pneumatic type and shall be complete with receivers, compressors, electric motors, control equipment, piping, and all necessary accessories.

2.2 **Sewage Receivers:** Sewage receivers shall be of cast-iron or welded-steel construction conforming to the ASME Code, Section VIII for Pressure Vessels. Sewage inflow and outflow pipe connections shall be flanged; air-supply and vent-piping connections shall be screwed. Pipe threads shall conform to Fed. Std. H28 and pipe flanges shall conform to Fed. Spec. WW-F-406. The receiver shall be tested at a pressure 50 percent greater than the working pressure. Each receiver shall be provided with suitable support and a manhole or handhole conveniently located. Steel receivers shall be coated inside and outside with coaltar primer and enamel conforming to the requirements of AWWA C203 in all respects of materials and application, or shall be coated with a coaltar epoxy paint system conforming to the requirements of SSPC-PS 11.01.

2.3 **Air Compressor:** Each compressor shall be equipped with suction silencer, complete automatic lubrication system, an air filter, and adequate means for cooling. The operating speed of the air compressors shall not exceed 1,800 rpm. Installation of the air compressor shall conform to ANSI B19.

2.4 **Air Reservoir:** If the equipment furnished requires a compressed air reservoir for proper operation, the tank shall be constructed in conformance with ASME Code, Section VIII for Pressure Vessels, with flanged or screwed inlet and outlet connections as required. The storage tank shall be tested at a pressure 50 percent greater than the working pressure. The tank shall be fitted with a pressure gauge, inspection openings, blowoff cock, and a safety valve. The connection to the compressor shall be provided with a check valve and a shutoff valve.

2.5 **Electric Motor:** Each electric motor shall conform to Fed. Spec. CC-M-1807. Temperature rise shall be based on 40 C ambient temperature.

2.6 Controls: An automatic control system shall be provided for each ejector.

2.7 Piping: The sewage influent and effluent lines shall be flanged cast iron. The air piping shall be wrought iron or steel with malleable-iron units and fittings. Pipe hangers and supports shall be spaced at not more than 10 feet on center.

2.8 Check Valves: Fed. Spec. WW-V-51, Type IV, Class A, except that valves on the discharge side of the receivers shall be provided with replaceable valve seats.

2.9 Gate Valves:

2.9.1 Cast Iron: Fed. Spec. WW-V-58, Type I or II, Class 1, Design NRS, flanged ends.

2.9.2 Bronze: Fed. Spec. WW-V-54, Type I, Class A.

2.10 Motor Controls: NEMA ICS 2.

2.11 Pipe:

2.11.1 Cast Iron: Fed. Spec. WW-P-421, Class 150, as applicable to pipe barrel only. Fed. Spec. WW-F-406, Class 125, for pipe flange.

2.11.2 Steel: Fed. Spec. WW-P-406, Weight A, Class 2, zinc coated.

2.12 Pipe Fittings:

2.12.1 Cast Iron: ANSI B16.1.

2.12.2 Malleable Iron: Fed. Spec. WW-P-521, Type II.

2.12.3 Malleable Iron Unions: Fed. Spec. WW-U-531, Type B.

2.12 Hangers and Supports: MSS SP-58 and SP-69.

3.1 EXECUTION:

3.2 Valves: Valves installed in the wrought-iron and steel pipeline shall be bronze with screwed ends and valves installed in the cast-iron pipeline shall have bronze-mounted iron bodies with flanged ends. Gate valves shall be opened by turning counterclockwise.

3.3 Concrete foundations shall be integral with and of the same concrete as the building floor unless otherwise directed. 4,000 psi concrete shall be used in foundations that are entirely separated from the surrounding floor. Foundation bolts, as required, shall be provided for proper positioning during the placement of the concrete.

3.4 Bolts, nuts, anchors, washers, and all other types of supports necessary shall be of wrought iron or steel galvanized according to ASTM A 153.

## SECTION 11320

### CENTRIFUGES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant centrifuges. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: (Section not used.)

3.1 EXECUTION:

3.2 Preparation: Clean centrifuge thoroughly of sludge and residue prior to commencing maintenance and repair.

3.3 Installation:

3.2.1 Repair and Replacement of Parts: The equipment shall be cleaned and repaired, and parts shall be replaced as required.

3.2.2 Lubrication: Friction parts shall be lubricated with proper lubricants. Oil and grease shall be removed from surfaces and parts not intended to be oiled or greased.

## SECTION 11325

### GRIT CHAMBERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant grit chambers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Epoxy Filler Compound for concrete surfaces shall comply with Fed. Spec. MMM-A-001993.

2.3 Coal-Tar Epoxy shall comply with SSPC-PAINT 16.

2.4 Epoxy Paint shall comply with Mil. Spec. MIL-P-24441.

2.5 Red-Lead Base Paint shall comply with Fed. Spec. TT-P-86, Type 1.

2.6 Finish Coat Paint shall comply with Fed. Spec. TT-P-38.

3.1 EXECUTION:

3.2 Interruption of Sewage Treatment: Not more than one grit chamber shall be taken out of service at a time.

3.3 Installation:

3.3.2 Dust Control: Adequate provisions shall be made to prevent the transfer of dust to other equipment and to areas occupied by Government personnel.

3.3.3 Grit Chamber Cleaning and Coating: Grit chamber shall be cleaned and coated as follows:

3.3.3.1 Interior Concrete Surfaces of the grit chambers shall be cleaned with high pressure water or steam to remove dirt and residue, allowed to dry, and brush sandblasted.

3.3.3.2 Holes and Voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. Apply two coats of coal-tar epoxy to the surface after the epoxy has cured.

3.3.3.3 Submerged Ferrous Metal Surfaces such as piping, ladders, structural steel, and equipment that are exposed to the sewage shall be sandblasted and coated with two coats of coal-tar epoxy.

3.3.3.4 The Exterior Concrete Surfaces shall be cleaned by means of brush sandblast, the surfaces blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide applied.

3.3.3.5 Ferrous Metal Surfaces that are not submerged shall be cleaned by means of sandblasting. Coat surfaces with one coat of redlead base paint. After the base paint has dried sufficiently, apply two coats of aluminum finish paint.

## SECTION 11326

### MICRO-SCREENS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant micro-screens and filter screens. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Replacement Parts shall have the same characteristics as the parts to be replaced, unless otherwise approved.

#### 3.1 EXECUTION:

3.2 General: Screen, wash pumps, controller, drive equipment, and appurtenances shall be repaired or replaced, lubricated, and placed in service as required.

3.3 Waste Outlet shall be flushed and cleaned with high pressure water or steam or by rodding.

3.4 Stopping Screen Unit: If, for any reason, the unit must be stopped, it shall be carefully drained down and the fabric shall be cleaned. The drum shall never be left standing for any length of time in a tank of dirty water. To the extent feasible, the interior and exterior water levels shall be maintained nearly equal, the drum kept constantly turning, and the backwashing spray left on until the tank has been drained.

3.5 Startup of Screen Unit: After testing for rotation, admit water at a slow rate to the micro-screen tank. Water levels on both sides of the screen shall be equalized during filling. Keep the drum rotating and turn the washwater supply on. Since initial filling of the tank may entrain many impurities, watch the operation of the unit carefully to avoid problems with backwashing and, if required, supplement washwater sprays with hose streams to keep the screen clean during the tank filling operation.

#### 3.6 Cleaning Screen:

3.6.1 Cleaning of Slime from the filter screen shall be accomplished by shock chlorination using sodium hypochlorite solution or other acceptable methods. After treatment, drain and flush the tank to waste prior to returning the micro-screen to service.

3.6.2 Cleaning of Iron or Manganese Oxide Film from the filter screen shall be accomplished by using an inhibited acid cleanser.

3.6.3 Clean Grease from the surface of filter screen panels by the use of steam.

## SECTION 11330

### COMMINUTORS AND BAR SCREENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant comminutors and bar screens. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Motor: Unless otherwise directed, replacement motors shall be rated for continuous operation.

2.3 Electrical Work: Electrical wiring shall comply with the requirements of NFPA No. 70.

2.4 Cutter Blades shall be cobalt-chromium-tungsten alloy faced.

2.5 Fasteners shall be stainless steel.

3.1 EXECUTION:

3.2 Motor Bearings shall be lubricated or replaced.

3.3 Welding shall be done by qualified welders in compliance with AWS D1.1.

## SECTION 11335

### ROTATING BIOLOGICAL FILTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant rotating biological filters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Steel Parts: Steel parts shall be fabricated from new stock conforming to ASTM A 366.

2.3 Hardware:

2.3.1 Bolts and Nuts: ASTM A 307.

2.3.2 Washers, Flat and Lock Type: ANSI B18.22.1.

2.4 Rust Inhibitive Primer: Fed. Spec. TT-P-636.

2.5 Galvanizing: ASTM A 123 and A 153.

3.1 EXECUTION:

3.2 Welding: Welding shall be in conformance with the American Welding Society standard D1.1. Galvanized or painted surfaces destroyed by welding shall be restored to original surface for corrosion protection.

3.3 Shop Coating: All structural and miscellaneous metal items shall be painted or galvanized as required.

3.4 Lubrication: Lubricate all motors, chains, drive units, and bearings in compliance with the equipment manufacturer's instructions.

SECTION 11340  
VACUUM FILTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant vacuum filters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Ferrous Metal Surfaces Not Exposed to Sewage shall be coated with red-lead paint complying with Fed. Spec. TT-P-86, Type 1, with finish coats of aluminum paint complying with Fed. Spec. TT-P-38.

2.3 Ferrous Metal Surfaces Exposed to Sewage shall be coated with a coal-tar epoxy-polyamide paint complying with SSPC 16.

3.1 EXECUTION:

3.2 Preparation:

3.2.1 Cleaning: Prior to removing parts or components of the vacuum filter or appurtenant equipment, clean dust, dirt, grime, and other foreign matter from the surfaces.

3.2.2 Interruption of Treatment: Provide temporary bypass piping required during the performance of the work, and remove when no longer required.

3.2 Installation:

3.2.1 Openings in Exterior Walls or floor left by removal of a piece of equipment shall be closed to the weather. Remove temporary closures upon installation of the equipment.

3.2.2 Ferrous Metal Surfaces Exposed to Sewage shall be sandblasted in compliance with SSPC-SP 10. After the necessary surface preparation has been accomplished, apply two coats of coal-tar epoxy to dry film thickness of 10 mils per coat.

3.2.3 Ferrous Metal Surfaces Not Exposed to Sewage shall have a surface preparation in compliance with the manufacturer's instructions and be coated with a primer and finish coat.

## SECTION 11350

### SLUDGE DRYING BEDS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant sludge drying beds. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Liner Repair Material: Plastic liner and bonding cement shall be compatible with the existing liner.

2.3 Sand: Sand shall have an effective grain size of 0.3 to 0.75 mm and a uniformity coefficient of not over 40.

2.4 Gravel shall be coarse, medium, and fine gravel suitable for supporting sand bed. Top three inches shall be 1/8 inch to 3/4 inch in size.

3.1 EXECUTION:

3.2 Walls shall be restored to original condition. Minor repairs may be made with concrete repair material.

- 3.3 Gate Repair shall be done by qualified welders in compliance with AWS D1.1.
- 3.4 Liner Repair shall comply with liner fabricator's recommendations.
- 3.5 Underdrain Repair: Clean, unplug, repair, or replace underdrains as required.

SECTION 11365  
TRICKLING FILTER

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant trickling filters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Filter Media shall be crushed traprock, granite, limestone, hard coal, coke, cinders, blast furnace slag, rot-resistant wood, ceramic, or plastic materials.

2.2.1 Media shall be free of most fine material.

2.2.2 Media Size shall comply with Fed. Spec. SS-S-448.

2.3 Distribution Arms: Pipe, nozzles, and drive parts shall be as recommended by the equipment manufacturer.

2.4 Underdrain System:

2.4.1 Vitrified Clay Underdrain: ASTM C 159.

2.4.2 Concrete Underdrain: ASTM C 654.

2.4.3 Perforated Vitrified Clay Pipe and Fittings: ASTM C 700.

2.4.4 Vitrified Clay Pipe and Fittings: ASTM C 301.

3.1 EXECUTION:

3.2 Filter Media: Place media to avoid damage, displacement, or clogging of the underdrains, in layers not exceeding 18 inches in depth, to ensure uniform vertical and horizontal distribution of size throughout the filter.

3.3 Distribution Arms Seals: Replace mechanical seal parts as recommended by the manufacturer. Replace mercury seals with mechanical seals.

3.4 Underdrain Collection System:

3.4.1 Underdrain Blocks shall be arranged in rows without anchoring and with space maintained by lug. Opening shall be free and unobstructed to the passage of water.

3.4.2 Perforated Pipe shall be firmly supported with sand bedding.

3.4.3 Open-Spaced Pipe shall be installed in compliance with ASTM C 12.

3.4.4 Patented Filter Underdrain Systems shall be installed as detailed in the manufacturer's published data.

## AERATION TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant aeration tanks. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Coatings:

2.2.1 Epoxy Filler Compound for concrete surfaces shall comply with Fed. Spec. MMM-A-001993.

2.2.2 Coal-Tar Epoxy shall comply with SSPC-PAINT 16.

2.2.3 Epoxy Paint shall comply with Mil. Spec. MIL-P-24441.

2.2.4 Red-Lead Base Paint shall comply with Fed. Spec. TT-P-86, Type 1.

2.2.5 Finish Coat Paint shall comply with Fed. Spec. TT-P-38.

2.2 Steel Plate shall comply with Fed. Spec. QQ-S-635.

3.1 EXECUTION:

3.2 Interior Concrete Surfaces of the tank shall be cleaned with high pressure water or steam to remove all dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPC-SP 7.

3.3 Holes and Voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. The surfacing material shall be allowed to cure overnight and coated with two coats of coal-tar epoxy.

3.4 Holes and Cracks in steel tank surfaces shall be cut back to solid metal with a torch. Steel plate of thickness equal to, or greater than, the existing steel tank shall be welded to the surface in compliance with AWS D1.1.

3.5 Submerged Ferrous Metal Surfaces that are exposed to liquids shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar.

3.6 The Exterior Concrete Surfaces of the tank shall be cleaned by means of brush sandblast in compliance with SSPC-SP 7. The surfaces shall be blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint applied.

3.7 Ferrous Metal Surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 3. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP 3. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of aluminum finish paint shall be applied.

## SECTION 11376

### SURFACE AERATORS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for surface aeration equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 **PRODUCTS:** The floating power assembly shall consist of an aerator motor, motor support-deflector, drive shaft and coupling, replaceable shaft sleeve and bearing, weedless or nonfouling propeller, and mounting hardware to attach the power assembly to the float assembly. The power assembly shall be high or low speed, as required.

2.2 **Aerator Motor:** The aerator motor shall be a vertical, totally enclosed, fan-cooled motor.

2.3 **Motor Support Deflector:** Support for the aerator motor shall be provided by a conically shaped, all fiberglass or stainless steel structure designed to carry the static and dynamic forces imposed upon the rotating assembly and the propeller.

2.4 **Drive Shaft and Coupling:** The propeller drive shaft shall be rigidly coupled with a compression type coupling to the standard motor shaft extension. Each drive shaft shall be equipped with a replaceable austenitic stainless steel shaft sleeve at the apex of the conical motor support-deflector.

2.5 **Propeller and Supporting Hardware:** The propeller shall be manufactured of cast manganese bronze or stainless steel. Blade design shall be two- or three-blade anti-fouling, with swept back leading edge.

2.6 **Float Assembly:** The flotation unit shall be constructed of polyester resin reinforced with fiberglass mat and woven glass roving. It shall be internally filled with high-density polyurethane, foamed-in place and completely sealed from the external environment.

2.7 **Mooring Cable:** The aerators shall be moored with 1/4-inch stain-less steel mooring cable. The mooring cables shall be attached to eye bolts anchored into blocks of concrete.

2.8 **Electric Cable:** Each aerator shall be furnished with the type and amount of underwater electric cable required.

3.1 **EXECUTION:**

3.2 **Operating Performance:** Each aerator shall be capable of high oxygenation by entraining and discharging atmospheric oxygen at designated minimum rate under standard conditions and with the motor not loaded over 100 percent of its rated capacity. The rotating assembly and propeller of each unit shall be statically, dynamically, and hydraulically balanced so that under normal operating conditions, the motor and unit will operate smoothly, and the vibration measured at the top of the motor shall not exceed established limits for industrial equipment of the same horsepower and motor speed. Aerators shall remain stable and not whirl, process, or otherwise exhibit erratic behavior that may result in damage or fatigue to itself or its accessories.

3.3 **Maintenance:** Aerator units shall be so designed as to require a minimum of maintenance consisting only of lubrications of the upper and lower motor bearings twice a year in accordance with the manufacturer's instructions.

## SECTION 11380

### SLUDGE DIGESTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installing of materials for repair and maintenance of sewage treatment plant sludge digesters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

##### 2.2 Coatings:

2.2.1 Epoxy Filler Compound for concrete surfaces shall comply with Fed. Spec. MMK-A-001993.

2.2.2 Coal-Tar Epoxy shall comply with SSPC-PAINT 16.

2.2.3 Epoxy Paint shall comply with Mil. Spec. MIL-P-24441.

2.2.4 Red-Lead Base Paint shall comply with Fed. Spec. TT-P-86, Type 1.

2.2.5 Aluminum Finish Paint shall comply with Fed. Spec. TT-P-38.

#### 3.1 EXECUTION:

##### 3.2 Preparation:

3.2.1 Protection required to prevent damage to adjacent materials, equipment, fixtures, and finishes shall be provided. Purge gas from anaerobic sludge digester tanks, covers, piping, equipment, and control buildings to prevent explosion, fire, or oxygen starvation of personnel.

3.2.2 Interruption of Treatment shall be held to a minimum. Not more than one sludge digester shall be taken out of service at a time.

##### 3.2 Installation:

3.2.1 Emptying Digester: Specified sludge digesters shall be emptied. Sludge digester emptying procedure shall be as follows:

3.2.1.1 Methane Formation shall be stopped and existing methane purged from under the digester cover, in the cover, in gas lines, equipment, and control building. After discontinuing the sludge feed, allow 3 days for the partial digestion of the last sludge added. When the rate of gas production indicates that most of the sludge has been digested, sludge heating shall be stopped. The gas space under the cover shall be purged with nitrogen or carbon dioxide. When the methane concentration is well below the lower explosive limit of 5.3 percent by volume, open all cover manholes and withdraw the contents of the digester.

3.2.1.2 When draining an anaerobic sludge digester with a floating or gas holder cover, the Contractor shall continuously observe the cover until the cover is resting on the corbels. If the cover should tilt or bind, withdrawal shall be stopped immediately and the problem corrected prior to resumption of the draining operation. As the cover contacts the corbels, the cover shall be watched for signs of structural failure that could damage piping and equipment in the sludge digester tank.

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3.2.2 Digester Cleaning and Coatings:

3.2.2.1 Interior Concrete Surfaces of the sludge digester tank shall be cleaned with high pressure water or steam to remove dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPCSP 7.

3.2.2.2 Holes and Voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. Epoxy shall be applied in compliance with the manufacturer's application instructions. Two coats of coal-tar epoxy shall be applied after the surface material has cured.

3.2.2.3 Submerged Ferrous Metal Surfaces such as piping, ladders, structural steel, equipment, and metal roof surfaces that are exposed to the sludge shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar epoxy.

3.2.2.4 Exterior Concrete Surfaces of the digester shall be cleaned by means of brush sandblast in compliance with SSPC-SP 7. the surfaces blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint applied.

3.2.2.5 Ferrous Metal Surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 6. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP8. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of aluminum finish paint shall be applied.

3.2.3 Hydrostatic Pressure Test: A hydrostatic test shall be made to demonstrate that the sludge digester is gas tight. After a satisfactory test has been made, the digester drained, and maintenance and repair work completed, valves shall be returned to normal operating position, plugs shall be removed, and the sludge digester and appurtenances shall be left ready for use.

3.2.4 Startup of Aerobic or Anaerobic Digester: After maintenance and repair work has been completed and approved, the Contractor shall return the sludge digester to service and operate it to design capacity.

## SECTION 11395

### TERTIARY SAND FILTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant tertiary sand filters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

##### 2.1 Filter Media:

2.1.1 Sand: Silica sand shall be inert to wastewater and bacterial attack and shall have the following characteristics:

2.1.1.1 Sphericity: Not less than 9.0.

2.1.1.2 Porosity: Not more than 0.4.

2.1.1.3 Hardness: Not less than 7.0.

2.1.1.4 Specific Gravity: Not more than 2.65 or less than 2.6.

2.1.1.5 Inertness: Not less than 97 percent of the sand shall remain insoluble after 24 hours in hydrochloric acid.

2.1.2 Support Gravel shall be hard, durable, clean, and uniformly spherical particles, free of mica and other thin and flat particles. Depths and sizes shall be as designated.

##### 2.2 Underdrain System:

2.2.1 Vitriified Clay Underdrain: ASTM C 159.

2.2.2 Concrete Underdrain: ASTM C 654.

2.2.3 Perforated Vitriified Clay Pipe and Fittings: ASTM C 700.

2.2.4 Vitriified Clay Pipe and Fittings: ASTM C 301.

##### 2.3 Filter Housing:

2.3.1 Grout shall be metallic, nonshrink type.

2.3.2 Concrete Repair Material shall be epoxy type complying with Fed. Spec. MMM-G-650.

2.3.3 Concrete Coatings:

2.3.3.1 Outside and Above Grade shall be epoxy type complying with Mil. Spec. MIL-P-24441.

2.3.3.2 Inside and Below Grade shall be coal-tar epoxy type complying with SSPC-PAINT 16.

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2.3.4 Steel Repair Material shall be steel plate, to match existing, epoxy cement, or fiberglass cloth.

2.3.5 Steel Coatings shall be red-lead base coat complying with Fed. Spec. TT-P-86, Type I and finish coats of aluminum paint complying with Fed. Spec. TT-P-38.

2.4 Loss of Head Switch shall be of the same model or type, range, and contact rating as the loss of head switch to be replaced.

3.0 EXECUTION:

3.1 Media Placement for Gravity and Pressure Filters:

3.1.1 The Filter Box or Tank and Underdrain shall be thoroughly cleaned before starting gravel and media placement. Materials becoming dirty shall be removed and replaced.

3.1.2 The Bottom Gravel Layer shall be placed carefully by hand to avoid movement to the underdrain system and to assure free passage for water from the orifices. Each layer shall be completed before the layer above is started. Gravel of differing gradations shall not be mixed. Gravel becoming mixed shall be removed and replaced. Gravel shall be cleaned as necessary by backwashing. For sizes less than 1/2 inch, the gravel shall be leveled to +/- 1/4 inch of the water surface defining its limit. For sizes greater than 1/2 inch, the gravel shall be leveled to +/- 1/2 inch of the water surface.

3.1.3 Media shall be placed in a manner similar to the gravel -placement and processed as may be required to achieve the gradation recommended by the manufacturer.

3.2 Underdrain Repair:

3.2.1 Underdrain Blocks shall be arranged in rows without anchoring and with space maintained by lug. Opening shall be free and unobstructed to the passage of water.

3.2.2 Perforated Pipe shall be firmly supported with sand bedding.

3.2.3 Open-Spaced Pipe shall be installed in compliance with ASTM c 12.

3.3 Filter Housing Repair:

3.3.1 Filter Material shall be removed and inside walls cleaned prior to grouting or coating application.

3.3.2 Welding shall be done in compliance with AWS D1.1.

3.4 Cleaning and Coating:

3.4.1 Interior Concrete Surfaces of the tank shall be cleaned with high pressure water, steam, or sandblasted to remove all dirt and residue.

3.4.2 Holes and Voids in the concrete surfaces left from the blast cleaning shall be filled with an epoxy filler. The surfacing material shall be allowed to cure overnight, and then two coats of coaltar epoxy shall be applied to a dry film thickness of 10 mils per coat.

3.4.3 Submerged Ferrous Metal Surfaces, such as piping, ladders, structural steel, equipment, and metal roof surfaces that are exposed to the sludge, shall be cleaned and coated with two coats of coal-tar epoxy with dry film thickness of 10 mils per coat.

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3.4.4 Exterior Concrete Surfaces of the tank shall be cleaned and two coats of epoxy-polyamide paint shall be applied to a dry film thickness of 5 mils per coat.

3.4.5 Ferrous Metal Surfaces that are not submerged shall be cleaned and coated with one coat of red-lead base paint to a dry film thickness of 3 mils. After the base paint has dried sufficiently, two coats of aluminum finish paint shall be applied to a dry film thickness of 2 mils per coat.

3.5 Manual Scouring shall be done during backwash (bed expanding) cycle, using long tined rakes and high pressure hose streams directed at, and into, the expanded bed.

3.6 Chemical Cleaning Solution from the filter bed shall be discharged to the backwash return tanks.

3.7 Detergents and Chemicals shall not be allowed in the maintenance of rapid sand filters. Purging of the underdrain system shall be with caustic detergents (2 to 5 percent caustic soda) or 50 parts per million chlorine solution in slow sand filters.

3.8 Defective Wash Nozzles shall be replaced in each filter.

3.9 Cleaning of Air or Water Wash Nozzles: Jet and cone shall be removed from each nozzle and punched clean with a wire or rod.

3.10 Distribution Laterals shall be flushed for a few minutes by removing the nozzles at the end of laterals.

3.11 General Maintenance of Loss of Head Switch: Connecting tubing shall be purged with clean air or water. Contacts shall be burnished, as required.

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SECTION 11402

FOOD SERVICE EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of food service equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Food service equipment shall comply with applicable NSF Standards. Gas-burning equipment shall be designed for operation with the type of gas designated and shall be approved by AGAL. Electrically operated equipment shall be in accordance with applicable standards of the UL Electrical Appliance and Utilization List and UL 197.

2.1 Equipment:

2.1.1 Vertical Steam Cooker: Mil. Spec. MIL-C-2354.

2.1.2 Commercial-Type Range: Gas, Mil. Spec. MIL-R-2357; electric, Mil. Spec. MIL-R-11295.

2.1.3 Ice Cube Machine: Mil. Spec. MIL-I-11867.

2.1.4 Rinser-Sanitizer: Mil. Spec. MIL-R-19038.

2.1.5 Fry Pan: Gas, Mil. Spec. MIL-P-28603; electric, Mil. Spec. MIL-P-23694.

2.1.6 Automatic Coffee Urn: Mil. Spec. MIL-U-43263.

2.1.7 Steam Kettles: Electric, Mil. Spec. MIL-K-43359; gas, Mil. Spec. MIL-K-43943.

2.1.8 Food Service Cabinets, Warmer-Refrigerator, Roll-Through, Roll-In: Mil. Spec. MIL-C-43427.

2.1.9 Convection Ovens: Gas, Mil. Spec. MIL-0-43679; electric, Mil. Spec. MIL-0-43633.

2.1.10 Sanitizing Hot Water Heater: Mil. Spec. MIL-H-43895.

2.1.11 High Pressure Cleaning and Sanitizing Machines: Mil. Spec. MIL-C-43949.

2.2 Materials:

2.2.1 Black Iron Pipe: Fed. Spec. WW-P-406.

2.2.2 Brass Pipe: Fed. Spec. WW-P-351, Class 1.

2.2.3 Chromium Plating of Brass Pipe, Valves, and Fittings: Fed. Spec. WW-P-541.

2.2.4 Copper Tubing: ASTM B 88, Type K or L. or ASTM B 75, as required.

2.2.5 Stainless Steel, Nonmagnetic: ASTM A 167 or ASTM A 240.

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2.2.6 Stainless Steel Pipe and Tubing: Seamless or welded, of true roundness, and of material specified for stainless steel. Seamless tubing shall be thoroughly annealed, pickled, and ground smooth. Welded tubing shall be thoroughly heat-treated, quenched to eliminate carbide precipitation, and then drawn true to size, roundness, and ground. Tubing shall be given a No. 3 or 4 finish when exposed to view.

2.2.7 Fittings for Copper Tubing: Solder-joint type. Flared joint fittings may be used in specific applications when approved. Cast bronze solder joint fittings shall conform to ANSI B16.22. Wrought copper and wrought bronze solder joint fitting shall conform to ANSI B16.22. Cast bronze fittings for flared joints shall conform to ANSI B16.26.

2.2.8 Fittings for Brass Pipe: Fed. Spec. WW-P-460, Class A or B, as required.

2.2.9 Galvanizing Repair Compound: Mil. Spec. MIL-P-21035.

2.2.10 Silver Solder: Fed. Spec. QQ-B-654, class as applicable.

2.2.11 Steel Structural Shapes for Framing: Fed. Spec. QQ-S-741. Sections shall be galvanized by the hot-dip process, conforming to ASTM A 123, coating designation G-90.

2.2.12 Tin-Lead Solder: Fed. Spec. QQ-S-571, composition Sn50.

2.3 Garbage Disposal Machine: A floor supported type with cast alloy body supported on adjustable tubular legs. The upper housing shall be removable. The disposal shall be provided with a stainless steel cone with a water swirl inlet. Throat shall have a neoprene silver trap.

2.3.1 The Disposal shall be provided with magnetic starter with overload and under voltage protection, 5-minute timer, panel cover interlock, fused disconnect, prewired solenoid, vacuum breaker, water flow controls, positive flushing action and reversing action, or other positive means of preventing jamming. The rotor shall be cast alloy carrying rigid impactors fixed directly onto motor shaft, or stainless steel swivel impellers and stainless steel undercutter. Disposal machines with a 5 hp or 7-1/2 hp motor shall have a minimum 8-inch diameter rotor.

2.3.2 Control: Control panel box shall be waterproof stainless steel construction.

2.4 Hoods: Design, fabrication, and installation of hoods and duct systems shall conform to NFPA 96 and UL 710 where applicable. Hood duct systems, grease removal devices, and cooking equipment, which may be a source of ignition of grease in the hood or duct, shall be protected with fixed pipe systems and provided with portable fire extinguishing equipment in accordance with NFPA 96, NFPA 17, and as specified. Ducts and hoods shall be secured to building so as to be level and free from vibration under all conditions of operations. Hoods, exposed ducts, and enclosures over dishwashing machines and rinse compartment of pot washing sinks shall be constructed of 18-gauge stainless steel. Hood shall be fabricated so as to form a condensate gutter at the perimeter and shall be provided with a condensate drain terminating at the floor sink location. Exhaust outlet shall be connected to the exhaust system.

2.5 Prefabricated Walk-In Refrigerators: Commercial, walk-in type, intended for use in dining facilities, in accordance with Mil. Spec. MIL-R-43900 except insulation shall provide a maximum "U" factor of 0.0295 Btuh.

11402-2

2.6 Gas Burning Equipment shall comply with the applicable requirements of AGAL and ANSI. Each gas-burning appliance shall be connected to the building piping by means of a quick-disconnect device and flexible connector. A manual shutoff valve shall be installed on the building piping, ahead of the supply side of each quick-disconnect device. The quick-disconnect device shall conform to ANSI Z21.41 and the flexible connector to ANSI Z21.45. The length of the flexible connector shall be as required but shall not exceed 72

inches. Flexible connector shall not be concealed and shall not extend from one room to another. Dust caps and plugs shall be provided for quick-disconnect fittings for use when fittings are uncoupled.

2.7 Backflow Preventers: Each item of food service equipment having water supply and waste connections, with the water inlet connected below the flood level of the equipment, shall be supplied with backflow preventer of size and proportions that will allow an ample flow of water to the equipment, but will prevent the backflow of waste or polluted water into the water supply system.

2.8 Paint shall be of a durable, nontoxic, nondusting, nonflaking, and mildew-resistant type, suitable for use with food service equipment and in conformance with NSF No. 2.

### 3.0 EXECUTION:

3.1 Installation: Equipment shall be installed in accordance with NSF Manual of Sanitation Aspects of Installation of Food Service Equipment. The Contractor shall make provision for the plumbing, heating, and electrical connections and for equipment indicated as being furnished and installed by the Government. Equipment connections shall be complete to wall or floor for all utilities. Unless otherwise specified, exposed piping shall be chromium-plated copper alloy or stainless steel. Gas equipment installation shall conform to ANSI Z21.15 and NFPA 54. Electrical work shall comply with NFPA 70.

3.2 Painting: All exterior, galvanized parts, exposed members of framework, and wrought steel pipe, where specified to be painted, shall be cleaned, degreased, primed with rust inhibiting primer, and finished with two coats of epoxy-based grey hammertone paint.

11402-3

SECTION 11452

REFRIGERATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential refrigerators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Refrigerators and Freezers: AHAM HRF-1 and HRF-2.

2.2 Cords and Plugs: UL 62 and UL 817

2.3 General Electrical: NFPA 70 and 70B.

2.4 Compressors: UL 984.

2.5 Condensers: UL 250.

2.6 Motors: UL 73.

3.0 EXECUTION: (Section not used.)

11452-1

SECTION 11453

DISHWASHERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential dishwashers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Dishwashers: UL 749.

2.2 Time Control: UL 917.

2.3 Control Valves: UL 429.

2.4 General Electrical: NFPA 70 and 70B.

2.5 Cords and Plugs: UL 62.

2.6 Motors: UL 73 and UL 547.

2.7 Safety-Interlock Switch: UL 749.

3.0 EXECUTION: (Section not used.)

11453-1

SECTION 11454

GARBAGE DISPOSERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential garbage disposers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Household Garbage Disposal: Fed. Spec. 00-G-1513 and AHAM FWD-1.

2.2 Cords and Plugs: UL 62 and UL 817.

2.3 Motors: UL 73.

2.4 General Electrical: NFPA 70 and 70B.

3.0 EXECUTION: (Section not used.)

11454-1

SECTION 11455

RANGES AND OVENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential ranges and ovens. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Conduit: UL 1.

2.2 Conductors: UL 62, UL 83, UL 115, and UL 817.

2.3 Switches: UL 20 and UL 917.

2.4 Fuses and Fuseholders: UL 198 and UL 512.

2.5 Connectors: UL 486.

2.6 Ranges: UL 858.

2.7 Thermal Cutoffs: UL 1020.

2.8 General Electrical: NFPA 70 and 70B.

2.9 Pilot Lights: UL 496 and UL 542.

2.10 Range Hoods: Non-vented, two-speed fan, charcoal filter, light, UL listed.

3.0 EXECUTION: (Section not used.)

11455-1

SECTION 11456

CLOTHES DRYERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential clothes dryers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cords and Plugs: -UL 62 and UL 817.

2.2 Thermal Cutoffs: UL 1020.

2.3 General Electrical: NFPA 70.

2.4 Motors: UL 73.

2.5 Home Laundry Equipment: UL 560 and Fed. Spec. 00-W-860.

2.6 Switches: UL 917 and UL 20.

2.7 Lamps and Lamp Holders: UL 496 and UL 542.

2.8 Vent Duct: Plastic wrapped, flexible wire duct of diameter to fit duct pipe of machine.

2.9 Weather Hood: Aluminum construction with backdraft damper.

3.0 EXECUTION: (Section not used.)

11456-1

SECTION 11457

CLOTHES WASHERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential clothes washers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cords and Plugs: UL 62 and UL 817.

2.2 Electrically-Operated Valves: UL 429.

2.3 Home Laundry Equipment- UL 560 and Fed. Spec. 00-W-860.

2.4 Lamps and Lamp Holders: UL 496 and UL 542.

2.5 General Electrical: NFPA 70.

3.0 EXECUTION: (Section not used.)

11457-1

SECTION 11460

UNIT KITCHENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of unit kitchens. Products shall match existing materials and/or shall be as directed by the Contracting officer.

Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 **PRODUCTS:** Electrical components shall comply with applicable UL standards and bear appropriate UL labels. Gas-burning equipment shall comply with ANSI Z21 and shall bear the AGA seal of approval.

2.1 **Materials:** Minimum 22-gauge steel sheet for component body parts, minimum 20-gauge steel sheet for door fronts and liners, and heavier-gauge steel for internal gussets and bracing.

2.2 **Components:** Electrical components shall be wired for the voltage available and shall terminate at factory-installed terminal boxes. Gas-burning components shall be designed to operate on the designated fuel. Unit kitchens shall include the following, as required:

2.2.1 Top and Sink shall be seamless, one-piece with integral back and end splashes fabricated from 18-gauge AISI Type 302/304 stainless steel with No. 4 brushed finish or 16-gauge minimum titanium steel with acid-resistant porcelain finish. Sink accessories shall include chrome-plated swing spout faucet with aerator, chrome-plated faucet handles, stainless steel cup strainer, and drain outlet with tailpiece.

2.2.2 Food Waste Disposer shall be complete with drain outlet and tailpiece.

2.2.3 Refrigerator and Freezer Compartments shall be the designated minimum capacity measured in accordance with ANSI B38.1.

2.2.4 Range: Each cooktop burner shall be rated at not less than 1,250 watts, if electric, or 8,000 Btu, if gas.

2.2.5 Oven: Electric oven "Bake" operation shall be rated at 2,000 watts minimum and "Broil" operation shall be rated at 2,500 watts minimum; gas oven burners shall be rated at 18,000 Btu minimum.

2.2.6 Cabinets shall be under-counter and upper wall-mounted, with shelves, doors, drawers, and hardware.

3.0 **EXECUTION:** (Section not used.)

11460-1

## SECTION 11490

### GYMNASIUM EQUIPMENT

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of gymnasium equipment. Products shall match existing materials and/or shall be as directed by the Contracting

Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Basketball Backstops shall be ceiling-suspended forward folding, backward-folding, side-folding, wall-braced or fixed type; wall-mounted up-folding, side-folding or fixed type; or floor-mounted portable type as required. Backstop shall come complete with backboard, goal, and all accessories. Backboard material shall be glass, fiberglass, steel or wood as required and rectangular or fan shaped. Movable backstops shall be manually or electrically operated. Backstops, goals, and their accessories shall meet the specifications of the National Collegiate Athletic Association.

2.2 Telescoping Bleachers shall be operable bleacher systems of multiple-tired benches on interconnected folding supports, which permit closing, without requiring dismantlement, into a nested relationship for purposes of storing or moving. The bleachers shall be wall-attached, free-standing floor-attached, or free-standing movable type as required. The bleachers shall conform to the applicable requirements of Chapter 9 of NFPA 102. Bleacher seats shall be wood, vinyl-clad steel, or plastic, as required. System shall have row rise and row spacing as desired and shall come complete with end panels, rear fillers, back panels, end railings and back railings as required. Bleachers shall be manually or electrically operated.

2.3 Gym Divider Curtains shall be constructed of vinyl for the first eight feet (81 0") above the floor. The remainder shall be 1-3/4 inch mesh, white nylon netting. A chain or other ballast shall be sewn into the bottom hem. Curtains that are drawn shall be manually operated and glide along their own track. Roll-up curtains shall be power operated.

## 3.0 EXECUTION:

3.1 Basketball Goals shall be securely attached to supporting construction and shall be installed at a height of 10 feet from the rim to the floor.

3.2 Telescoping Bleacher Seating: Verify that areas to receive telescoping bleacher seating are free of impediments interfering with installation and operation. Securely attach to supporting construction.

3.3 Gym Divider Curtains: Verify that areas to receive gym divider curtains are free from interference and structurally capable of supporting the curtains.

11490-1

## SECTION 11496

### TARGET FIRING RANGES (EXTERIOR)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the maintenance and repair of target firing ranges. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aggregate-and Gravel: ASTM D 2940.

2.2 Concrete: ASTM C 94.

2.3 Lumber and Timber: ASTM D 245 and ASTM D 1760.

2.4 Reinforcement Steel: ASTH A 615.

2.5 Structural Steel: ASTM A 36.

2.6 Manufactured Materials and Equipment: Parts for equipment and materials no longer available shall be repaired or replaced using approved equipment and materials equivalent to the original.

3.0 EXECUTION: Timber repairs shall be executed using methods complying with the approved practices as referenced in AITC Timber Construction Manual.

11496-1

SECTION 11498

FIXED WOOD BLEACHERS (EXTERIOR)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fixed wood bleachers. Products shall match existing materials and/or shall be as directed by the Contracting Officer.

Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Hardware, Brackets, Fasteners, and Connectors shall be zinc coated or hot-dipped galvanized steel or aluminum. Nails, brads, staples, and spikes shall comply with Fed. Spec. FF-N-105.

2.2 Lumber and Timber Members used for repair or replacement of bleacher components shall be of the species and grades complying with National Design Specification for Stress-Grade Lumber and its Fastenings (National Forest Products Association). Sizes shall comply with PS20. Lumber materials shall bear a mark of recognized inspection agency identifying the species, grade, and compliance with the applicable standard. Wood preservatives shall be pressure-applied and shall comply with ASTM D 1760. Creosote or arsenate treatments shall not be used.

2.2.1 Seatboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 yellow pine boards.

2.2.2 Footboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 yellow Southern pine boards.

2.2.3 Support Member and Timber shall be Dense No. 1 Douglas fir or Dense No. 1 yellow pine timbers or boards.

2.3 Ready-Mixed Concrete shall comply with ASTM C 94 with compressive strength of 3,000 pounds per square inch (210.9 kgs per square cm) at 28 days and shall be protected from freezing for seven days after placement.

2.4 Reinforcement for concrete shall comply with ASTM A 184, A 185, or A 615 as indicated.

3.0 EXECUTION: Repair or replace wooden bleacher components using methods complying with the approved practices as referenced in American Institute of Timber Construction's Timber Construction Manual.

11498-1

SECTION 11499

DEMOUNTABLE BLEACHERS (EXTERIOR)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of demountable bleachers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Hardware and Accessories shall be zinc-coated or hot-dipped galvanized steel or aluminum.

2.2 Lumber used for seatboard and footboard repair or replacement shall be species and grades complying with National Forest Products Association National Design Specification for Stress-Grade Lumber and Its Fastenings. Sizes shall comply with PS20. Lumber materials shall bear the mark of a recognized inspection agency identifying the species, grade, and compliance with the applicable standard. Wood preservatives shall be pressure-applied and shall comply with ASTM D 1760. Creosote or arsenate treatments shall not be used.

2.2.1 Seatboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 Southern pine boards.

2.2.2 Footboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 Southern pine boards.

2.3 Steel Structural Members shall comply with ASTM A 36.

2.4 Aluminum Structural Members shall comply with ASTM B 308.

3.0 EXECUTION: Repair or replace bleacher components using methods complying with the approved practices as referenced in American Institute of Timber Construction's Timber Construction Manual.

11499-1

SECTION 11501

PAINT SPRAY BOOTH

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of paint spray booths. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and

removal of materials shall be as required to support the work. Contact the Fire Protection Engineering Branch for requirements of paint spray booth protection.

2.0 PRODUCTS: All products shall meet applicable OSHA and NFPA standards.

2.1 Enclosure:

2.1.1 Panels: 18 gauge, ASTM A 568.

2.1.2 Stiffeners and Support Shapes: ASTM A 36.

2.1.3 Exhaust Chamber: 18 gauge, formed to hold filters.

2.1.4 Doors:

2.1.4.1 Access Door: 2 feet 6 inches by 7 feet 0 inches, steel clad.

2.1.4.2 Entrance Doors for Vehicular Booths: Swing type, two section, steel-framed with intake air filters, a minimum opening of 8 feet 9 inches in height by 9 feet 10 inches in width, leak-proof seals and a heavy-duty latch.

2.1.4.3 Exit Doors for Vehicular Drive-Through Booths: Swing type, two-section, steel frame, metal-clad, solid, with a minimum opening of 7 feet.9 inches in height by 9 feet 10 inches in width, leak proof seals, and a heavy-duty latch.

2.1.5 Factory Finish: Galvanized or painted.

2.2 Filtering Equipment:

2.2.1 Arrestor: Disposable, expanded fiber or fiberglass, Class 2 listed by UL.

2.2.2 Water Wash: Complete with pumps, spray nozzles, baffles, and controls.

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2.3 Exhaust Fans shall be sized to maintain 100 fpm minimum across the cross sectional area of booth and shall have permanently lubricated bearings and enclosed belts. Fan motors shall be located outside of air stream.

2.4 Lighting: Fluorescent.

2.5 Fans, Controls, and Lights inside Paint Booths shall be explosion proof.

3.0 EXECUTION: Installation shall comply with applicable codes and environmental regulations.

11501-2

## SECTION 11851

### BRIDGE-ATTACHED LAND AND MARINE TRAFFIC CONTROLS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for marine traffic controls attached to bridges. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 General: All navigational aid shall meet the standards of the governing authority.

2.2 Conduit shall be galvanized rigid steel pipe or PVC.

2.3 Boxes and Fittings shall be forged or cast to comply with NEKA.

2.4 All Materials shall be corrosion-resistant, and assemblies shall be weatherproof. Galvanized steel shall only be permitted as specified above.

#### 3.0 EXECUTION:

3.1 General: All electrical repairs or replacements shall comply with standards of the National Electrical Code.

3.2 Sign Panels and Supports: Install signs at the locations indicated by the Contracting Officer.

3.2 Pavement and Waterway Marking: Stenciling is permitted for waterway level, clearance, and other information directly applied to the structure.

3.4 Conduit: All above grade wiring shall be run in conduit. Any existing wiring not in conduit shall be removed and conduit shall be provided for the existing wiring.

3.5 Boxes and Fittings: Wherever possible replacement boxes shall be installed where the removed box was located. Boxes shall be of proper size and shape for the conduits and conductors entering them. New conduits having runs of more than 100 feet or more than three right angle bends shall have pull boxes at intermediate locations. Pull boxes shall be supported independently of the conduits. Boxes shall have only the holes necessary to accommodate the conduit at points of installation.

3.6 Buried Cables: Trenches for direct burial cables shall be at least 27 inches in depth with 3 inches of sand bedding above and below cable.

3.7 Grounding: All conduit, raceways, switchgear frames and housings, panel housings, fixture housings, equipment frames, etc., shall be properly grounded.

## SECTION 13121

### PRE-ENGINEERED STRUCTURES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pre-engineered metal buildings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Metal buildings shall be the design and product of a recognized metal building manufacturer who is regularly engaged in the fabrication of pre-engineered structures.

#### 2.1 Design Requirements:

2.1.1 Metal Buildings shall be designed for the dead load, designated live loads, and combinations of these loads as set forth in the MBMA publication, Recommended Design Practices Manual.

2.1.2 Framing and Structural Members: Structural steel members shall be designed in accordance with AISC publication, Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Structural cold-formed steel framing members shall be designed in accordance with the AISI publication, Specification for the Design of Cold-Formed Steel Structural Members. Framed openings shall be designed to structurally replace the covering and framing displaced. Welding of steel shall be in accordance with AWS D1.1.

2.1.3 Exterior Covering: Maximum wind load deflection for wall sheets shall not exceed 1/180 of the span between supports; Maximum live load deflection for roof sheets shall not exceed 1/180 of the span between supports. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect.

#### 2.2 Materials:

2.2.1 Hot-Rolled Structural Shapes: ASTM A 36 or A 529.

2.2.2 Tubing or Pipe: ASTM A 500, Grade B; ASTM A 501; or ASTM A 53.

2.2.3 Members Fabricated from Plate or Bar Stock: 42,000 psi minimum yield strength; ASTM A 529, A 570, or A 572.

2.2.4 Members Fabricated by Cold Forming: ASTM A 607, Grade 50.

2.2.5 Galvanized Steel Sheet: ASTM A 446 with G 90 coating.

#### 2.3 Framing:

2.3.1 Rigid Frames shall be hot-rolled structural steel; factory welded and shop-painted built-up "I" shape or open web rigid frame consisting of tapered or parallel flange beams and tapered columns. Furnish complete with attachment plates, bearing plates, and splice members. Frames shall be factory-drilled for bolted field assembly.

2.3.2 End Wall Columns shall be factory-welded, built-up "I" shape or cold-formed sections, fabricated of minimum 14-gauge material, and shop-painted.

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2.3.3 Wind Bracing shall be adjustable, threaded steel rods, 1/2 inch in diameter minimum; ASTM A 36 or A 572, Grade D.

2.3.4 Secondary Framing: Purlins, eave struts, end wall beams, and flange and sag bracing shall be minimum 16-gauge rolled formed sections and shop-painted. Base channel, sill angle, end wall Structural members (except columns and beams), and purlin spacers shall be minimum 14-gauge cold-formed steel, galvanized.

2.3.5 Bolts shall be ASTM A 307 or A 325 as necessary for design loads and connection details. Bolts shall be shop-painted, except zinc or cadmium plated units shall be provided when in direct contact with panels.

2.4 Roofing and Siding: Provide flashings, closers, fillers, metal expansion joints, ridge covers, fascias, and other sheet metal accessories, factory-formed of same material and finish as roofing and siding.

2.4.1 Roof-Covering Assemblies shall have a wind uplift resistance rating of Class 90 in accordance with UL 580 and shall be listed in the UL Fire Resistance Index for wind uplift resistance classification.

2.4.2 Steel Covering shall be zinc-coated steel conforming to ASTM A 446, Grade C, with G 90 coating complying with ASTM A 525. Steel sheets and panels shall be not less than 26-gauge.

2.4.3 Aluminized Steel Sheets shall be aluminum-coated, ASTM A 463, Drawing Quality with TI-40 coating. Metal thickness shall be not less than 26-gauge.

2.4.4 Aluminum Sheets shall be fabricated from aluminum alloy 3003 or 3004 Alclad with tempering as required to suit forming operations, ASTM B 209. Aluminum sheet thickness shall be not less than 0.032 inch.

2.4.5 Insulated Wall Panels shall be factory-assembled or field assembled units, consisting of a central insulating core with metal interior and exterior face sheets securely fastened together with rivets, bolts, studs, "snap-on", or other approved methods of fastening, including interlocking with basic wall units.

## 2.5 Insulation:

2.5.1 Insulation shall be batts, blankets, and/or rigid material of required thickness and density to provide an overall tested heat transfer U-value as required. Insulation shall have a flame spread classification of 25 or less and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84. Exposed insulation shall be faced with a vapor barrier of vinyl film, vinyl reinforced foil, or foil reinforced kraft.

2.5.2 Rigid or Semirigid Board Insulation shall conform to Fed. Spec. HH-I-558, Form A, Class 1 or Class 2. Insulation shall have a white non-dusting and non-shedding painted finish.

2.5.3 Blanket Insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6. Insulation shall have a white sheet vinyl facing.

## 2.6 Accessories:

2.6.1 General: Provide coated steel accessories with coated steel roofing and siding; aluminum accessories with aluminum roofing and siding.

2.6.2 Gutters shall be formed in sections, complete with end pieces, outlet tubes, and special pieces that may be required. Finish to match roof fascia and rake.

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2.6.3 Downspouts shall be formed in sections, complete with elbows and offsets, and shall be finished to match wall panels.

2.6.4 Circular Gravity Roof Ventilators shall be low-profile, ridge type ventilators, complete with base, bird screen, hood, flashing, closures, and fittings, finished to match roof panels.

2.6.5 Continuous Ridge Ventilators shall be factory-engineered and fabricated units of continuous heat valve type.

2.6.6 Wall Louvers: Provide units fabricated of not less than 18-gauge steel, finished to match wall panels. Provide bird screens of 1/2-inch x 1/2-inch galvanized steel mesh in rewirable frames on exterior face of louvers. Secure screens with clips to ensure ease of removal for cleaning and rewiring.

2.7 Hollow Metal Doors and Door Frames shall comply with Recommended Specifications for Standard Steel Doors and Frames (SDI100), Steel Door Institute.

2.7.1 Materials: Hot-rolled, pickled, and oiled in compliance with ASTM A 569 and A 568; cold rolled in compliance with ASTM A 366 and A 568.

2.7.2 Hollow Metal Units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping, shall comply with ANSI A 115, Specifications for Door and Frame Preparation for Hardware. Locate finish hardware in compliance with Recommended Locations for Builder's Hardware, NBHA.

2.7.3 Hardware: Provide hardware for each door, as follows:

2.7.3.1 Hinges: 1-1/2 pair, steel, template hinges, 4-1/2 inches x 4-1/2 inches.

2.7.3.2 Lockset: Cylindrical, key in knob.

2.7.3.3 Threshold: Extruded aluminum (exterior doors only).

2.7.3.4 Weatherstripping: Sponge neoprene or extruded vinyl, enclosed in an aluminum housing. Bottom weatherstripping shall be an aluminum extrusion with vinyl sweep strip.

2.8 Overhead Doors:

2.8.1 Overhead Doors shall be industrial type of standard manufacture. fabricated of 24-gauge galvanized steel minimum or 0.032inch thick aluminum. Accessories shall include galvanized steel track, torsion-spring mechanism, ball-bearing roller, cylinder lock, and weatherstripping. Doors shall be manually operated, except that doors over 144 square feet in area shall be chain hoist or electric motor operated.

2.8.2 Overhead Coiling Doors:

2.8.2.1 General: Provide operating door assemblies as a complete unit produced by one manufacturer, including door curtain, guides,-counterbalance, hood, hardware, operators, and installation accessories.

2.8.2.2 Door Curtain: Fabricate overhead coiling door -curtain of interlocking slats designed to withstand required wind loading. Slats shall be structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication, or aluminum slats, 5052 alloy, standard mill finish, not less than 0.04 inch thick.

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2.9 Windows: Windows shall be of steel in accordance with the Steel Window Institute publication, Recommended Specifications for Steel Windows, or of aluminum in accordance with the AAMA publication, AAMA 302.9. Windows shall be complete with operating and locking hardware and glazing.

2.10 Fabrication: Shop fabricate to the required size and section, complete with base plates, bearing plates, and other plates as required for erection, welded in place, and with all required holes for anchoring or connections shop drilled or punched to template dimensions. Shop connections shall be power riveted, bolted, or welded. Field connections shall be bolted.

2.11 Shop Painting:

2.11.1 Clean Surfaces to be Primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.

2.11.2 Prime Structural Steel primary and secondary framing members with rust-inhibitive primer having over 50 percent rust inhibitive pigment, such as red-lead mixed pigment alkyd varnish (Fed. Spec. TT-P-86, Type II) or zinc chromate iron-oxide alkyd (Fed. Spec. TT-P-636).

2.11.3 Prime Galvanized Members, after phosphoric acid pretreatment, with zinc dust-zinc oxide primer (Fed. Spec. TT-P-641).

3.0 EXECUTION: Erection shall be in accordance with the approved erection instructions. Dissimilar materials that are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Exposed surfaces shall be kept clean and free from sealant, metal cuttings, and other foreign materials.

3.1 Framing: Erect structural framing true to line, level, plumb, rigid, and secure. Provide rake or gable purlins with tightfitting closure channels and fascias. Provide diagonal rod or angle bracing in both roof and sidewalls as required. At framed openings provide shapes of proper design and size to reinforce opening and-to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

3.2 Roofing and Siding: Arrange and nest sidelap joints so that prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage. Provide weather seal-under ridge cap; flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.

3.2.1 Roof Sheets: Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheeting and protruding equipment, vents, and accessories.

3.2.2 Wall Sheets: Apply elastomeric sealant continuous between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Align bottoms of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws.

3.3 Sheet Metal Accessories: Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories, for positive anchorage to building and weathertight mounting.

3.4 Swing Doors and Frames: Install doors and frames straight, plumb, and level.

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3.5 Overhead Doors: Set doors and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports. Adjust moving hardware for proper operation.

3.6 Windows: Anchor windows securely in place. Seal entire perimeter of each unit with elastomeric sealant used for panels. Adjust and lubricate operating sash (vents) and hardware for proper operation. Clean surfaces of window units. Mount screens directly to frames with tapped screw clips.

3.7 Glazing: Clean channel surfaces and prime is recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bite all around. Install setting blocks at quarter points, set in a bed of sealant if heel-bead is used. Install spacers inside and out, all around, wherever liquid or plastic mastic compounds are used.

3.8 Thermal Insulation: Install blankets straight and true in one-piece lengths and both sets of tabs sealed to provide a complete vapor barrier.

3.9 Field Painting: Apply finish coating to factory-primed items.

13121-5

SECTION 13152

SWIMMING POOL ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of swimming pool equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Diving Stands shall be fabricated of 1-1/2 inch Schedule 40 stainless steel pipe. Their use shall be directed by facility dimensional requirements and shall comply with APHA, USS, NCAA, AAU, and FINA.

2.2 Diving Boards shall be fabricated of all aluminum or of laminated wood and fiberglass. All upper surfaces shall be non-skid, and all edges shall be rounded and sealed.

2.3 Ladders shall be fabricated from low carbon Type 304 stainless steel and have raised non-skid treads. Quantities, locations, and clearances shall comply with National Swimming Pool Institute standards.

2.4 Lifeguard Chairs shall be fabricated from Type 304 stainless steel (framework and handrails) and have raised non-skid treads and nonskid platforms. Units shall comply with Safety Requirements, published by the National Swimming Pool Institute, and OSHA standards.

2.5 Underwater Lights of not less than 0.5 watts per square foot of pool area shall be provided in accordance with Lighting and Wiring, published by the National Swimming Pool Institute, and Article No. 68D of the National Electrical Code.

2.6 Pool Covers shall be polyethylene, having a flame spread rating of "0" as per ASTM E 84. Materials shall be non-toxic, nonabsorbent, non-permeable, chemical-resistant and have a upper service limit of 110 F. Storage reels shall be constructed of Type 304 stainless steel.

2.7 Slides shall consist of fiberglass bodies with integral continuous flowing water supply, Type 304 stainless steel frames and raised non-skid ladder treads.

3.0 EXECUTION: (Section not usee.)

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SECTION 13182

SLUDGE INCINERATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant incinerators. Products shall match existing materials and/or as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Refractory Materials shall comply with ASTM C 64.

2.2 Sand for Fluidized Bed shall be high silica sand having an effective size of 0.20 mm. and a uniformity coefficient of 1.8.

2.3 Repair and Replacement Parts for Burners shall be compatible with the existing burners.

3.0 EXECUTION:

3.1 Cleaning, Lubrication, and Adjustments: Thoroughly clean fan, blower, motor, and damper of dirt, dust, and other foreign material. Parts shall be lubricated and adjusted for proper operation.

3.2 Burner Parts shall be cleaned and primary and secondary air openings shall be adjusted as required for good combustion and to meet the design requirements for excess air to the burner. Adjustments shall be made with the incinerator in normal operation.

3.3 Cleaning of Fuel and Atomizing Lines: Gas, oil, air, and steam lines connected to the burner shall be disconnected, cleaned, and reconnected.

3.4 Startup: After completion of maintenance and repairs, the incinerator shall be started up and operating adjustments shall be made by the Contractor as required to achieve the design flow rate and emission quality of the incinerator.

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SECTION 13205

SETTLING CHAMBER

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant settling chambers and weirs. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION:

3.1 Interruptions of Treatment: Not more than one settling chamber shall be taken out of service at a time.

3.2 Installation:

3.2.1 Painting: Exposed new surfaces and surfaces marred during the work shall be painted to match existing color.

3.2.2 Startup: Final adjustments and startup shall be made in such a way as to ensure that all equipment operates at design conditions and rated capacity.

3.2.3 Weir Adjustment: Adjust existing weirs that have a top edge elevation variation of more than 1/32 inch, and all new weirs, to be level throughout their length at the elevation specified.

3.2.4 Weir Repair: Grind metal weir plates smooth and even, if grinding does not exceed amount of available equipment.

13205-1

SECTION 13221

WATER TREATMENT PLANT FILTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of gravity and pressure filters for water treatment plants. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Repair Materials shall be epoxy type grout in compliance with Fed. Spec. MMM-A-001993.

2.2 Steel Plate, Welding Rods, and Welding Electrodes shall be of a composition that complies with Section II of ASME Boiler and Pressure Vessel Code.

2.3 Sequencing Controls and Solenoid Valves shall comply with NEKA ICS and UL 508.

2.3 Filter Media shall comply with the requirements of AWWA B100 and shall be equivalent to the existing filter materials.

2.4 Replacement Weirs and Troughs may be steel, conforming to ASTM A 36, or glass fiber reinforced plastic, in compliance with ASTM D 3841.

3.0 EXECUTION:

3.1 Tank and Trough Repair: Welding repairs shall comply with Paragraph UF-37 of Section VIII of the ASME Boiler and Pressure Vessel Code or AWS D1.1.

3.2 Weirs: Adjust weirs to the elevation required. Weirs may not have a top edge elevation variation of more than 1/32 inch throughout their length. Eroded top edges of metal weir plates shall be ground smooth and even, if grinding does not exceed amount of available adjustment.

3.3 Filter Media: Filtering materials shall be replaced in accordance with AWWA B100.

3.4 Testing: Test leak repairs by hydrostatic pressure or by pneumatic pressure if the leak is in the tank air space. Test sequence controls, solenoid valves, and backwash equipment to ensure that they operate at design conditions.

3.5 Cleaning: Clean tank interior of all sediment and foreign matter after completion of repair and testing. Clean sequence controls and associated electrical contacts.

3.6 Painting: Exposed metal surfaces shall be painted.

3.7 Disinfection: Disinfect piping and filters in accordance with AWWA B100.

## PRESSURE FILTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of pressure filters for water treatment plants. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Steel Plate, Welding Rods, and Welding Electrodes shall be of a composition that complies with Section II of ASME Boiler and Pressure Vessel Code.

2.2 Relief Valves shall be set to relieve at 15 psi above the normal operating pressure of the tank.

### 3.0 EXECUTION:

3.1 General: Welding repairs shall comply with Paragraph UF-37 of Section VIII of the ASME Boiler and Pressure Vessel Code or AWS D1.1.

3.2 Repair of Pin Holes: Weld holes of diameter less than half the plate thickness in compliance with AWS D1.1.

3.3 Repair-of Cracks: Patch cracks or holes larger than one half the thickness of the tank shell plate.

3.5 Testing: Test leak repairs by hydrostatic pressure or by pneumatic pressure if the leak is in the air space of the tank.

3.6 Cleaning: Clean tank interior of all sediment and foreign matter after completion of repair and testing.

## BACKWASH TANKS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for repair and maintenance for water treatment plant backwash tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 **Bolts and Screws:** Existing bolts and screws removed due to repair work shall be replaced with new bolts or screws complying with ASTM A 193, Grade B8 and nuts complying with ASTM A 194, Class 8F of the same type, size, and finish.

2.2 **Finishes:** Items replacing existing items that are galvanized, plated, painted, or otherwise finished shall be of like finish.

2.3 **Steel Tank Repair** Parts shall be as specified in ASTM A 36, A 131, A 283, or A 573, depending upon required thickness.

2.4 **Steel Tank Coatings** shall be as specified in AWWA D 102.

2.5 **Concrete Tank Repair Material** shall be epoxy type grout in compliance with Fed. Spec. MMM-A-001993.

2.6 **Concrete Tank Coatings** shall be a taste-free and odor-free, coal-tar base coating.

### 3.0 EXECUTION:

3.1 **Preparation:** Temporary backwash tank and accessories shall be furnished and installed as required to provide uninterrupted service.

#### 3.2 **Installation:**

3.2.1 **Flame Cutting:** No cutting by torch or flame shall be done without written authorization from the Contracting Officer.

3.2.2 **Testing:** Test tanks by filling with water and inspecting for leaks. Test piping and valves hydrostatically at one and one half times normal working pressure or 50 psig, whichever is greater.

SEWAGE TREATMENT PLANT  
ELECTRICAL CONTROLS AND INSTRUMENTATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sewage treatment plant instrumentation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Applicable Data: Flow diagrams, loop diagrams, and installation drawings of the existing instruments and sampling systems for which maintenance and repair is to be provided should be requested from the Contracting officer.

2.2 Instrumentation: All instrumentation shall be in accordance with the manufacturer's instructions.

3.0 EXECUTION:

3.1 Scheduling and Coordination: Contractor shall determine that arrangements have been made to take the equipment out of service for the duration of the work.

3.2 General: Perform listed maintenance procedures and repairs on meter and sampling system in compliance with the manufacturer's recommendations.

3.3 Calibration: Calibrate meter over the meter's range and adjust to read correctly.

WATER TREATMENT PLANT  
ELECTRICAL CONTROLS AND INSTRUMENTATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water treatment plant electrical controls and instrumentation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Items not specified but required for the proper installation or repair of a specified item of work shall be provided. Items shall be of proper type, size, design, and characteristics for the use intended. Parts shall be factory-made.

2.2 Finishes: Items replacing existing items that are galvanized, plated, painted, or otherwise finished shall be finished with like finish in compliance with the manufacturer's standard practice.

2.3 Electrical Controls and Instrumentation Components for replacement purposes shall be designed for same service as the existing.

3.0 EXECUTION:

3.1 Coordination: Contractor shall determine that requirements for removal of the equipment from service, the bypassing of control valves, and installing of temporary replacements have been coordinated with the Contracting Officer. Bypassing of control valves or putting a control instrument in the Remote-Hand-Control mode will be done by the plant operators.

3.2 Power Supplies that may be a hazard during the performance of the work shall be locked out.

3.3 Testing: Check the operation of each instrument after it is returned to service. Adjust each instrument to operate properly over the design range.

## FLOW MEASUREMENT DEVICES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of current type, turbine type, compound type, and fire service type meters for the measurement of flow. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Current Type Meters in sizes ranging between 5/8 inch and 6 inches shall conform to AWWA C 700.

2.2 Turbine Type Meter For Customer Services in sizes ranging between 1-1/2 inches and 12 inches shall conform to AWWA C 701.

2.3 Compound Type Meters in sizes ranging between 2 inches and 10 inches shall conform to AWWA C 702.

2.4 Fire Service Type Meters in sizes ranging between 3 inches and 10 inches shall conform to AWWA C 703.

2.6 Current Type Meters, Propeller-Driven in sizes ranging between 2 inches and 36 inches shall conform to AWWA C 704.

2.7 Multi-Jet Type Meters in sizes ranging between 5/8 inch and 2 inches shall conform to AWWA C 708.

3.0 EXECUTION: Calibration shall result in the flow measurement device reading correctly over its normal operating range.

## VEHICLE BARRIERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of portable, semi-permanent, permanent, power-assisted or manually deployed vehicle barriers. Type, size and capacity shall be as indicated or shall match existing.

### 2.0 PRODUCTS:

2.1 Retractable Barriers: In the raised position, the total retractable barrier heights shall be no less than 28 inches above the roadway surface and the width indicated. In the lowered position, the retractable barrier shall extend no more than 5/8 inch above the roadway surface. Retractable barriers in the lowered position shall be capable of supporting a 32,000-pound axle load or a 16,000-pound wheel load. Design for this load shall be in accordance with AASHTO-01.

2.1.1 Powered Retractable Barrier shall be capable of 240 complete up/down cycles per hour. Barrier motion shall be instantly reversible and shall be capable of raising the barrier from the lowered position to the raised position within 8 seconds during normal use, and within 2 seconds during an emergency. Barrier shall be capable of being closed from the raised position to the lowered position in not more than 3 seconds. Portable power-assisted retractable barriers shall be equipped with on and off ramps for smooth transition between surfaces.

2.1.1.1 Failure Modes of Operation: The system shall be designed to prevent lowering of the barrier in the event of hydraulic, electrical, or mechanical failure. A manual pump shall be included for operation of hydraulic and/or mechanical barriers without power.

2.1.1.2 Electric Motors: Unless otherwise indicated, electric motors shall have totally enclosed enclosures.

2.1.1.3 System shall be designed to maintain the barriers in the raised position, without inspection, for periods of time of up to 1 week. Equip hydraulic systems with pressure relief valves to prevent overpressure.

2.1.1.4 Hydraulic Power Unit shall contain hydraulic fluid which maintains its viscosity between 80 to 4000 saybolt universal seconds (SUS) even at constant heaviest use rate, for an ambient temperature range of 20 degrees F to 150 degrees F. Buried hydraulic lines for the connection of the hydraulic power unit to the barrier shall be flexible and/or carbon steel pipe.

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Flexible and rigid hydraulic line working pressure shall exceed the maximum system relief pressure. PVC pipe and fittings for burial of hydraulic lines shall be in accordance with ASTM D 3034 Type PS 46 with minimum pipe stiffness of 46.

- a. Flexible hydraulic lines shall be in accordance with SAE J517.
- b. Seamless carbon steel pipe shall be in accordance with ASTM A 106.

2.1.1.5 Hydraulic Power Unit Enclosure: A NEXA Type 3R enclosure as specified in NEMA 250 shall be provided to enclose the hydraulic power unit. The enclosure shall be designed for easy removal of the hydraulic power unit and other accessories without complete removal of the enclosure.

2.1.2 Manual retractable barriers shall be capable of being raised and lowered by manual means such as levers or hydraulics requiring a maximum 60 pounds of force. The manual mechanism shall contain a locking pin which accepts a padlock for securing the barrier when it is in the "UP" position.

2.2 Retractable Bollards: Total bollard height in the raised position shall be no less than 30 inches above the roadway surface and shall have an outside diameter of no less than 8 inches. Bollard system shall consist of a minimum of three bollards spaced no more than 32 inches from centerline to centerline of bollards across a 10-foot roadway. Bollards in the lowered position shall be capable of supporting a 16,000-pound wheel load each. Design for this load shall be in accordance with AASET0-01.

2.2.1 Powered retractable bollards shall be capable of 240 complete up/down cycles per hour. Bollards shall be capable of being raised or lowered within a 3 to 15-second range during normal use and within 2.5 seconds for emergency operations.

2.2.1.1 Failure Modes of Operation: The system shall be designed to prevent lowering of the barrier in the event of hydraulic, electrical, or mechanical failure. A manual pump shall be included for operation of hydraulic and/or mechanical barriers without power.

2.2.1.2 Electric motors shall have totally enclosed enclosures unless otherwise indicated.

2.2.1.3 System shall be designed to maintain the barriers in the raised position, without inspection, for period of time of up to 1 week. if a hydraulic system is used, it shall be equipped with pressure relief valves to prevent overpressure.

2.2.1.4 Hydraulic power unit shall contain hydraulic fluid which maintains its viscosity between 80 to 4000 saybolt universal seconds (SUS) even at constant heaviest use rate, for an ambient temperature range of 20 degrees F to 150 degrees F. For ambient temperatures below 20 degrees F, a hydraulic oil heater shall be provided so that the oil viscosity remains between 80 to 4000 SUS. Buried hydraulic lines for the connection of the hydraulic power unit to the barrier shall be flexible and/or carbon steel pipe. Flexible and rigid hydraulic line working pressure shall exceed the maximum system relief pressure. PVC pipe and fittings for burial of hydraulic lines shall be in accordance with ASTM D 3034 Type PS 46 with minimum pipe stiffness of 46.

- a. Flexible hydraulic lines shall be in accordance with SAE J517.
- b. Seamless carbon steel pipe shall be in accordance with ASTM A 106.

2.2.1.5 Hydraulic Power Unit Enclosure: A NEMA Type 3R enclosure as specified in NEMA 250 shall be provided to enclose the hydraulic power unit. The enclosure shall be designed for easy removal of the hydraulic power unit and other accessories without complete removal of the enclosure.

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2.2.2 Manual retractable bollards shall be capable of being raised and lowered utilizing a recessed handle on the top surface of the bollard, with a maximum force of 60 pounds or a manual hydraulic pump requiring a max 60 pounds of force. A recessed panel at the base of each bollard, adjacent to the bollard in the "DOWN" position, shall contain a spring actuated latching mechanism that automatically secures the bollard in either the full "UP" or full "DOWN" position. The panel shall have an access cover with provisions for a padlock to secure the access cover.

2.3 Crash Gate shall consist of steel buttresses anchored into the ground and an above grade assembly consisting of a heavy steel structural or a combination of heavy steel and structural aluminum capable of being opened and closed. The height of the gate shall be a minimum of 84 inches from the road surface to the top of the gate frame. The length shall close and protect a minimum 120 inch clear opening. The maximum clear opening between the gate frame and end posts, between the bottom of the gate and finished grade, and between any grill work shall be 3 inches.

2.3.1 Powered Crash Gate: The gate movement shall be controlled by an electromechanical gate operator or a hydraulic gate operator consisting of an operator unit with required control circuits and operator station. The control and operating voltage shall be 24 vac (nominal).

2.3.2 Failure Mode of operation: The system shall be designed to prevent opening of the crash gate in the event of electrical or mechanical failure. A disconnect system for the gate drive shall be provided to allow manual operation of the barrier in the event of a power outage.

2.3.3 Manual crash gate shall be capable of being hinged from either side. Hinge points of both buttresses shall each contain a locking pin with padlock acceptance for securing the crash gate in the closed position. The crash gate shall withstand a 10,000-pound vehicle at impact speed of 50 miles per hour, with maximum gate deflection or vehicle penetration of 10 feet.

2.4 Crash Beam shall be an above-grade assembly that, in the "DOWN" position, shall present a formidable obstacle to approaching vehicles. The height of the barrier shall be a minimum of 30 inches as measured from the roadway surface to the centerline of the crash beam. The crash beam shall be capable of blocking a minimum road width of 120 inches. The crash beam end shall contain a locking pin with padlock acceptance for securing the crash beam when it is in the "DOWN" position. Crash beam shall withstand a 10,000-pound vehicle at impact speed of 15 miles per hour, with a maximum beam deflection of 20 feet.

2.4.1 Powered crash beam shall be operated by means of a hydraulic power system. The crash beam shall be capable of being raised or lowered within an 8- to 15-second time range.

2.4.1.1 Failure Mode of Operation: A disconnect system for the crash beam shall be provided to allow manual operation of the barrier in the event of an electrical or mechanical failure.

2.4.2 Manual crash beam shall be manually raised and lowered with the aid of a counterbalanced end requiring approximately 60 pounds of force.

2.5 Electrical Work: Motors, manual or automatic motor control equipment except where installed in motor control centers, and protective or signal devices required for the operation specified herein, and wiring required for operation shall be provided in accordance with DIVISION 16 ELECTRICAL Section.

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2.6 Control Panel and control circuit shall be provided to interface between all barrier control stations and the power unit. The control station is defined as the main control panel and the remote control panel as shown. The control circuit shall contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation. The control panel shall allow direct interface with auxiliary equipment such as card readers, remote switches, loop detectors, infrared sensors, and gate limit switches. The enclosure shall be as indicated on the drawings. All device interconnect lines shall be run to terminal strips.

2.6.1 Voltage: The control circuit shall operate from a 120 volt 60 Hz supply.

2.6.2 Main control panel shall be supplied to control barrier function. This panel shall have a key-lockable main switch with main power "ON" and panel "ON" lights. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. An emergency fast operate circuit (EFO) shall be operated from a push button larger than the normal controls. The EFO shall also be furnished with an EFO-active light and reset button. The main control panel shall have a key lockable switch to arm or disable the remote control panel. An indicator light shall show if the remote control panel is enabled.

2.6.3 Remote control panel shall have a panel "ON" light that is lit when enabled by a key lockable switch on the main control panel. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. The EFO shall be operated from a push button larger than the normal controls. The EFO shall be interconnected with an EFO-active light. When the remote control panel EFO is pushed, operation of the barrier will not be possible from this panel until reset at the main control panel;

2.7 Miscellaneous Equipment:

2.7.1 Safety Equipment: Red/yellow 8-inch traffic lights shall be supplied for each entrance and exit to alert motorists of the barrier position. Traffic lights are not required for manual barriers. The yellow light shall indicate that the barrier is fully open. All other positions shall cause the light to show red. Brackets shall be supplied to allow the light to be mounted a minimum 4.5 feet above the roadway pavement on a 3.5-inch outside diameter metal post or mounted directly on the crash gate.

2.7.2 Heater: A waterproof barrier heater with a thermostat control and NEMA 4 junction box connection point shall be provided for de-icing and snow melting. The heater shall provide barrier operation to an ambient temperature of minus 40 degrees F. For retractable bollards, a 250-watt heater shall be provided for each bollard.

2.7.3 Signage shall read "Axle Weight Limit 9 Tons" and shall conform to FHWA-01 sign (R12.2).

2.7.4 Vertical Arm Gates (Traffic Arms) shall have an opening and closing time of less than or equal to 15 seconds. The gates shall be capable of 15 duty cycles per hour as a minimum. Gate shall operate the arm through 90 degrees. Gate operators shall be supplied with single phase 120 volt motors. Each gate shall be capable of being operated from a remote open-close push button station. Gates shall have a hand-crank mechanism which will allow manual operation during power failures. Each gate shall be supplied with a handcrank. Gate arms shall be constructed out of wood, steel, fiberglass, or aluminum, as specified by the manufacturer for the given lengths as shown on the drawings. Gate arms shall be covered with 16-inch wide reflectorized red and white sheeting. Each gate shall be furnished with a spare gate arm. Gate operator cabinets shall be constructed of galvanized steel and shall be painted manufacturers standard color as approved., Each gate operator shall be provided with an obstruction detector that will automatically reverse the gate motor when an obstruction is detected. The obstruction detector shall be any of the following three types: An electronic loop vehicle detector buried in the road, a photocell electric eye mounted on the gate operator, or a safety strip mounted on the lower edge of the arm. The detector system shall be automatically deactivated when the arm reaches the fully lowered position. Slab size and anchorage for gate operator shall be per manufacturer requirements.

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2.8 Finish: Surfaces shall be painted in accordance with requirements of DIVISION 9 Section on painting except for materials supplied with manufacturers standard finish. The roadway plate shall have a nonskid surface. The barrier front shall have 6-inch wide reflective yellow stripes 4 inches apart. Bollards shall be painted reflective yellow with 3-inch wide black diagonal stripes. The barrier crash gate shall be painted white and the crash beam shall be painted reflective yellow with 3-inch wide black diagonal stripes.

2.9 Concrete shall conform to DIVISION 3 Concrete section.

2.10 Welding shall be in accordance with AWS D1.1.

2.11 Pavement: After placement of the vehicle barrier, the pavement sections shall be replaced to match the section and depth of the surrounding pavement. Pavement shall be warped to match the elevations of existing pavement. Positive surface drainage, away from the vehicle barrier, shall be provided by pavement slope.

3.0 EXECUTION:

3.1 Installation shall be in accordance with manufacturers instructions.

3.2 Buried Hydraulic Lines shall be placed in polyvinyl chloride (PVC) sleeves. Positive drainage shall be provided from the hydraulic power unit to the barrier for drainage of condensation within the PVC sleeve.

3.3 All controls shall be terminated with compression ring-style terminals. Roundhead screws and lockwashers shall be used to provide vibration-resistant connections. Connections between any printed circuit cards and the chassis shall be made with screw connections or other locking means to prevent shock or vibration separation of the card from its chassis.

## SECTION 14245

### PASSENGER ELEVATORS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of passenger elevators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 **Elevators** shall be of size, type, and operation directed by the Contracting Officer. Elevators shall comply with the requirements of ANSI A17.1 and ANSI A117.1. Elevator cab shall be galvanized metal shell with enamel finish. Elevator doors shall be galvanized metal with enamel finish. Walls of elevator shall have raised plastic laminate panels. Structural and non-exposed ferrous metal surfaces shall receive two coats of structural grade primer. Elevator shall be complete with protective car pads and hooks.

2.2 **Operating Equipment:** Motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.

#### 2.3 Finishes:

2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.

2.3.2 Enamel: Shop-applied baked enamel of color as selected by the Contracting Officer.

2.3.3 Plastic Laminate: Fed. Spec. L-P-508, color, texture, and pattern as selected by the Contracting Officer.

2.4 **Wiring:** All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.

#### 3.0 EXECUTION:

3.1 **Preparation:** Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.

3.2 **Installation:** Install machinery, guides, controls, car, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.

3.3 **Inspection:** At completion of installation, elevator shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.

## FREIGHT ELEVATORS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of freight elevators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Elevators shall comply with the requirements of ANSI A17.1. When provisions for the handicapped are required, elevators shall comply with the requirements of ANSI A117.1. Elevator cab shall be galvanized metal shell with enamel finish. Elevator doors shall be galvanized metal with enamel finish. Structural and non-exposed ferrous metal surfaces shall receive two coats of structural grade primer.

2.2 Operating Equipment: Motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.

### 2.3 Finishes:

2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.

2.3.2 Enamel: Shop-applied baked enamel.

2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.

### 3.0 EXECUTION:

3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smooth operation, free from sidesway, oscillation or vibration.

3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.

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SECTION 14400

LIFTS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of commercial lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 **PRODUCTS:** Lifts shall comply with ANSI A17.1.

2.1 **Lifts** shall be electrically operated traction type with counter-weights, winding drum type, or hand-operated chain or screw drive type for low-capacity, infrequent use as required. The lift shall be manufacturer's standard pre-engineered system.

2.2 **Capacity Rating** shall be 100 pounds, 50 pounds, or as required.

2.3 **Speed** shall be 50 fpm, with travel distance as required.

2.4 **Hoistway Doors** shall be 2 feet 6 inches wide by 3 feet 0 inches high, or as required.

2.5 **Self-Supporting Structure:** Provide units with structural steel self-supporting hoistway framing that requires vertical-load support only at base and lateral support only at landing levels to coordinate car movement with hoistway doors.

2.6 **Machine Locations:** Locate lift machines inside the shaft at top or bottom of hoistway as required.

2.7 **Electric Control System:** Provide standard, fully automatic call-and-send operation that responds to momentary push-button signals at each landing.

2.7.1 Pushbuttons Shall Be Inoperative while car is in transit, for a predetermined time period after car arrival at any given landing, or when any doors are open. Delivery calls shall take precedence over calls for service.

2.7.2 Provide Adjustable Limited Period of Time for receiving station to make its access to car, before responding to next station call-for-service. Post notice of limitation at each station.

2.7.3 When Delivery Has Been Completed, doors are closed, and no calls-for-service are registered, return car automatically for parking at indicated "home" station.

2.8 **Materials and Finishes:**

2.8.1 Enameled Steel: Formed steel units with baked synthetic enamel finish.

2.8.2 Primed-for-Paint Steel: Formed steel units with baked metal primer.

2.8.3 Stainless Steel: AISI Type 302/304, with directional polish or satin finish.

2.8.4 Plastic Laminate: High-pressure type complying with NEMA LD3, 0.05 inch thickness.

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2.9 **Car Construction:**

2.9.1 **General:** Provide car construction of either formed, reinforced, and sound-deadened sheet metal with welded joints; or of metal-clad plywood with mechanically riveted or bolted joints, with exposed edges of plywood covered with metal and with internal seams sealed by soldering. Provide shelves, compartments, gates and other features as required.

2.9.2 Car Light: Equip car with recessed incandescent light fixture, located in ceiling near front of car. Provide perforations or glazed port through car gate and hoistway doors near light location, sufficient for observation that car is present at landing.

2.10 Car Gates:

2.10.1 Manual Car Gates shall be of counterbalanced bi-parting vertical sheet steel with black enamel finish and electrical interlocks.

2.10.2 Power-Operated Car Gates shall be vertical bi-parting gates, equipped with power operator and connecting linkages to operate hoistway doors at landing when car is present.

2.11 Hoistway Doors: Provide flush hollow metal doors and frames of counterbalanced vertical bi-parting design.

2.12 Signal Equipment: Provide signal equipment at each landing hall push-button station; include call button, send button for each landing served, and illuminated "car-in-use" pilot light that flashes when car arrives at landing (until door is opened). Provide recessed station set in face of door jamb with surface-mounted stainless steel face plate.

2.13 Door Buttons: Where power operated doors are required, provide momentary pressure "door open" and constant pressure "door close" buttons.

2.14 Audible Arrival Signal: Provide standard bell or gong system on top of each car, equipped to sound as car approaches landing.

2.15 Audible Call Signal: Provide standard buzzer system on top of car, equipped to sound continuously when any call button is depressed and held, but only if car is located at a landing where hoistway door or car gate is open.

3.0 EXECUTION: (Section not used).

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SECTION 14410

PERSONNEL LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of personnel lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer.

Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Personnel Lifts: Personnel lifts shall be electrically operated, electronically controlled platform type. Capacity shall be as directed. Lift shall have a capacity safety factor of 5. Lift speed shall not exceed 30 feet per minute. Platform shall be welded and bolted steel construction. Drive belts and/or chains shall have safeties that automatically lock the carriage to the guide rails in the event of slack or lift beltchain failure. Lifts shall conform to ANSI A90.1. Lifts shall be complete with necessary screens and guards for moving parts and floor openings.

2.2 Controls: Personnel lifts shall be provided with normal and final limit switches at each stop. Lifts shall have emergency stop switch.

2.3 Motor: Motors shall be sized for capacity of lifts. Motor shall be direct drive, gear type with electric brake. Power requirements shall be as directed.

2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on lifts shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.

## 3.0 EXECUTION:

3.1 Preparation: Prior to installation of lifts, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, lifts and equipment, and accessories in accordance with applicable codes and standards. Installation shall provide quiet, smooth operation free from sidesway, oscillation, or vibration.

3.3 Inspection: At completion of installation, lifts shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.

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## SECTION 14420

### CHAIR LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of chair lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation

procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Chair Lifts shall be of size, type, and configuration designated and shall be designed for the applicable stair configuration. Chairs applicable shall be padded, vinyl upholstered type. Chair lifts shall comply with the requirements of ANSI A90.1.

2.2 Operating Equipment: Motors, controllers, casings, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide fully operational chair lift shall be provided.

2.2 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on chair lifts shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways. except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed as to provide a proper size loop for the chair lift. Traveling cables shall have a fire resistant outer braid.

## 3.0 EXECUTION:

3.1 Preparation: Prior to installation of chair lifts, ensure that installation surfaces are true to lines and levels. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, chair lifts, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smooth operation, free from sidesway, oscillation, or vibration.

3.3 Inspection: At completion of installation, chair lift shall be inspected in accordance with ANSI A17.2 All deficiencies shall be corrected and retested.

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## SECTION 14450

### VEHICULAR LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vehicular lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer.

Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Vehicular Lifts: Lifts shall comply with ANSI B153.1. Lifts shall have automatic mechanical lift lock. Lift lock shall be automatically activated when lift is operated to full stroke to prevent accidental lowering.

2.2 Operating Equipment: Motors, controllers, casings, pumps, hydraulic fluid reservoir, cylinder, plunger, piping, buffers, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.

2.3 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the lift shall be provided. Wiring shall be in accordance with the National Electrical Code and shall be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs.

3.0 EXECUTION:

3.1 Preparation: Prior to installation of vehicular lifts, ensure that shafts and openings are plumb, level, and in line. Check measurements of space for equipment and clearances for operation.

3.2 Installation: Install machinery, controls, and lift and its equipment and accessories in accordance with manufacturer's instructions and applicable codes and standards, to provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.

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SECTION 14510

AUTOMATIC CART TRANSPORTATION SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of automatic cart transportation systems. Products shall match existing materials and/or shall be as directed by the

Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

2.1 Automatic Cart Transportation Systems: Automatic cart transportation systems shall be of the size and configuration directed by the Contracting Officer. System shall be complete with manufacturer's standard steel rail system for the capacity required, chain drive, switches, carriers, carts, stops, and other accessories required for a complete installation. Field-painted components shall match adjacent surfaces.

2.2 Operating Equipment: System shall be provided with manufacturer's standard automatic destination control circuitry. Control system shall allow fully automatic delivery of carts to predetermined locations. Motors, indicators, wiring, hardware, fittings, and all other equipment required to provide a fully operational cart transportation system shall be provided.

2.3 Wiring: All wiring necessary to connect buttons, switches, signals, and all electrical equipment shall be provided. Wiring shall be in accordance with the National Electrical Code and shall be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs.

## 3.0 EXECUTION:

3.1 Preparation: Prior to installation, ensure that installation surfaces are true to lines and level. Check measurements of space for equipment, means of access for installation, and clearances for operation.

3.2 Installation: Completed installation shall operate smoothly without undue noise, oscillation, or vibration.

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## SECTION 14560

### TRASH CHUTES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of trash chutes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition

and removal of materials shall be as required to support the work. Contact the fire protection engineering branch for the specific requirements of fire protection.

## 2.0 PRODUCTS:

2.1 General: Chutes shall be gravity type in accordance with the standards of NFPA 82. Intake doors shall bear the UL Class B, 1-1/2 hour, 250 F rating. Doors shall be tested in accordance with ASTM E 152 Fire Endurance Test.

2.2 Chutes: Chutes shall be manufactured of galvanized steel, aluminized steel, or stainless steel, as directed. Galvanized steel and aluminized steel shall be minimum 18 gauge. Stainless steel shall be minimum 0.05 inch thick. Diameter of chute shall be as directed. Chutes shall be provided with necessary supports.

2.3 Intake Doors and Frames: Chutes shall be equipped with Type 302 stainless steel, hand hopper type intake doors bearing the UL Class B, 1-1/2 hour rating. Surfaces of doors and frames shall have satin finish. Doors shall be sized in accordance with the requirements of NFPA 82. Frame trim shall be minimum 0.060 inch thick, Type 302 stainless steel. Doors shall be self-closing and positive latching.

2.4 Outlet Doors: Outlet door shall be UL "B" label 1-1/2 hour fire rated, and equipped with a fusible link to be self closing and self latching.

2.5 Vent: Trash chute shall be provided with a roof vent in accordance with NFPA 82. Vent shall extend 4 feet minimum above roof line and be provided with flashing as required to provide a watertight installation. Vent shall be same diameter and material as trash chute. Vent shall be provided with a rain cap and bird screen.

2.6 Sprinklers: Sprinkler shall be provided as required by NFPA 82 and as directed. Sprinklers shall be installed in accordance with NFPA 13.

2.7 Hopper: Each trash chute shall be provided with a hopper type receptacle.

## 3.0 EXECUTION:

3.1 Preparation: Prior to installation of trash-chute, ensure that shafts and openings are plumb, level, and in line. Check measurements of-space for materials and means of access for installation.

3.2 Installation: Install trash chute in accordance with applicable codes and standards. Ensure that installation procedures maintain required fire resistance ratings.

## SECTION 14570

### WATER TREATMENT PLANT TRAVELING SCREENS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for repair and maintenance of traveling screens for water treatment intake structures. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS:

2.1 Replacement Motors and Parts shall have the same characteristics and as the motors and parts to be replaced, unless otherwise approved.

2.2 Replacement Pumps shall comply with design specifications for head, capacity, material of construction, and motor characteristics of the pumps to be replaced.

2.3 Finishes for items replacing existing items that are galvanized or painted shall be finished with like finish in compliance with manufacturer's standard practice.

2.4 Screen Wash Nozzles shall be stainless steel, brass, or bronze. Stainless steel shall be Type 316. Brass shall comply with ASTM B 282. Bronze shall comply with ASTM B 255.

2.5 Screen Metal Fabric shall be stainless steel complying with ASTM A 580.

2.6 Screen Frame shall be steel or stainless steel. Stainless steel parts shall comply with ASTM A 193, A 480, and A 564. Steel shall comply with ASTM A 36. Steel fasteners shall comply with ASTM A 307 or A 325.

#### 3.0 EXECUTION:

3.1 General: Screen, wash pumps, controller, drive equipment, and appurtenances shall be repaired, lubricated, and placed back in service.

3.2 Welding shall be done in compliance with AWS D1.1.

## PNEUMATIC TUBE SYSTEM

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for repair and maintenance of pneumatic tube systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 Vacuum Pumps, Compressors, Specialty Components, and Parts shall be the product of the system's original manufacturer. Parts and materials no longer available from the original manufacturer shall be replaced with similar substitute parts and materials, subject to the approval of the Contracting officer.

2.2 Carrier and Tube Components shall be not lighter than 16gauge cold-rolled-electric-welded steel manufactured for pneumatic systems.

2.3 Welding and Brazing materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.

2.4 Electrical Devices shall comply with the requirements of National Electrical Code.

### 3.0 EXECUTION:

3.1 Safety: Repairs shall be accomplished with either the entire system or applicable portions removed from service by interrupting the power supply and locking the disconnect switch in the off position.

3.2 Performance: In addition to the manufacturer's instructions, all repairs shall be accomplished in compliance with National Electrical Code.

3.3 Flame Cutting, Welding, and Brazing: No cutting by torch or flame, welding or brazing shall be permitted without written authorization from the Contracting Officer.

## PNEUMATIC MESSAGE SYSTEMS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of pneumatic message systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.0 PRODUCTS:

2.1 **Pneumatic Message System:** System shall be computer controlled pneumatic tube type to permit automatic unattended transmission of carriers from any station to any other station. System components shall be designed and located in such a manner that in the event of a defect, components may readily be removed and replaced. Failure of one station shall not interfere with normal functioning of any other station. Number of stations and zones shall be as directed.

2.2 **Tubing:** Tubing for carrier transmission lines shall be not lighter than 16-gauge cold-rolled-electric-welded steel, manufactured for pneumatic systems. Air lines shall be sized as required for proper system operation.

2.3 **Fittings and Hangers:** Fittings shall be cast iron, cast aluminum, or fabricated steel. Box connectors, close elbows, tees, coupling sleeves, other fittings, hangers, and supports required for proper installation of the system shall be provided.

2.4 **Power Unit:** Power units shall be provided for each zone. Power units shall be capable of operating all lines simultaneously and producing an average carrier speed of 25 feet per second. Power units shall be complete with vibration isolators, intake and exhaust mufflers, intake and exhaust piping, screen box, and air valves, if required, and shall be designed for easy access.

2.5 **Control Center:** The system shall be controlled by a software sensitive, magnetic core or complementary metal oxide semi-conductor memory computer. Computer shall perform logic, control, supervisory, and alarm functions and provide permanent storage for system operating program. Program memory protection shall be provided during power loss.

2.6 **Carriers:** Three carriers shall be furnished for each station provided. Carriers shall be side opening of full access type, bidirectional.

### 2.7 **Painting:**

2.7.1 Sending and Receiving Units shall receive factory- or field-finish standard with the manufacturer. Field finish shall match adjacent surfaces.

2.7.2 Tubing shall be field-painted, when exposed, to match adjacent surfaces.

2.8 **Electrical Work:** Pneumatic message system shall be provided complete with motors, motor starters, and controls and shall comply with NEMA MG 1. Electrical equipment and wiring shall be in accordance with NFPA No. 70 and the National Electrical Code. Motor starters shall be provided complete with properly sized thermal-overload protection. Each motor shall be sized to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor when operating at proper electrical system voltage.

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### 3.0 EXECUTION:

3.1 **Preparation:** Prior to installation of pneumatic message system, check measurements of spaces

for equipment and means of access for installation and operation.

3.2 Fireproofing: Where holes are required in fire and smoke walls for the passage of piping and other accessories, the holes shall be filled with UL approved fireproofing material that equals the wall fire or smoke rating.

3.3 Tests: Test installed system in the presence of the Contracting Officer to determine that the system is functional, operational, and installed in accordance with the specifications. Tests shall be conducted in accordance with the following:

- a. Computer simulation and interrogation.
- b. Consecutive dispatching to random stations within the zone.
- c. Consecutive dispatching to random stations outside the zone.
- d. Multi-station dispatching within the zone where all dispatchers are loaded with carriers, random stations are selected, and dispatching begins.
- e. Multi-station dispatching outside the zone where all dispatchers are loaded with carriers, random stations are selected, and dispatching begins.
- f. Two stations in each zone will be randomly selected to dispatch carriers into other zones.

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SECTION 14583

PNEUMATIC TRASH AND LINEN CHUTES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pneumatic trash and linen chutes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Contact the fire protection engineering branch for the specific requirements of fire protection.

## 2.0 PRODUCTS:

2.1 General: Pneumatic waste and linen systems shall be vertical, horizontal, or inclined duct systems, having sufficient mechanically-applied airflow to convey refuse or linen to point of disposition without clogging. Systems shall have stations and configurations as directed.- Systems shall be in accordance with the standards of NFPA 82.

2.2 Air Velocity: The minimum air velocity in the system shall be 5,000 feet per minute. Blower system shall be designed to provide continuous air supply at no less than the minimum velocity.

2.3 Tubes: Tubes for system shall be a minimum of 16 inches in diameter. Tubes shall be galvanized, aluminized, or stainless steel. Material-conveying lines shall be not lighter than 20 gauge and charging stations or changes in direction of conveying lines shall be not lighter than 16 gauge. In all cases, steel shall be of sufficient thickness to retain its design shape under all operating conditions.

2.4 Fire Protection: Automatic fire dampers shall be installed at all points where the system penetrates fire-resistant partitions or floor assemblies. The system shall shut down automatically upon closing of one of the fire dampers. Sprinklers shall be provided in accordance with the requirements of NFPA 82. Fire separation at service openings and terminal rooms shall be as required by NFPA 82.

2.5 Service Openings: Service openings shall be sized and designed in accordance with NFPA 82. Doors shall bear UL Class B 1-1/2 hour rating.

2.6 Wiring: All wiring necessary to connect motors, switches, and controls shall be provided. Wiring shall be in accordance with the National Electrical Code, and shall be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs.

## 3.0 EXECUTION:

3.1 Preparation: Prior to installation of pneumatic trash and linen chutes, ensure that shafts and openings are plumb, level, and in line. Check measurements of space for equipment, accessibility for installation, and clearances for operation.

3.2 Installation: Install machinery, tubes, controls, equipment, and accessories in accordance with the manufacturer's instructions and applicable codes and standards. Install fire protection sprinklers in accordance with NFPA 13. Complete installation shall operate properly without undue noise or vibration. Ensure that installation procedures maintain required fire resistance ratings.

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SECTION 14602

CRANES AND HOISTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cranes and hoists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Crane: Crane Manufacturers Association of America (CMAA) Specification No. 70, Specification for Electric Overhead Traveling Cranes, or Monorail Manufacturers Association (MMA) Specifications for Underhung Cranes and Monorail Systems.

2.2 Hoist: Hoist Manufacturers Institute HK 100, Specifications for Electric Wire Rope Hoists.

3.0 EXECUTION: The derrick shall be assembled and installed with the guy wires placed in position, hoisting ropes installed, and the derrick made ready for regular operation. Equipment installed outdoors shall be primed and finish-painted with a suitable corrosion-resistant paint on all parts and components not otherwise made of corrosion resistant materials or otherwise protected.

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SECTION 14650

ASH HOISTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ash hoists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation

procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

## 2.0 PRODUCTS:

### 2.1 Winches and Sheaves:

2.1.1 Wire Rope Sheaves shall be iron or steel with bronze bushings, furnished either plain or as an assembly of frame, sheave, swivel hook, and axle as required.

2.1.2 Winches shall be of steel construction with bronze bearings on rotating parts. Winches shall have a capacity of not less than 500 pounds, with band action handbrake and drum width adequate for the quantity and diameter of wire rope to be used. Winches shall be marine type with gear cover and shall have corrosion-resistant parts and finish suitable for outdoor use.

2.1.2.1 Power Winches: NEKA 3 weather-protected, with two speeds (30 or 60 fpm) for lifting and a single speed for lowering, automatic upper-limit switch for hook travel, with push-button control.

2.1.2.2 Hand wench shall have spring-operated holding dogs, freespooling feature, and adjustable handles.

2.1.3 Wire Rope: Wire rope shall be flexible, hoisting grade composed of approximately 7 strands or bundles of small diameter steel wire with a fiber or independent wire rope core.

2.2 Mast and Boom: Mast, boom, and miscellaneous fabricated components shall be provided as required to complete the unit assembly. Boom shall rotate. Fabricated parts shall be finished with a corrosion resistant paint.

2.2.1 Mast shall telescope where required. Fully extended mast shall allow transport of ash container from bottom of pit to bed of truck without handling container twice.

2.2.2 Ash-Handling Pit shall have watertight door covering where required. Doors shall be mechanically linked to mast so that they automatically open and close with the raising and lowering of the mast.

3.0 EXECUTION: The Contractor shall complete the assembly of any equipment furnished partially assembled and place the items in position as directed. The ash hoist shall be assembled and securely bolted in position, hoisting ropes installed, and the hoist made ready for regular operation. The Contractor shall furnish all miscellaneous hardware items required to complete the installation of all equipment and components. Equipment shall be primed and finish painted with a suitable corrosion-resistant paint on all parts and components not made of corrosion-resistant materials or otherwise protected.

## SECTION 15050

### BASIC MECHMICAL MATERIALS AND METHODS

1.1 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of basic materials and methods. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.2 **General Conditions and Requirements:** The General Conditions, Supplementary Conditions and Section 1 General Requirements apply.

1.3 **Work Included:** Contractor shall be required to provide a complete and operating installation including all obviously necessary items even though such items are not indicated on the drawings and specifications.

1.4 **Permits and Inspections:** The contractor is responsible for all required permits and fees for the installation of the system in accordance with the General Provisions.

1.5 **Codes and Standards:** Comply with the latest applicable requirements of the National Fire Protection Association (NFPA) and the Plumbing Code as a minimum standard unless specifications listed herein require a higher minimum standard.

1.6 **Minor Deviations:** The contractor's submitted drawing should indicate the extent and general arrangement of equipment and systems. If any departure is deemed necessary, submit details of such departures and reasons therefore to the Contracting Officer for approval.

1.7 **Project Record Documents:**

A. Record Drawings:

(1) Provide record drawings which shall clearly show all differences between the contract work as drawn and installed for all concealed work as well as work added to the contract which may not be shown on the original submitted drawings.

(2) Maintain a set of marked drawings at the job site. Keep legible and current and available for inspection by the Contracting Officer or designated representative at all times. Show all changes in the contract work or work added on these drawings in a contrasting color.

(3) Upon substantial completion of the work, transfer the information from the marked drawings at the site to the record drawings on reproducible sheets which the contractor shall turn over to the Contracting Officer.

B. Equipment List and Maintenance Manual:

(1) Prior to completion of the job, the contractor shall compile a complete equipment list and maintenance manual. After review and approval by the Government, contractor shall furnish three bound copies. The equipment list shall include the following items for every piece of material and equipment supplied under this section of the specifications: Name, Model and Manufacturer Complete parts drawings and list Local Supply for parts or replacement with address and telephone numbers Local service organization for equipment with address and telephone number All tags, inspection packages, inspection slips, etc., removed from equipment as shipped from the factory Electrical wiring diagram as applicable

(2) Maintenance manual shall include all available manufacturer's operation and maintenance instructions together with the record drawings previously specified and all other diagrams and instructions necessary to properly operate and maintain the equipment. include the name, address and phone number of the subcontractors involved in any of the work specified herein. The equipment list and maintenance manual shall be submitted in accordance with Section 1, General Provision.

## 2.1 PRODUCTS:

### 2.2 Pipe:

- A. Galvanized Steel: comply with ASTM A120.
- B. Copper: Type "DWV" for drains and Type "K" or "L" for water distribution.
- C. Cast Iron:
  - (1) Bell and Spigot: Centrifugally spun service weight, tar coated inside and out.
  - (2) Mechanical Joint: Class 140 AWWA C111 standard joint and C106 barrel.

### 2.3 Pipe Fittings:

- A. Galvanized Steel: 150 lbs. galvanized malleable iron.
- B. Copper: Make joints with non-lead solder except joints in Type "K" or "L" in pipe 2 inches and over and all underground pipe to be made with 95-5 solder.

### 2.4 Pipe Hangers and Supports:

- A. Capable of maintaining the installed load plus 500 lbs.
- B. Support C.I. at every floor vertically and 5-foot intervals horizontally.
- C. Screwed Pipe: Ten foot (max.) horizontally.
- D. Copper Tubing: Six feet (max.) horizontally.
- E. Hangers:
  - (1) Grinnel or F&M cast malleable or wrought iron split ring, clevis type or auto-grip; all designed for use with mild steel threaded support rods. Hangers and rods proportioned for the weight of the pipe supported.
  - (2) Copper plated hangers for copper pipe.
  - (3) Trapeze hangers for parallel pipes. Spacing determined by the smallest pipe supported.
  - (4) Plumbers strap is not to be used.

### 2.5 Valves and Cocks:

- A. General:

- (1) Acceptable Manufacturers: Crane, Powell, Jenkins, Walworth, or Stockham. Manufacturer's name and valve rating cast in body.
  - (2) Minimum Working Pressure: 125 psig steam.
  - (3) Valves 2" and Smaller: Brass body, brass or bronze(sweat type ends for copper).
  - (4) Valves 2-1/2" and Larger: Iron body, brass or bronze trimmed, flange ends.
- B. Gate: 20 and smaller-bronze, solid wedge disc, tapered seat, non-rising stem, 150 lbs. SWP, Crane No. 461, 2-1/2" and larger - Crane.
- C. Check: 2" and smaller-bronze, composition No. 12 disc horizontal lift check, 150 lbs. SWP, Crane No. 27, 2-1/2" and larger bronze trimmed, swing check, 125 lbs. SWP, non-slam, Crane No. 373.
- D. Vacuum Breaker: Sloan V-188A, Watts 288A Series, or Watts 8A on hose bibbs.
- E. Stop Valves: Provide all fixtures including drinking fountains, hose bibbs, dishwashers and ice makers.
- F. Globe Valves: 2" and smaller-screwed, bronze, composition disc No. 12 rising stem, 150 lbs. SWP, Crane No. 7; 2-1/2" and larger-flanged iron body, bronze trimmed, flanged bonnet, 125 lbs. Crane No. 351.
- G. Other Balancing and shut-off Valves: Centerline Butterfly Model L.T. with bibb handles.
- H. Gage Cocks: Screwed, all bronze, lever handle, 200 lbs., WOG, H.O. Trerice Co. No. 880.
- I. "Y" Type Strainers: 2" and smaller-screwed; 2-1/2" and larger-flanged, semi-steel body with 20 mesh monel screen, O.C. Keckly Co. Style "B". Pipe blow-off to floor drain with gate valve.
- J. Pressure Gages: H.O. Trerice Co. No. 500 X, 4-1/2" dial with cast-aluminum bottom outlet, field calibration adjustment from white dial face, case with wrinkled black finish, chrome plated bezel, 1/4" NPT connection, No. 879 impulse dampener, and range as required so that readings take place in mid-scale. Provide one pressure gage at each gage cock.

### 3.1 EXECUTION:

#### 3.2 Layout:

- A. Set work lines and establish heights in accordance with the drawings and specifications.
- B. Set all sleeves, anchors, bolts and/or inserts before concrete is poured.
- C. Wherever work pierces waterproofing, seal openings after the item piercing the waterproofing has been set, and make absolutely watertight.
- D. Cut and rough patch, as necessary, for the installation of the work. Seal all openings in Equipment Room walls, floors and ceilings, plumbing chases, and walls.

#### 3.3 Existing Conditions:

- A. All excavation and/or remodeling work required shall be performed with care so as not to interrupt other existing services (water, gas, electrical, sewer, sprinklers, etc.). If any service is interrupted, it shall be this Contractor's responsibility to repair and replace that service promptly at no expense to the Government.

B. Any existing service (or operating system) which must be interrupted for any length of time shall be supplied with a temporary service if necessary for continuation of the normal operations of this facility.

C. All utilities, existing systems, and conditions: Examine all areas and conditions in which utilities or existing systems are to be affected. Do not proceed with work until unsatisfactory conditions are corrected. Show on the submitted drawing the existing layout, indicate the needed requirements, the contractor shall verify before any work is started.

D. Any interruptions of existing services and any work required to be done to or in existing occupied space must be done at the Government's convenience, using overtime labor if required. Proper notice shall be given before any interruptions (48 hours minimum). Interruption of the main utility systems shall be coordinated with the Government and a minimum of one (1) week's notice in writing will be required.

E. If the new construction requires the temporary removal of any existing services, lines, etc., same shall be replaced and restored to the original conditions upon completion of the job. All finished surfaces, walls, ceilings, floors, etc., which are cut or damaged shall be replaced and restored to original conditions to the full satisfaction of the Contracting Officer.

#### 3.4 Installation:

A. Open Ends: Keep ends of all piping, including those extending above the roof, drains, water and fixture outlets, closed during construction with caps or plugs. Set roof drain strainers in place during construction.

B. Escutcheons: Fit and firmly secure C.P. brass escutcheons to the pipes where they pass through finished floors, ceilings and walls. Escutcheons to be of sufficient outside diameter to cover the sleeved openings and set in mastic and plaster.

#### C. Water Piping:

- (1) Ream all piping.
- (2) Use "Tite-Seal" on male threads only.
- (3) Provide "Raleigh" di-electric coupling at junction of dissimilar metals (PVC not acceptable.)
- (4) Locate unions or flanged connections so that equipment, control valves, water heaters, etc., may be easily removed.
- (5) Use reducers or reducing fittings. Bushings not permitted. Use eccentric reducers on pump suction.
- (6) Grade horizontal runs in cold and hot water piping slightly toward the lowest outlet on any one branch or riser. Swing connections to hot water mains.
- (7) Use standard weld elbows, tee, laterals, and reducing weld lets in welded piping. Field fabricated fittings are not permitted.
- (8) Flush all water piping until piping is free of all sand, slag and other foreign materials.

D. Sleeves: where piping pierces concrete floors, ceilings or masonry walls, furnish and install sleeves. Caulk sleeves in exterior surfaces after installation of piping to make watertight seal.

3.5 Painting and Labeling:

A. Leave all equipment with an unblemished finish. Touch up all shop coats and paint as needed.

B. Label all disconnect switches, starters, controls, control switches and equipment with embossed plastic labels equal to dymo.

SECTION 15060  
MECHANICAL PIPING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of piping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS: Piping shall comply with ANSI B31.1, where applicable. Piping in pressure systems shall comply with requirements of the ASME Boiler and Pressure Vessel Code, where applicable.

2.2 Steel Pipe:

2.2.1 Pipe: Carbon steel pipe shall comply with ASTM A 53 or A 106. Galvanized pipe shall comply with ASTM A 120. Stainless steel pipe shall comply with ASTM A 312.

2.2.2 Fittings: Malleable iron threaded fittings shall comply with ANSI B16.3. Forged steel threaded and socket weld fittings shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI B16.11. Forged stainless steel threaded and socket weld fittings shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.11. Carbon steel butt welded fittings shall comply with ASTM A 234 and shall be fabricated in compliance with ANSI B16.9. Stainless steel butt welded fittings shall comply with ASTM A 403 and shall be fabricated in compliance with ANSI B16.9.

2.2.3 Flanges: Carbon steel flanges shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI B16.5. Stainless steel flanges shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.5.

2.2.4 Bolting: Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2. Stainless steel bolting shall comply with ASTM A 193, Grade B8, with hex nuts complying with ASTM A 194, Grade 8F, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

2.3 Copper and Brass Pipe:

2.241 Pipe: Seamless copper pipe shall comply with ASTM B 42. Seamless red brass pipe shall comply with ASTM B 43. Copper pipe to be used with brazing or welding shall be oxygen free and shall comply with ASTM B 302 or B 88.

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2.2.2 Fittings: Threaded fittings shall comply with ASTM B 249 and shall be fabricated in compliance with ANSI B16.15. Solder fittings shall comply with ASTM B 88 and shall be fabricated in compliance with

ANSI B16.18. Butt welding fittings shall comply with ASTM B 302 or B 88 and shall be fabricated in compliance with ANSI B16.9.

2.2.3 Flanges shall comply with ASTM B 61 and shall be fabricated in compliance with ANSI B16.31.

2.2.4 Bolting shall comply with ASTM B 36 and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

### 2.3 Cast and Ductile Iron Pipe:

2.3.1 Pipe: Bell and spigot pipe shall comply with ASTM A 74 and shall be in compliance with ANSI A112.5.1 and AWWA C106. Push-on type pipe shall comply with ASTM A 377 and shall be in compliance with ANSI A21.6, A21.8, and AWWA C106. Mechanical joint pipe shall comply with ASTM A 377, ANSI A21.6, A21.8, A21.11, A21.51, and AWWA C106, C111, and C151. Flanged pipe shall comply with ASTM A 377, ANSI A21.6, A21.8, B16.1, and AWWA C115. Threaded pipe shall comply with ASTM A 377 and shall be threaded at both ends for screwed fittings.

2.3.2 Fittings: Bell and spigot fittings shall comply with ASTM A 74, ANSI A112.5.1, and AWWA C110. Push-on type fittings shall comply with ASTM A 126 or A 536, ANSI A21.10, and AWWA C110. Mechanical joint fittings shall comply with ASTM A 126 or A 536, ANSI A21.10 and A21.11, and AWWA C110 and C111. Flanged fittings shall comply with ASTM A 126 or A 536, ANSI A21.10 and B16.1, and AWWA C110. Threaded fittings shall comply with ASTM A 126 and ANSI B16.4.

2.3.3 Flanges shall comply with ASTM A 126 or A 536 and ANSI A21.15 and B16.1.

2.3.4 Gaskets: Gaskets for cast-iron soil pipe shall comply with ASTM C 564. Gaskets for mechanical joint or push-on type pipe shall comply with ANSI A21.11 and AWWA C111.

2.3.5 Bolting: Alloy steel bolting shall comply with ASTM A 193, Grade B8, and A 194, Grade SF. Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

### 2.4 Polyvinyl Chloride Pipe:

2.4.1 Pipe: Pressure rated pipe shall comply with ASTM D 1785. Waste, vent, and drain pipe shall comply with ASTM D 2665. Sewer pipe shall comply with ASTM D 2729.

2.4.2 Fittings: Threaded fittings shall comply with ASTM D 2464. Socket solvent weld type fittings for pressure pipe shall comply with ASTM D 2466 or D 2467. Socket solvent weld type fittings for waste and drain pipe shall comply with ASTM D 2665. Socket solvent weld type fittings for sewer pipe shall comply with ASTM D 2729.

2.4.3 Flange Dimensions shall be in compliance with ANSI B16.31.

2.4.4 Bolting shall be alloy steel bolts and nuts complying with ASTM A 193, Grade B8, and A 194, Grade 8F.

### 2.5 ABS Pipe:

2.5.1 Pipe: Waste and drain pipe shall comply with ASTM D 2661. Sewer pipe shall comply with ASTM D 2751. All other ABS pipe shall comply with ASTM D 1527.

2.5.2 Fittings: Threaded fittings shall be Schedule 80 ABS and shall comply with ASTM D 2465. Socket solvent weld fittings for waste and drain pipe shall comply with ASTM D 2661. Socket solvent weld fittings for sewer pipe shall comply with ASTM D 2751. Socket solvent weld fittings for all other pipe shall be ABS Schedule 40 complying with ASTM D 2468 or ABS Schedule 80 complying with ASTM D 2469.

2.6 Vitrified Clay Pipe:

2.6.1 Pipe: Regular vitrified clay pipe shall comply with ASTM C 700. Perforated vitrified clay pipe shall comply with ASTM C 498.

2.6.2 Fittings shall be regular vitrified clay complying with ASTM C 700.

2.6.3 Compression Joint Sealing Element shall comply with ASTM C 425 and shall be of rubber, plastic, or metal.

2.7 Asbestos Cement Pipe shall not be repaired but shall be replaced with new piping that does not contain asbestos, as directed by the Contracting Officer.

2.8 Polyethylene Pipe:

2.8.1 Pipe: Polyethylene shall comply with ASTM D 2447. Pipe shall be polyethylene SDRPR and shall comply with ASTM D 3035.

2.8.2 Fittings: Butt fusion type fittings shall comply with ASTM D 3261. Socket type heat fusion fittings shall comply with ASTM D 2683. Insert type heat fusion fittings shall comply with ASTM D 3197.

2.9 Conduit Systems:

2.9.1 Carrier Pipe: Carbon steel pipe shall comply with ASTM A 106. Polyvinyl chloride pipe shall comply with ASTM D 1785. Copper pipe shall comply with ASTM B 42. Fiberglass reinforced plastic pipe shall meet commercial standards.

2.9.2 Insulation: For systems 250 degrees or less, polyurethane foam insulation shall comply with commercial standards. For systems over 250 degrees, calcium silicate insulation shall comply with ASTM C .533.

2.9.3 Outer Jacket: For systems 250 degrees or less, polyvinyl chloride outer jacket shall comply with ASTM D 1785 or fiberglass reinforced plastic outer jacket shall meet commercial standards. For Systems over 250 degrees, cast-iron outer jacket shall comply with ASTM A 377, or steel conduit outer jacket shall be epoxy-coated, spiral weld, 10 gauge minimum.

2.10 Gaskets shall comply with ANSI B16.21 and/or the following:

2.10.1 Gaskets shall be rubber complying with ASTM C 564.

2.10.2 Gaskets for mechanical joint or push-on type cast-iron or ductile iron pipe shall be rubber complying with ANSI A21.11 and AWWA C111.

2.11 Solvent Cement for solvent welding of pipe shall comply with ASTM D 2564, except solvent cement for ABS pipe and fittings shall comply with ASTM D 2235.

2.12 Dielectric Unions and Flanges:

2.12.1 Dielectric unions and flanges shall comply with Fed. Spec. WW-U-531 and requirements of ANSI B16.39 and ANSI B16.24.

3.1 EXECUTION:

3.2 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.

3.3 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.

3.4 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.

3.5 Solvent Cement Joints shall be made in compliance with ASTM D 2855.

3.6 Heat Fusion Joints in polyethylene pipe and fittings shall be made in compliance with ASTM D 2657.

3.7 Concrete Linings in cast and ductile iron pipe shall be prepared with cement mortar complying with AWWA C104. Pipe leak clamps shall be ductile iron, split sleeve type.

3.8 Protective Covering for Replacement Underground Steel Pipe shall be mechanically applied in a factory or field plant especially equipped for the purpose. Specials, valves, and fittings that cannot be coated and wrapped mechanically shall have the protective covering applied by hand. Joints shall be coated and wrapped by hand. The pipe covering shall consist of a coat of coal-tar primer, a coat of coal-tar enamel, a wrapper of coal-tar-saturated asbestos felt, and a wrapper of kraft paper or a coat of water-resistant whitewash, applied in the order named and complying with the requirements of AWWA C203 in all respects to materials, thicknesses, methods of application, tests, and handling, except that interior lining will not be required. Joints and fittings shall be coated and wrapped in compliance with AWWA C203.

3.9 Hydrostatically Test Pipe Systems where required by ANSI B31.1 or ASME Code.

3.10 Dielectric Unions or Flanges shall be provided for connections between ferrous and nonferrous metallic pipe or equipment.

## SECTION 15100

### VALVES

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of valves. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 **PRODUCTS:** Valve pressure/temperature ratings shall equal or exceed the ratings of the valves being replaced. Pressure/temperature ratings shall be in accordance with ANSI B16.5. Valves shall comply with the ASME Boiler and Pressure Vessel Code where applicable.

2.2 Gate Valves shall comply with HIL-V-18434 and with MIL-V12126, MIL-V-18110, MIL-V-13803, MIL-V-12125, MIL-V-58039, and MSS SP-80 as applicable.

2.3 Globe Valves shall comply with MIL-C-18434 and with MIL-V18826, MIL-V-24109, MIL-V-17501, MIL-V-24578, and MSS SP-80 as applicable.

2.4 Check Valves shall comply with MIL-V-6129 and/or MIL-V-10386 and MSS SP-80.

2.5 Needle Valves shall comply with MIL-V-24586 and/or with applicable MSS specifications.

2.6 Ball Valves shall comply with MSS SP-72.

2.7 Butterfly Valves shall comply with Fed. Spec. WW-V-1967 and/or AWWA C 504.

2.8 Pressure Relief Valves shall comply with MIL-V-23255 and MILV-55341.

2.9 Pressure Regulators shall comply with MIL-V-2962, MIL-V24384, MIL-V-18318, MIL-V-16733, or MS-17854 as applicable.

2.10 Flow Control Valves shall comply with MIL-V-23254.

2.11 Backflow Preventers shall comply with AWWA C 506.

2.12 Vacuum Breakers shall comply with MIL-V-5461 and MS-87005.

2.13 Solenoid Operated Valves: Coil shall be epoxy encapsulated, manufactured to UL 429, and rated for ac voltage.

2.14 Float Valves shall comply with Fed. Spec. WW-V-001915.

2.15 Stop and Waste Valves shall comply with HIL-C-22052.

2.16 Plugs and Cocks shall comply with MIL-C-1203 and MIL-V-12003.

2.17 Diaphraixm Valves shall comply with MIL-V-182026 and/or with applicable MSS specifications.

3.1 EXECUTION:

3.2 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer. Where flame cutting is authorized, at least one person shall be standing by exclusively with fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.

3.3 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.

3.4 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.

## SECTION 15120

### PIPING ACCESSORIES

1.0 DESCRIPTION OF WORK-. This specification covers the furnishing and installation of piping accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Filters: Pressure-temperature rating and filter medium particle size retention rating of the replacement filter shall equal or exceed the ratings of the existing filter. Pressure drop at the required capacity shall not exceed that of the replaced filter. Filters shall be constructed in accordance with ASME Code where applicable.

2.3 Strainers shall comply with MIL-S-16293.

2.3.1 Low Pressure Y-Type Strainers shall have Type 304 stainless steel screens. Bodies of threaded or flanged strainers shall be cast iron. Bodies of butt-weld end strainers shall be Schedule 40 cast carbon steel.

2.3.2 High Pressure Y-Type Strainers shall comply with ASME Code if applicable. Strainers shall have Type 304 stainless steel screens. Bodies of threaded or flanged strainers shall be cast iron. Bodies of butt-weld end strainers shall be Schedule 80 cast carbon steel.

2.4 Traps shall be in accordance with Fed. Spec. WW-T-696, and steam traps shall comply with ASME Code where applicable.

2.4.1 Thermostatic Traps shall be constructed of cast brass. Thermostatic element valve cone shall be stainless steel.

2.4.2 Float and Thermostatic Traps shall have body and cover constructed of cast iron or semi-steel. Thermostatic element shall have stainless steel valve cone and valve seat. Provide stainless steel or seamless copper float.

2.4.3 Inverted Bucket Traps shall have body and cover constructed of cast iron or semi-steel. Bucket shall be brass or stainless steel, with lever mechanism of heat-treated stainless steel.

2.4.4 Thermodynamic Traps shall have body and cover constructed of stainless steel. Disc shall be heat-treated stainless steel.

2.4 Joints shall comply with the standards of the Expansion Joint Manufacturer's Association (EJMA). Replacement expansion joints shall equal or exceed the pressure-temperature ratings of the replaced expansion joint.

2.4.1 Expansion Compensators shall have 2 ply phosphor bronze bellows, brass shrouds, and end fittings for copper piping systems, or 2 ply stainless steel bellows, carbon steel shrouds, and end fittings for steel piping systems.

2.4.2 Rubber Expansion Joints shall be constructed of duck and butyl rubber with full-faced integral flanges, internally reinforced with steel retaining rings.

2.4.3 Slip Joints shall comply with MIL-E-17814 and shall be of the type designed for repacking under pressure.

2.4.4 Flexible Ball Pipe Joints shall be designed for 360 degree rotation, with minimum of 30 degree angular flexing movement for sizes 1/4 inch to 6 inches, 15 degrees for sizes 8 inches and larger. Certify carbon steel joints for environmental shock testing in accordance with MIL-S-4456 or MIL-S-901C. Joints shall comply with Section II of ASME Boiler and Pressure Vessel Code and ANSI B31.1 Power Piping for materials and design of pressure-containing parts and bolting.

2.4.5 Expansion Joints for Grooved Piping shall be combination couplings and nipples constructed of cut grooved short pipe nipples and couplings, or slip-type expansion joints constructed of carbon steel pipe and couplings.

2.5 Pipe Supports: Pipe supports shall comply with MSS SP-58 and SP-69 and, where applicable, with Fed. Spec. WW-H-171D. Fed. Spec. load carrying and coating tests will not be required. Contact between dissimilar metals shall be prevented in supporting copper tubing. Those portions of pipe supports which contact the tubing shall be copper plated, rubber- or vinyl-coated, or stainless steel. All pipe supports located in sewage wetwells shall be 18-8 stainless steel.

2.6 Valve Boxes shall be of cast iron, extension sleeve type; shall be not less than 5 inches in diameter; shall have a minimum thickness at any point of 3/16 inch; and shall be provided with cast iron bases and covers. Covers shall have cast thereon an appropriate name designating the service for which the valve is used. All parts of valve boxes, bases, and covers shall be coated by dipping in bituminous varnish.

### 2.7 Flexible Hoses:

2.7.1 Flexible Hoses for Non-Ferrous Piping shall be bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose.

2.7.2 Flexible Hose for Ferrous Piping shall be stainless steel hose covered with stainless steel wire braid with NPT steel nipples or 150 psi ANSI flanges, welded to hose.

2.7.3 Rubber Flexible Hoses shall be rubber and butyl construction with integral full-faced duck and butyl flanges, internally steel wire reinforced, and furnished complete with steel retaining rings.

### 3.1 EXECUTION:

3.2 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer. Where flame cutting is authorized, at least one person shall be standing by exclusively with a fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.

3.3 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.

3.4 Welding: All welding shall be performed in compliance with ANSI B31.1 and with ASME Code Section IX where applicable.

3.5 Y-Type Strainers shall be located in supply line ahead of the following equipment if integral strainer is not included in equipment.

- a. Pumps.
- b. Steam traps serving steam main drips.
- c. Temperature control valves.
- d. Pressure reducing valves.
- e. Temperature or pressure regulating valves.

3.6 Installation of Steam Traps: Install strainer ahead of trap if not integral with trap.

3.7 Pipe Support Installation: Concrete inserts or L-shaped anchor bolts shall be used to support piping from new cast-in-place concrete. Expansion anchors shall be used to fasten supports to existing concrete and masonry.

3.8 Valve Boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped on each side of the box.

3.9 Flexible Hoses shall be installed on equipment side of shutoff valves, horizontally and parallel to equipment shafts wherever possible.

## SECTION 15160

### PUMPS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pumps. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Worn or Damaged Pump Parts shall be replaced rather than repaired.

2.3 New Pump Impellers, when required, shall be statically balanced before installation.

2.4 Used Impellers shall be checked for balance before reinstallation. Out of balance impellers shall either be balanced or replaced.

2.5 Close Coupled Pumps, when replaced, shall be replaced complete with motor.

#### 3.1 EXECUTION:

3.2 Before Any Work is started, the pump driver shall be locked out and tagged to prevent any driving power to the pump. The pump suction and discharge piping shall be valved off, locked, and tagged, or pipe line blanks shall be installed.

3.3 Before Any Work is performed on pumps in acid or other toxic material service, the pump must be vented and drained (flushed, if possible). Acid-proof personal protection shall be worn until pump and parts have been cleaned and neutralized.

3.4 Gaskets shall be replaced whenever a gasketed joint has been disturbed.

3.5 Flexible Coupling Alignment shall be required if either the pump or motor mounting has been disturbed and shall be to the tolerances specified by the flexible coupling manufacturer.,

3.6 Removal and Installation of impellers shall be accomplished using pullers, jacks, crane, or hoist. Impact tools are strictly prohibited.

3.7 Turbine Pumps removed from casings shall be lifted vertically to prevent damage to the pump or the pump casing.

3.8 New Impeller Rings, Gaskets, and Strainer shall be installed before reassembly of turbine pumps.

3.9 Relief Valve in discharge line for positive displacement pumps shall be set and tested at 110 percent of design discharge pressure or as recommended by pump manufacturer for service in which pump is used.

## SECTION 15261

### INSULATION FOR ABOVEGROUND PIPE

1.0 **DESCRIPTION OF WORK;** This specification covers the furnishing and installation of insulation for aboveground pipe. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Insulation shall be in accordance with the following:

<u>Service Temperature, F</u>	<u>Insulation Material</u>
1,900 Maximum	Diatomaceous earth, ASTM C517
1,800 Maximum	Calcium silicate, ASTM C 533
1,500 Maximum	Expanded perlite, ASTM C 610
1,200 Maximum	Preformed mineral fiber, ASTM C 547
800 Maximum	Cellular glass, ASTM C 552
225 Maximum	Rigid, preformed cellular urethane, ASTM C 591
60 F and below (cold piping)	Cellular glass, ASTM C552 or mineral fiber, Fed. Spec. HH-I-558

2.3 Insulation Jacket materials shall have fire hazard ratings that do not exceed 75 for flame spread and 150 for fuel contributed and smoke developed, except where otherwise required by the authority having jurisdiction. Test ratings shall be determined in compliance with ASTM E 84 and NFPA 255.

2.4 Accessory Materials, including insulating cements, adhesives, staples, coatings, tapes, bands, and other accessory materials shall be as recommended for the particular application by the manufacturer of the insulation or jacket.

3.0 **EXECUTION:** Vapor barrier shall be continuous throughout each piping run for cold piping (-30 F to 60 F).

## SECTION 15262

### INSULATION FOR UNDERGROUND PIPE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulation for underground pipe. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Insulation for Conduit Systems shall be calcium silicate complying with ASTM C 533 or polyurethane foam for low temperature systems (250 F and below).

2.3 Insulation Jackets for Conduit Systems shall be cast iron complying with ASTM A377 or epoxy-coated spiral weld steel conduit for high temperature systems (above 250 F); or shall be polyvinyl chloride complying with ASTM D 1785 or fiberglass reinforced plastic for low temperature systems (250 F and below).

#### 3.1 EXECUTION:

3.2 Backfill on Pipe System shall be 12 inches minimum.

3.3 Ground Surface shall be resodded or otherwise restored to the condition existing prior to the work.

## SECTION 15281

### BOILER FIREBOX INSULATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler firebox insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

##### 2.2 Block or Board Insulation:

2.1.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 612.

2.1.2 Diatomaceous Earth in accordance with ASTM C 517.

2.1.3 Calcium Silicate in accordance with ASTM C 533.

2.1.4 Cellular Glass in accordance with ASTM C 552.

2.1.5 Cellular Polyurethane in accordance with ASTM C 591.

2.1.6 Expanded Perlite in accordance with ASTM C 610.

2.2 Blanket Insulation: Mineral fiber rock, slag, or glass in accordance with ASTM C 553 or ASTM C 592.

##### 2.3 Loose Fill Insulation:

2.3.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 764.

2.3.2 Vermiculite in accordance with ASTM C 516.

2.3.3 Perlite in accordance with ASTM C 549.

##### 2.4 Insulating Cement:

2.4.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 195 or ASTM C 449.

2.4.2 Exfoliated Vermiculite in accordance with ASTM C 196.

2.5 Castable-Refractol in accordance with ASTM C 64.

2.6 Spray-Applied Fibrous Insulation in accordance with ASTM C 720 and ASTM C 762.

2.7 Refractory Supports attached to pressure parts of the boiler shall comply with the ASME Boiler and Pressure Vessel Code.

3.1 EXECUTION:

3.2 Safety: The boiler shall be removed from service, cooled, drained, and purged prior to conducting internal inspection or repairs. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic, explosive, or suffocating gases.

3.3 Closing up the Boiler: The repair shall not be covered by replaced or reinstalled materials until authorized.

## SECTION 15290

### DUCTWORK INSULATION

1.0 DESCRIPTION OF VORK: This specification covers the furnishing and installation of ductwork insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Rigid Fiberglass Ductwork Insulation shall conform to Fed. Spec. HH-I-558, Form A. It shall consist of rigid fibrous glass board with foil facing, vapor sealed and attached to ducts with mechanical fasteners. Density shall be 3 lb/ft.

2.2. Flexible Fiberglass Ductwork Insulation shall conform to Fed. Spec. HH-I-539, -Form B. It shall consist of 3/4 lb/ft density fibrous glass blanket with reinforced foil and kraft facing lapped and joints sealed vapor tight.

2.3 Ductwork Insulation shall have a flame spread rating not exceeding 75 and a smoke developed rating not exceeding 150 as determined by test procedures in ASTM E 84. Components such as adhesives, mastics, and cements must meet the same individual ratings as the minimum requirements.

2.4 Adhesives shall conform to Mil. Spec. MIL-A-3316.

2.5 Vapor barrier shall conform to Fed. Spec. HH-B-100, Type I for exposed ducts and Type I or Type II for concealed ducts.

3.0 EXECUTION: Insulation shall be installed so that finishes are smooth and all joints are tight and sealed.

## SECTION 15301

### FIRE PROTECTION SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire protection systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Fire Protection System Materials and Components shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in accordance with all applicable National Fire Protection Association (NFPA) National Fire Codes.

2.3 Test Reports shall be submitted for all tests required by referenced publications applicable to the particular materials and components furnished for use in the work.

#### 3.1 EXECUTION:

3.2 The Design, Fabrication, Installation, and Testing of fire protection systems shall be in accordance with all applicable NFPA National Fire Codes and their respective appendices. These codes include but are not necessarily limited to the following:

NFPA	12	Carbon Dioxide Extinguishing Systems
NFPA	16A	Closed-Head Foam-Water Sprinkler Systems
NFPA	17	Dry Chemical Extinguishing Systems
NFPA	1961	Fire Hose
NFPA	1962	Fire Hose, Care, Maintenance and Use
NFPA	1963	Fire Hose Connections
NFPA	20	Fire Pumps, Centrifugal
NFPA	30	Flammable and Combustible Liquids Code
NFPA	11	Foam Extinguishing Systems
NFPA	11A	Foam Systems, Medium and High Expansion
NFPA	16	Foam-Water Sprinkler and Spray Systems
NFPA	12B	Halon 1211 Fire Extinguishing Systems
NFPA	12A	Halon 1301 Fire Extinguishing Systems
NFPA	24	Private Fire Service Mains
NFPA	231C	Rack Storage of Materials
NFPA	13A	Sprinkler Systems, Care, Maintenance
NFPA	13	Sprinkler Systems, Installation
NFPA	14	Standpipe and Hose Systems
NFPA	26	Water Supplies, Valves Controlling
NFPA	22	Water Tanks for Private Fire Protection

3.3 Scheduling Interruptions and Coordination: At least 48 hours before commencing work on any specific system, the Contractor shall notify the Contracting Officer of all interruptions, if any, that must be made to the system and the estimated period of time the system will be out of service during each interruption. Interruptions shall be made only at the time or times approved by the Contracting Officer. Equipment and standby systems shall be provided for building protection during interruption to the existing systems.

3.4 Tests: All field tests required by applicable standards shall be performed in the presence of the Contracting Officer.

## SECTION 15401

### INTERIOR PLUMBING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of interior plumbing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Contact the Fire Protection Engineering Branch for requirements of piping material.

#### 2.1 PRODUCTS:

#### 2.2 Drinking Water Dispenser:

2.2.1 Electric Water Coolers shall comply with ARI Standard 1010 and shall use one of the halogenated hydrocarbons as refrigerant. Top surfaces of the dispenser in contact with water shall be stainless steel or porcelain enameled steel. Piping connections from the shutoff or stop valve and outlet valve arrangement shall be chrome-plated brass, copper tubing, or stainless steel.

2.2.2 Drinking Fountains shall comply with Fed. Spec. WW-P541/6.

#### 2.3 Hot Water Generators and Storage Tanks:

2.3.1 Heating Element for the hot water generator shall consist of U-bend coils, a tube sheet, and air element head. The coil shall be seamless tubing inserted into holes in the tube sheet and secured by expanding. The tube sheet shall be copper alloy or other nonferrous metal. Tubing for the heating element shall be light drawn copper tubing complying with ASTM B 75 or copper alloy tubing complying with ASTM B 111, copper alloy No. 706. Element shall be in accordance with Mil. Spec. MIL-H-12322.

2.3.1.1 Copper Tubing shall be designed for a working pressure of 150 psig steam and shall withstand an internal hydrostatic pressure of 225 psig for not less than 15 seconds without leaking or any evidence of damage.

2.3.1.2 Copper Alloy Tubing shall be designed for a working pressure of 400 psig with 400 F hot water and shall withstand an internal hydrostatic pressure of 600 psig for not less than 15 seconds without leaking or any evidence of damage.

2.3.1.3 The Head for the Heating Element shall be close grained cast iron or fabricated steel for steam service, or cast or fabricated steel for high temperature hot water service. The heads shall be partitioned to separate the steam supply and condensate return head shall be equipped with tappings or flanges for the supply, return, air relief, and vacuum breaker connections. The air-relief valve and vacuum breaker connection shall be 1/2 inch pipe size.

2.3.2 New Storage Tanks shall be constructed, tested, and marked in compliance with the ASME Boiler and Pressure Vessel Code, Section VIII. The tank shall be glass-lined steel. Tanks shall be cathodically protected if required by local conditions. Tanks shall be in accordance with Mil. Spec. HIL-T-12295. The thermal efficiency and standby heat loss shall comply with the requirements of ASHRAE 90A.

2.3.3 Storage Tank Repair shall comply with the ASME Boiler and Pressure Vessel Code, Section VIII.

2.3.4 Heaters/Storage Tanks shall be equipped with ASME rated accessories.

2.4 Pneumatic Water Supply Systems:

2.4.1 New Pneumatic Tanks shall be designed for 125 psig working pressure and shall be constructed in compliance with ASME Boiler and Pressure Vessel Code, Section VIII. Tanks shall be equipped with manhole in head, water gauge glass, pressure gauges, water pressure relief valves, and tapped openings for all piping.

2.4.2 Compressor shall be belt-driven by a motor having a maximum speed of 1800 rpm. The motor shall have a manual across-the-line starter and thermal overload protection. Guards complying with OSHA requirements shall be provided for all exposed moving parts.

2.4.3 Control System: Pressure switches shall be of the adjustable type having an operating range of 30 to 90 psig. The switch shall be three-position type.

2.5 Gas Fired Water Heaters:

2.5.1 Water Heater Storage Tank shall be steel with a copper or glass lining and shall comply with ANSI Z21.10.1. Equipment shall comply with the approval requirements of the Certified Appliances and Accessories of AGAL. For elevations above 2,000 feet, the AGAL rating shall be reduced at the rate of 4 percent for each 1,000 feet above sea level. Safety pilot valve shall be supplied to automatically shut off the main gas supply to the burner or burners in the event that the pilot flame is extinguished.

2.5.2 Flue Gas Piping shall be single-wall metal pipe constructed of not less than No. 24 B&S gauge sheet copper or No. 20 gauge galvanized sheet steel.

2.5.3 Relief Valves shall comply with ANSI Z21.22. Relief valves shall be ASME rated.

2.5.4 Thermostat shall be snap action type actuated by water temperature.

2.6 Oil Fired Water Heaters:

2.6.1 Water Heater Tank shall be glass-lined steel. Tanks of 120-gallon capacity, or less, shall be hydrostatically tested to 300 psig. Tanks shall have vertical flue passages or annular flue passages between the tank and the casing. Tanks shall be cathodically protected if required by local conditions.

2.6.2 Burner shall be mechanical pressure atomizing type.

2.6.3 Controls shall consist of a combustion safeguard (primary control) to shut down the burner in event of ignition failure or flame failure, a limit control to prevent overheating in case of thermostat failure, and a thermostat of the adjustable immersion type to control water temperature.

2.6.4 Relief Valve shall comply with ANSI Z21.22. Relief valves shall be ASME rated.

2.6.5 Draft Regulator shall be of the automatic, barometric type designed for installation in the chimney or flue connector at the outlet of the water heater. The draft regulator shall meet the requirements of UL 378.

2.6.6 Flue Gas Piping shall be single wall steel pipe, minimum 28 gauge. Finish shall be zinc coated or oxidized to form blue black color.

2.6 Electric Water Heaters:

2.6.1 Water Heater Tanks shall be glass-lined steel complying with Fed. Spec. W-H-196, with dual heating elements. Tanks shall be cathodically protected if required by local conditions.

2.6.2 Relief Valves shall comply with ANSI Z21.22. Relief valves shall be ASME rated.

2.6.3 Thermostats shall be provided in compliance with UL 174.

2.6.4 Wiring shall comply with NFPA No. 70.

2.6.5 Heating Elements shall be medium watt density commercial grade incoloy sheathed flanged mounted elements with prewired terminal leads, and element fusing per N.E.C.

2.7 Lavatories:

2.7.1 Lavatories shall be first quality vitreous china or enameled cast iron.

2.7.2 Drains and Jam Nuts shall be cast wrought copper alloy. Strainer shall be copper alloy or corrosion-resisting steel.

2.7.3 Faucets shall be single, center set, combination, or single control mixing type, complying with Fed. Spec. WW-P-541/4.

2.7.4 Stop Valves shall be angle or straight-type and constructed of copper alloy, chrome plated.

2.7.5 Traps shall be P-type.

2.7.6 Soap Dispensers shall be glass or metal type with a capacity of 12 fluid ounces for liquid soap.

2.8 Urinals:

2.8.1 Wall-Hung Urinals shall have integral trap and extended shield; shall have washout, blowout, or siphon-jet flushing action; and shall be constructed of first quality vitreous china.

2.8.2 Pedestal Type Urinals shall have integral trap, siphon-jet flushing action, and a bottom outlet for connection to a closet type floor flange. Urinal shall be constructed of first quality vitreous china.

2.8.3 Trough Type Urinals shall be wall-hung with an integral flushing rim and shall be constructed of first quality vitreous china.

2.9 Water Closets:

2.9.1 Elongated Bowl Water Closets shall be of the siphon jet, floor outlet type, for use with a flush valve and constructed of first quality vitreous china. Seats shall be open front, less cover, constructed of molded plastic or wood.

2.9.2 Regular Bowl Water Closets shall be of the siphon jet, floor outlet type, constructed of first quality vitreous china. The tank shall be separate, secured to and supported by the water closet and shall contain a copper, copper alloy, or corrosion-resisting steel floating flush valve with a refill tube, operating lever, and control valve stop and supply pipe. Seats shall be closed front, with cover constructed of molded plastic or wood.

2.9.3 Fittings: Floor flanges, gaskets, bolts, and screws shall be supplied. Flanges may be copper, copper alloy, or cast iron. Gaskets shall be nonstaining wax.

2.10 Sinks:

2.10.1 Kitchen Sink shall be single or double bowl enameled cast iron, porcelain enameled formed steel, or corrosion-resisting formed steel.

2.10.2 Service Sink shall be single bowl, trap standard, floor or wall mounting. Sink shall be constructed of enameled cast iron or vitreous china. Rim guard shall be copper alloy or corrosion-resisting steel.

2.10.3 Faucets shall be a single center set or combination type complying with Fed. Spec. WW-P-541/5. Vacuum breaker shall be provided on faucets where required by codes. Handicapped faucets shall be provided with lever or wrist blades.

2.10.4 Drains shall have a removable metal strainer, jam nut, coupling, and tail piece.

2.10.5 Traps for kitchen sinks shall be P-type chrome plated. Exterior surfaces of traps for service sinks shall be as cast or painted.

2.11 Bathtubs shall be enameled cast iron or porcelain enameled formed steel in compliance with Fed. Spec. WW-P-541/3 or shall be fiberglass reinforced plastic. Drains shall be chrome-plated with pop-up or trip lever stopper.

2.12 Laundry Tubs:

2.12.1 Laundry Tubs shall be double bowl enameled cast iron or corrosion-resisting formed steel with frame, wall, pedestal, or leg support.

2.12.2 Faucet shall be mounted in back of tub and shall be a separate or combination fitting. Combination faucet shall have exposed valve body, union inlet, and swing spout. Finish shall be chrome or nickel plated. Vacuum breakers shall be provided on faucets where required by codes.

2.12.3 Drain shall have a removable metal strainer, jam nut, coupling, and tail piece. Drain shall have a suitable rubber type stopper.

2.12.4 Trap shall be P-type with cleanout plug and shall be chrome-plated.

2.13 Flush Valves: Flush valve shall be a large diaphragm or large piston type exposed style with a side oscillating handle. The flush valve shall have a vacuum breaker; a control stop with or without a cap; a back check in the control stop with or without a cap; a back check in the control stop or anti-siphon within the valve; a flush connection with coupling nuts, gaskets, and spud flanges; and a wall flange or escutcheon. Exposed surfaces of the flush valve shall have a bright chrome-plated finish. The valve shall be capable of operating without chatter or water hammer and shall deliver 2 gallons minimum for urinals and 4 gallons minimum for water closet per flush at any inlet pressure from 10 psi to 50 psi.

2.14 Showers shall be wall mounted, column, bath, free standing cabinet, or emergency type complying with Fed. Spec. WW-P-541/7. Shower heads and handles shall be copper alloy or corrosion-resisting steel. Escutcheons shall be corrosion-resisting steel or copper alloy. Control valves shall be copper alloy and have metal integral parts of copper alloy, nickel alloy, or corrosion-resisting steel. Control valves shall be thermostatic mixing; pressure balancing; mechanical, either mixing or single control; or separate hot and cold water valves. Shower heads shall be nonadjustable.

2.15 Floor Drains:

2.15.1 Cast-Iron Drains shall comply with ANSI A112.21.1, Figure 3.3. Body shall be cast iron and strainer shall be chrome-plated bronze.

2.15.2 Polyethylene Drains shall be constructed of polyethylene complying with ASTM D 1248.

2.15.3 Gaskets shall be neoprene complying with ASTM C 564 or as recommended by the drain manufacturer.

2.16 Wall Faucets: Provide faucets with vacuum breaker, backflow preventer, brass body, 3/4-inch male inlet threads, hexagon shoulder, and 3/4-inch hose connection. Faucet handle shall be securely attached to stem.

2.17 Wall Hydrants: Provide hydrants with vacuum breaker, backflow preventer, nickel-brass or nickel-bronze wall plate, and detachable key handle. Hydrant shall be self-draining and have 3/4-inch exposed hose thread on spout.

2.18 Lawn Faucets: Provide faucets with either straight or angle brass bodies, and shall be of the compression type. Faucet spout shall have 3/4-inch hose threads, and handle shall be securely attached to stem.

2.19 Yard Hydrants: Yard box or post hydrants shall have valve housings located below frost lines. Hydrants shall be bronze with cast iron box or casing guard. "T" handle key shall be provided.

2.20 Backwater Valves: Valves shall be of the flap type, hinged or pivoted, with revolving disks. Hinge pivots, disks, and seats shall be nonferrous metal.

3.1 EXECUTION:

3.2 Installation of new equipment and repair of existing equipment shall comply with NAPHCC National Standard Plumbing Code. Mounting height of fixtures for use by the physically handicapped shall be in accordance with ANSI A117.4.

3.3 Repair of the Pneumatic Pressure Tank shall comply with ASHE Boiler and Pressure Vessel Code, Section VIII.

3.4 Testing of Repaired Tanks: After repairs have been completed, hot water generator storage tanks and pneumatic pressure tanks shall be tested in compliance with ASME Boiler and Pressure Vessel Code, Section VIII.

3.5 Flue Gas Piping: New flue gas piping shall be installed in compliance with NFPA No. 211. New flue gas vent piping shall be installed in compliance with NFPA No. 54.

3.6 Faucet Repair shall be limited to replacement of washers, renewable seats, or broken handles.

3.7 Air Chambers for prevention of water hammer shall be checked to see if they are waterlogged.







## SECTION 15451

### STEEL TANKS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of steel tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Tank Materials shall be as required for the service by AWWA D100 or D103 for water tanks, or by API standards for petroleum product tanks.

2.3 New Tanks shall comply with AWWA or API standards as applicable for the service. Storage tanks for flammable liquids shall also comply with UL and NFPA requirements.

2.4 Nozzle Flange Diameters and Drillings shall be in compliance with ANSI B16.5.

2.5 Butt Weld Nozzles shall be in compliance with ANSI B16.25.

#### 3.1 EXECUTION:

3.2 Tank Repair and Installation Work shall comply with applicable requirements of AWWA D100 or D103, or with API standards.

3.3 Welding shall be performed in accordance with AWS D1.1. Pipe welding to nozzles shall be performed in accordance with ASME Code Section IX.

## SECTION 15452

### PLASTIC TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Tank Material shall be reinforced fiberglass polyester in compliance with AWWA D120 for water tanks, or ASTM C 582 for tanks in chemical service.

2.3 New Tanks shall be horizontal, cylindrical tanks and shall comply with AWWA D120 or ASTM D 3299 as applicable. Chemical resistance tests, when required, shall be performed at the fabrication shop in compliance with ASTM C 581.

2.4 Nozzle Flange Diameters and Drillings shall be in compliance with ANSI B16.5.

3.0 EXECUTION: Repair and installation work shall be performed in compliance with recommended procedures and practices of SPI and of PPI, where applicable.

## POOL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pool equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.1 PRODUCTS:

2.2 Electric Swimming Pool Heaters shall be UL listed and shall conform to the ASME Boiler and Pressure Vessel Code. The heating elements shall be constructed of copper and shall be pre-wired with the connection at the element terminal sealed against moisture. Controls shall include a differential thermostat and a high temperature limit manual reset switch.

2.3 Gas-Fired Swimming Pool Heaters shall conform to the ASME Code and shall be approved by the American Gas Association. Heat exchangers shall be two-or four-pass design with copper-finned tubes. The burner shall be constructed of stainless steel and shall be provided with all necessary valving to meet ASME Code requirements.

2.4 Diatomite Filtration System shall consist of a centrifugal circulating pump, plastic filter elements surrounded by diatomaceous earth coating, a dry chemical feeder for feeding diatomaceous earth, and a modulating level control valve for the filter inlet line.

2.5 Swimming Pool Chlorinators shall be the gaseous chlorine cylinder-mounted type materials for construction of chlorinators shall be in accordance with recommendations of the Chlorine Institute.

2.6 Swimming Pool Surge Tank System shall include a surge tank, a vertical pump, and an electronic float switch. The surge tank shall be in compliance with ASME Code requirements for unfired pressure vessels.

2.7 Pool Drains shall be constructed of cast iron.

### 3.1 EXECUTION:

3.2 Personnel shall not begin repairs on the electric swimming pool heater until power to the heater has been disconnected.

3.3 Chlorine Gas Storage and Use shall be in accordance with recommendations of the Chlorine Institute Inc., Chlorine Manual.

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SECTION 15481

COMPRESSED AIR EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of compressed air equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 All New Compressed Air Equipment and materials for repair or replacement shall comply with ANSI Safety Standard B19.3, and ASME Boiler and Pressure Vessel Code, Section VIII.

2.3 New Reciprocating Air Compressors shall be of the single or two-stage, heavy-duty, double-acting, water-cooled or air-cooled, "Y" or "L" cylinder type complete with flange-mounted drive motor. The piston, valve, and cylinder construction shall not require lubrication. Teflon piston rings and Teflon or carbon rider rings shall be used. Compressors shall operate at a speed not in excess of 1,800 rpm.

2.3.1 Bearings: Main crankshaft bearings shall be anti-friction roller or ball type. Connecting rod bearings shall be sleeve type.

2.3.2 Valves: Compressor cylinder valves shall be of the channel, feather, or plate type suitable for service without external lubrication.

2.3.3 Lubrication: Force-feed lubrication system shall lubricate the crankshaft, connecting rod, and crosshead bearings.

2.3.4 Rod Packing: Piston rod packing shall be Teflon or carbon non-lubricating type.

2.3.5 Intake Air Filter - Silencer shall be a pipe-supported dry type capable of removing 95 percent of all particles 10 microns and larger.

2.3.6 Intercooler and Aftercooler shall be a shell-and-tube or plate type.

2.3.7 Motor shall be squirrel-cage induction, drip proof, NEKA Class B, with split-sleeve bearings.

2.4 New Centrifugal and Rotary Screw Compressors shall be of the multi-stage or two-stage type driven by an electric motor through speed-increaser gears.

2.4.1 Intake Air Filter-Silencer shall be a full-capacity dry type capable of removing 95 percent of all particles 10 microns and larger.

2.4.2 Blowoff Silencer shall be a full-capacity blowoff vent type.

2.4.3 Bearings: Centrifugal compressor radial bearings shall be of the pivoted shoe type. Axial bearings shall be Kingsbury-type thrust bearings capable of absorbing thrust in either direction. Rotary screw compressor radial bearings shall be anti-friction roller type. Ball thrust bearings shall be provided to carry the axial load.

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2.4.4 Seals: Centrifugal compressors shall be labyrinth or carbon ring-type air and oil seals. Rotary screw compressors shall be stainless steel sealing rings.

2.4.5 Intercoolers and Aftercoolers shall be water-cooled shell and tube type.

2.4.6 Vents and Drains: Vents shall be tapped and plugged. Drains shall be complete with drain valves.

2.4.7 Lubricating Oil System shall be a shaft-driven main oil pump, motor-driven auxiliary oil pump, dual oil coolers, oil reservoir, dual oil filters, pressure switches and gauges, check valves, valves, and interconnecting piping.

2.4.8 Check Valves shall be 150-pound class, carbon steel.

2.4 New Control Air Compressor and Dryer shall be air-cooled with a reciprocating compressor and a single receiver constructed in accordance with ASME Code requirements. Motor shall be NEMA Class B design with built-in overload protection. Unit shall include an air gauge, pop safety valve, external check valve, filter, pressure switch, and drain cock. Air dryer shall be refrigerated type designed for continuous operation with hermetically sealed compressor, heat exchanger, ambient air filter, and automatic drain trap. Oil and water filter shall have aluminum housing with pressure rating of 250 psig at 70 F and include manual drain valve and 10 replacement filters.

2.5 Aftercoolers shall be of the watercooled, shell-and-tube pipeline type with adequate surface area to limit the discharge to the temperature required. The unit shall include moisture separators, gauge glasses, automatic condensate traps, valves, drain piping, and thermal reliefs on the waterside.

2.6 Receivers shall meet ASME Section VIII, Division 1 requirements and shall include pressure gauge, relief valve, shutoff valve, automatic moisture trap, and drain valve. Receivers shall be designed for 200 psi.

2.7 All Rotating Parts and Equipment shall be true, dynamically balanced at the factory, and shall include vibration isolators.

2.8 Safety Guards shall meet OSHA requirements.

2.9 Pressure Regulators shall be designed for a maximum inlet pressure of 125 psi and a maximum temperature of 200 degrees F. Regulators shall be single-seated, pilot-operated with valve plug, bronze body and trim, and threaded connections. Regulator shall include a pressure gauge.

3.1 EXECUTION:

3.2 Repair and Replacement Work done on receiver tanks shall be in accordance with ASME Pressure Vessel Code and the NBBI. Repair procedures shall provide structural integrity as required by NBBI-23.

3.3 Welding shall be performed in compliance with AWS D1.1 and ASME Code Section IX.

3.4 Repaired Pressure Parts and Replacement Pressure Parts shall be tested after completion of repair or installation in accordance with the ASME Code.

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SECTION 15556

FIRE TUBE BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire tube boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

3.1 EXECUTION:

3.2 No Personnel shall enter the boiler until the boiler has been removed from service, cooled, drained, and purged and the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.

3.3 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code and have been approved by the Contracting officer.

3.4 Waterside Repairs: Wash drum internals to remove loose scale and soft deposits prior to making repairs.

3.5 Fireside Repairs:

3.4.1 Remove Soot and Other Deposits from furnace tube, fire tubes, and tube sheets.

3.4.2 Cracks at the junction of the furnace tube and tube sheet shall be repaired by welding.

3.4.3 Boiler Shell and Tube Sheet Patches shall be designed and installed in compliance with the National Board Inspection Code Chapter VI. All patches shall comply with the requirements for new construction of ASME Code Section I or IV.

3.4.4 Damaged Fire Tubes shall be removed and replaced with new tubes, except for a single leaking fire tube, which may be repaired by plugging at tube sheet at both ends.

3.4.5 Corroded Surfaces may be built up by fusion welding in compliance with the NBBI National Board Inspection Code.

3.4.6 Seal Welds used for fluid tightness shall be applied in compliance with the NBBI National Board Inspection Code recommendations.

3.5 Closing the Boiler:

3.5.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.

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3.5.2 Front and Rear Door: Clean seating surface, replace gaskets, and close front and rear access doors.

3.5.3 The Repair shall not be covered by replaced or reinstalled materials until authorized.

3.6 Inspection and Testing of completed boiler repairs shall be in compliance with the ASME Code.

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SECTION 15557

WATER TUBE BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water tube boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

3.1 EXECUTION:

3.2 No Personnel shall enter the steam drum or lower drum until the boiler has been removed from service, cooled, drained, and purged and all steam and water valves, including drain and blowdown valves, have been closed, and locked or tagged. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.

3.3 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code and have been approved by the Contracting Officer.

3.5 Waterside (Internal) Repairs: Wash drum internals to remove loose scale and soft deposits. Turbine the water tubes. Perform chemical cleaning by either circulation or soaking.

3.6 Cracks in Drums shall be repaired in compliance with the NBBI National Board Inspection Code.

3.7 Tube Seat Leaks may be repaired by internal seal welding of the tubes in compliance with National Board Inspection Code.

3.8 Fireside (External) Repairs:

3.8.1 Clean Deposits from fireside surfaces by washing with hot alkaline water, brushing, scraping, or air lancing. Surfaces shall be dried immediately after washing.

3.8.2 Corroded Surfaces may be built up by fusion welding in compliance with the NBBI National Board Inspection Code Chapter VI.

3.8.3 Drum Shell Patches shall be designed and installed in compliance, with NBBI National Board Inspection Code.

3.8.4 Minor Cracks in tube shall be repaired by replacement of a tube section. Minimum length of replacement tube section shall be 12 inches. Use backing rings when sections are welded into existing tubes. Use the TIG (tungsten-inert-gas) process for the root pass.

3.8.5 For Major Tube Damage, replace entire tube. If only one or two tubes require replacement, the damaged tubes may be removed and the holes plugged if approved by the Contracting Officer.

3.8.6 Seal Welds used for fluid tightness shall be applied in compliance with the NBBI National Board Inspection Code recommendations.

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3.9 Closing the Boiler:

3.9.1 Manholes, Handholes and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.

- 3.9.2 The repair shall not be covered by replaced or reinstalled materials until authorized.
- 3.10 Inspection and Testing of completed boiler repairs shall be in compliance with the ASME Code.

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SECTION 15558

HIGH TEMPERATURE WATER BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of high temperature water boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

3.1 EXECUTION:

3.2 Personnel shall not enter the boiler until it has been removed from service, cooled, drained, and purged.

3.3 Repair and Maintenance Work shall be performed in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Contracting Officer.

3.4 Tubes shall be replaced as specified in NBBI NB-23.

3.5 Tube Joints, Headers, and Drums shall be repaired as specified in NBBI NB-23.

3.6 Material and Equipment removed for access to the boiler or to make repairs shall be reinstalled following successful completion of performance tests and authorization of the Contracting Officer.

3.7 Repairs to Pressure-Parts shall be inspected and tested as specified in NBBI NB-23. The Contractor shall submit the Inspection Certificate to the Contracting Officer.

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SECTION 15559

CAST-IRON BOILERS AND FIREBOXES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of cast-iron boilers and fireboxes, and furnishing and installation of cast-iron boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS: Replacement parts and materials shall comply with the requirements of the ASME Boiler and Pressure Vessel Code for new construction.

2.2 Gas-Fired, Oil-Fired, and Combination Gas/Oil-Fired Boilers: Boilers shall be rated and tested in accordance with ANSI Z21.13. Boilers shall meet the requirements of the following safety codes and standards: UL 726, UL 795, and UL 296. Boilers shall be provided with combustion controls.

3.1 EXECUTION:

3.2 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere has been checked and found to be free of toxic or explosive gases.

3.3 Repair and Maintenance work shall be performed in accordance with procedures developed by the Contractor, in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Contracting Officer.

3.4 Clean Fireside Surfaces: Thoroughly clean flueway and firebox surfaces.

3.5 Clean Waterside Surfaces to remove sludge and sediment.

3.5.1 On Steam Boilers, open blowdown valve and flush water until clear while under steam pressure. On water boilers, open boiler drain cock to remove sludge and sediment that have settled to the bottom. Then refill boiler to correct water level for steam boilers or correct water pressure for water boilers.

3.5.2 If Boiler is Shut Down, remove plugs and open drain cock. Wash the inside of the boiler with water to remove sludge and sediment. Fill boiler and drain again. Fill boiler to correct level or pressure.

3.6 Replace Damaged Boiler Section: Clean seating surfaces and replace gaskets or sealant before installing boiler sections.

3.7 Repair Cracks by brazing in compliance with the ASME Code Section IV and Section IX.

3.8 Closing the Boiler:

3.8.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.

3.8.2 Other Materials: The repair shall not be covered by replaced or reinstalled materials until authorized.

3.9 Inspection and Testing of completed boiler repairs shall be in compliance with the ASME Code.  
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## SECTION 15560

### CLEANING OF BOILERS

1.0 DESCRIPTION OF WORK: This specification covers cleaning of boilers. Products and materials used shall be in accordance with the boiler manufacturer's recommendations and/or shall be as directed by the contracting Officer. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the boiler manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Equipment required for cleaning, such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizer tank and pump, power brushes, high pressure sprays, and other equipment shall be supplied by the Contractor.

2.3 Chemical Cleaning Materials:

2.3.1 Boilout Chemicals shall be trisodium phosphate complying with ASTH D 538, caustic soda complying with ASTH D 456, and soda ash complying with ASTM D 458.

2.3.2 Acid Cleaning Chemicals shall be:

Hydrochloric Acid complying with Fed. Spec. 0-H-765

Ammonium Bifluoride, N<sub>2</sub>H<sub>4</sub>F<sub>2</sub>

Hydroxyacetic Acid, CH<sub>2</sub>OHC(=O)OH, Technical Grade

Formic Acid, HCOOH, Technical Grade

Phosphoric Acid complying with Fed. Spec. 0-0-670

Sulfuric Acid complying with Fed. Spec. O-S-809

Sulfamic Acid, HS<sub>03</sub>NH<sub>2</sub>

2.3.3 Neutralizing-Passivating Chemicals shall be as follows:

Monosodium Phosphate, H<sub>2</sub>NaO<sub>4</sub>p

Di-sodium Phosphate, Na<sub>2</sub>HP<sub>04</sub>

Ammonia, Anhydrous, complying with Fed. Spec. O-A-445

Hydrazine, Anhydrous, H<sub>2</sub>NNH<sub>2</sub>

Sodium Sulfite complying with Fed. Spec. O-S-00650

Sodium Nitrate complying with Mil. Spec. MIL-S-322

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2.3.4 Flushing Water shall be demineralized water with a conductivity end point of 50 micro-ohms.

2.3.5 Pressure Draining Gas shall be commercially pure, 99.5 percent nitrogen.

2.3 Mechanical Cleaning and Equipment:

2.3.1 Brushes shall be of the type for use with power units.

2.3.2 Washwater shall be hot alkaline washwater for removing ash deposits.

3.1 EXECUTION:

3.2 Clean Boilers of all scale and deposits.

3.3 Inspection: After cleaning, the boiler shall be given a visual inspection for effectiveness of scale removal.

3.4 Welding and Burning: No welding or burning shall be allowed during cleaning operations.

3.5 Alkaline Boilout:

3.4.1 Boilout Chemicals shall be completely dissolved in water before being introduced into the boiler.

3.4.2 Boilout chemicals shall be trisodium phosphate and caustic soda, 1,500 to 2,500 ppm concentration or caustic soda and soda ash, 3,000 ppm concentration.

3.4.3 Boilout Pressure shall be operating pressure for boilers operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.

3.4.4 Concentration of Chemicals and duration of boilout will be dependent upon the scale analysis. Boilout time may vary from 8 to 24 hours with boiler water solids purged by blowdown at approximately 4hour intervals.

3.4.5 Flush Unit with demineralized water until the effluent is clear of visible solids.

3.5 Acid Cleaning, using either the circulating or soaking method, shall be done in the following sequence.

- a. Wash heating surfaces with an acid solvent containing a proper inhibitor.
- b. Flush unit with clean water.
- c. Neutralize and passivate the unit.
- d. Flush the unit with clean water.

3.6 Circulating-Method:

3.6.1 Acid Application: Acid cleaning time shall vary from a minimum of 4 hours, depending on scale analysis. Time shall be determined by analyzing samples of return solvent for iron concentration and acid strength.

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3.6.2 Flushing: After cleaning, flush unit with demineralized water until pH reaches 6.5.

3.6.3 Neutralization: After flushing, neutralize the unit with ammonia and hydrazine for 2 hours at 200

F.

3.6.4 Final Flush: Final flush with demineralized water until pH reaches 7.5.

3.7 Soaking Method:

3.7.1 Application: Acid cleaning time shall vary from 4 to 8 hours depending on scale analysis. For soft sludges, cleaning time shall be a minimum of 4 hours. Cleaning time shall be 6 hours for thin coatings of hard scale. For heavy deposits, cleaning time shall be a maximum of 8 hours. The time periods noted are actual retention time of the solvent in the unit, including the time of filling and draining. Unit shall be drained under nitrogen pressure.

3.7.2 Flushing: After required cleaning time, flush unit with demineralized water.

3.7.3 Neutralizing: After flushing, the unit shall be neutralized and passivated with a solution of soda ash and boiled out for a period of 4 to 6 hours. The boilout pressure shall be operating pressure for boilers operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.

3.7.4 Final Flush: After boilout, the unit shall be drained and flushed with demineralized water containing sodium nitrate, until the pH reaches 7.5.

3.8 Effluent Neutralization: The solvent effluent drained from the unit shall be neutralized with caustic soda or soda ash to a pH of 6.8 to 8.5.

## SECTION 15565

### FIREBRICK FIREBOXES FOR BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire brick fireboxes for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Replacement Parts and for pressure parts, or for attachment to pressure parts, shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

2.3 The Following Refractor shall comply with the requirements of ASTM C 64: fire-brick, refractory tile, plastic refractory, castable refractory, and refractory mortar.

#### 3.1 EXECUTION:

3.2 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and have been approved by the Contracting Officer.

3.3 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

#### 3.4 Fire Tube Boilers:

3.4.1 When Replacing Burner Throat Tile, maintain correct throat diameter and ensure that throat is centered in the furnace.

3.4.2 Repair Burner Throat and Furnace Liner Tile Cracks with high temperature bonding mortar.

3.4.3 Wash Coat Burner Throat and Furnace Liner Tile with high temperature bonding mortar diluted with water.

3.4.4 Patch Cracks, 1/8 inch and larger in width, with high temperature bonding mortar or high temperature plastic refractory.

3.4.5 Patch Gap between castable refractory and baffle tile with high temperature plastic refractory.

3.4.6 Patch Damaged Rear Door Refractory with castable refractory.

3.5 Watertube Boilers: Repair cracks with ceramic fiber. Apply wash coat to burner throat.

3.6 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.

3.7 Drying Out:

3.7.1 Air Dry: Allow refractory to air dry as long as possible.

3.7.2 Fire Dry: To thoroughly dry refractory by firing, fire boiler intermittently at low rate.

## SECTION 15566

### FIREBRICK FOR INSULATION OF BOILER FIREBOXES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of firebrick for insulation of boiler fireboxes. Products shall match existing materials and/or Shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Replacement Parts and Materials for attachment to pressure parts of the boiler shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

2.3 Firebrick, Plastic Refractory, Castable Refractory, and Refractory Mortar shall conform to the requirements of ASTM C 64.

#### 3.1 EXECUTION:

3.2 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

3.3 Repair and Maintenance Work shall be performed in accordance with procedures in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Contracting Officer.

3.4 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.

3.5 Drying Out: Allow refractory to dry as long as possible.

## SECTION 15571

### OIL-FIRED AND GAS-FIRED BURNERS FOR BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil-fired and gas-fired burners for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Oil-Fired Burner Pipe, Tubing, Fitting, Flanges, Valves, And Gaskets shall comply with the requirements of ANSI B31.1.

2.3 Gas-Fired Burner Pipe, Tubing, Fitting, Flanges, Valves, and Gaskets shall comply with the requirements of ANSI B31.2.

2.4 Burner and Pilot System and Combustion and Safety Controls shall comply with the requirements of ANSI/NFPA 85A, 85B, or 85D; or Mil. Spec. MIL-B-18796.

2.5 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI C1.

#### 3.1 EXECUTION:

3.2 No Personnel shall enter the boiler until it has been removed from service, cooled, purged and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

3.3 Before Welding, Brazing, or Cutting, gas piping shall be purged and the atmosphere checked and found to be free of an explosive gas mixture.

3.4 Oil-Fired Burner Repairs: All oil-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and C1, ANSI/NFPA 85A or 85D, and MIL-B-18796. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1.

3.5 Gas-Fired Burner Repairs: All gas-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.2 and C1, ANSI/NFPA 85A or 85B, and HIL-B-18796. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.2.

#### 3.6 Inspection and Testing:

3.6.1 Leak Test all piping.

3.6.2 Pressure Test all piping in compliance with ANSI B31.1 for oil-fired burners or ANSI B31.2 for gas-fired burners.

## SECTION 15572

### COAL-FIRING SYSTEMS FOR BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coal-firing systems for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Coal-Firing System Equipment and Materials shall comply with the requirements of ANSI B31.1, ASME Boiler and Pressure Vessel Code Section II, and NFPA 60.

2.3 Burner and Pilot System and Combustion and Safety Controls shall comply with the requirements of ANSI/NFPA 85E.

2.4 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI C1 and NFPA 70.

#### 3.1 EXECUTION:

3.2 Personnel shall enter the boiler until it has been removed from service, cooled, purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

3.3 Before Welding, Brazing, or Cutting, coal piping shall be purged and the atmosphere checked and found to be free of an explosive coal/air mixture.

3.4 Coal-Fired Burner Repairs: All coal-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and C1, ASME Code Section II, NFPA 60, and ANSI/NFPA 85E. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1 and ASME Code Section IX.

3.5 Testing: Leak test all piping. Pressure test all piping in compliance with ANSI B31.1 and ASME Code Section II.

## DRAFT CONTROL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of draft control equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Structural Steel shall comply with ASTM A 36.

2.3 Steel Pipe shall comply with ASTM A 53.

2.4 Piping Components shall comply with ASTM A 105.

2.5 Flanges, Fittings, and Valves shall comply with ASTM A 181.

2.6 Seamless Copper Tube shall comply with ASTM B 75.

2.7 Insulation shall comply with ASTM C 517 and ASTM C 547.

2.8 Thermal Insulation and Finishing Cement shall comply with ASTM C 449.

2.9 Welding and Brazing Materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.

3.1 EXECUTION:

3.2 Safety: Adequate natural or forced ventilation shall be provided during repair activities conducted in confined spaces. Forced or induced draft fans shall be rendered inoperable before performing internal repairs to the fan casing or adjacent ductwork.

3.3 Repairs shall be accomplished in compliance with NFPA No. 70.

3.4 Welding and Brazing shall be performed in accordance with Section IX of the ASME Code.

3.5 Drive Train Components shall be repaired or replaced to transmit power free from vibration at the required torque.

## BREECHING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of breaching. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.1 PRODUCTS:

#### 2.2 Metal Breeching:

2.2.1 Carbon Steel shall comply with ASTM A 568.

2.2.2 Galvanized Steel shall be carbon steel complying with ASTM A 568, galvanized in compliance with ASTM A 123.

2.2.3 Stainless Steel shall comply with ASTM A 167.

2.1.3 High Heat Insulating Refractory shall be an alumina-silica-base castable refractory complying with ASTM C 64.

2.1.5 Acid Resistant Liner shall be phenolic, rubber, and polyester resin liner.

2.1.6 insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

2.1.7 Bolts and Nuts: Where breaching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.

2.1.8 Paint for prime coats and finish coats for touchup or refinishing shall be of the high heat-resistant type.

#### 2.2 Masonry:

2.2.1 Mortar and Grout for repair of cracks in reinforced concrete shall comply with ASTM C 476. Mortar for use in the repair or replacement of brick lining in high heat breaching shall be ground fire clay complying with ASTM C 105. Chemical-resistant mortar shall be resin mortar complying with ASTM C 395.

2.2.2 Brick for lining of high heat breaching requiring acid resistance shall be refractory brick complying with ASTM C 64. Brick for breaching requiring acid resistance shall be chemical-resistant brick complying with ASTM C 279, type H.

2.2.3 Inspection Doors shall be heavy-duty cast iron or steel, lined on interior with insulating, castable refractory complying with ASTM C 64.

2.2.4 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

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#### 2.3 Refractory Brick:

2.3.1 Brick shall be high heat refractory type complying with ASTM C 64.

2.3.2 Mortar: Fire clay mortar shall be of high heat, ground type complying with ASTM C 105. Chemical-resistant mortar shall be the silica type complying with ASTM C 466.

2.3.3 Refractory shall be of the insulating, castable type complying with ASTM C 64. Chemical-resistant type castable refractory shall be in compliance with ASTM C 401.

2.3.4 Inspection Doors shall be heavy-duty cast iron or cast steel, lined on the interior with insulating castable refractory complying with ASTM C 64.

3.1 EXECUTION:

3.2 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.

3.3 Welding: All welding shall be performed in compliance with AWS D1.1.

3.4 Installation of Breechings shall be in compliance with NFPA No. 211.

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SECTION 15577

STACKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of stacks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Metal-Stacks:

2.2.1 Carbon Steel shall comply with ASTM A 568.

2.2.2 Galvanized Steel shall be carbon steel complying with ASTM A 568, galvanized in compliance with ASTM A 123.

2.2.3 Stainless Steel shall comply with ASTM A 167.

2.1.3 Insulating Refractory shall be alumina-silica base castable refractory complying with ASTM C 64.

2.1.5 Acid-Resistant Liner shall be phenolic, rubber, and polyester resin liner.

2.1.6 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

2.1.7 Insulation Jacket: Canvas jacket shall be 8-ounce standard proprietary canvas jacket. Aluminum jacket shall be 0.016 inch thick, corrugated, embossed, or smooth, complying with ASTM B 209, temper H14. Type 3003 or 5010 with 50-pound polyethylene vapor barrier. Supports for aluminum jacket shall be stainless steel Z-clips and bands 0.016 inch thick by 3/4 inch wide.

2.1.8 Bolts and Nuts: Where breaching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.

2.1.9 Steel Rivets shall comply with ASTM A 502.

2.1.10 Steel Structural Wire Rope shall be zinc-coated and shall comply with ASTM A 603.

2.1.11 Paint For Prime Coats and Finish Coats for touchup or refinishing shall be of the high-heat-resistant type.

2.2 Masonry Stacks:

2.2.1 Ceramic Glazed Clay Brick shall comply with ASTM C 126.

2.2.2 Chemical-Resistant Masonry Units shall comply with ASTM C 279.

2.2.3 Castable Refractory shall comply with ASTM C 401.

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2.2.4 Mortar for Fireclay Brick shall comply with ASTM C 105. Mortar for chemical-resistant applications shall comply with ASTM C 395. Mortar and grout for reinforced masonry shall comply with ASTM C 476.

2.3 Prefabricated Stacks shall consist of double-wall vent pipe and fittings. All components shall be UL-listed and shall comply with NFPA 211.

3.1 EXECUTION:

3.2 Installation or Repair of all stacks shall be in accordance with NFPA 211.

3.3 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.

3.4 Welding: All welding shall be performed in compliance with "S D1. 2.

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SECTION 15580

BOILER FEEDWATER EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler feedwater equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Specialty Components and Parts shall be in accordance with applicable requirements of the ASME Boiler and Pressure vessel Code.

2.3 Welding and Brazing Materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.

3.1 EXECUTION:

3.2 Repairs shall be accomplished with either the entire feedwater system or applicable portions isolated from service and drained.

3.3 All Isolation Valves shall be secured in the closed position, all drain valves secured in the open position, and pumps rendered inoperative before and during repairs to the deaerators, softeners, and chemical feeders.

3.4 Welding shall be performed in accordance with Section IX of the ASME Code.

3.5 Electrical Work shall comply with the requirements of NFPA 70.

3.6 Drive Train Components shall be repaired or replaced to transmit power free from vibration at the required torque.

3.7 A Repair Procedures for receiver vessels shall provide structural integrity as specified in NBBI NB-23.

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SECTION 15581

GAS METERS AND REGULATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gas meters and regulators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Meters: Meters shall conform to Mil. Spec. MIL-M-18294, Style B, without resettable counter. Meters shall be pipe or pedestal mounted.

2.3 Pressure Regulators: Pressure regulators shall have iron or steel bodies and shall be adjustable for changing the downstream pressure. The regulator shall be adjustable with automatic loading, and shall have automatic pressure relief. The pressure relief shall be diaphragm-operated, spring-loaded type with vent for relief.

2.4 Valves: Valves shall conform to ADI Spec. 6D, Class 150.

3.1 EXECUTION:

3.2 Installation of Meters shall conform to ANSI B31.8. Permanent gas meters shall be installed with provisions for isolation and removal for calibration and maintenance.

3.3 Installation of Pressure Regulators shall be installed with by-pass line and lubricated plug valves installed in the by-pass line and on each side of the regulator between the regulator and by-pass connections.

3.4 Installation of Strainer shall be upstream of meter.

3.5 Installation of Pressure Reducing Valve at Meter Station shall be provided as needed.

15581-1

SECTION 15590

FUEL HANDLING SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fuel handling systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Fuel Handling System-Components shall comply with applicable requirements of API.

2.3 Fuel Unloading Hose shall be in compliance with applicable requirements of UL 180, 330, 536, and 569 and of ANSI/ASME B31.3.

2.4 Gasoline Dispensing Pumps shall be in compliance with applicable requirements of UL 79 and 87 and of MIL-P-10406.

2.5 Oil/Water Separators shall be of the coalescing type, with coalescing media as required for the application. Separators shall be repaired or constructed in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

3.1 EXECUTION:

3.2 Repair and Replacement Work shall be performed in compliance with applicable requirements of NFPA 30, NFPA 70, and the ASME Code.

3.3 Welding shall be performed in accordance with ANSI B31.3 and ASME Code Section IX.

3.2 Flushing: Repaired or replaced systems shall be flushed with the same type of fuel intended for use in the system until the out flowing fuel is free of sediment and emulsion and does not appear cloudy or hazy.

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SECTION 15610

WARM AIR FURNACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of warm air furnaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 New Furnace shall comply with the AGA Directory of Certified Appliances and Accessories, NFPA 70, and UL 296, 378, 499, 727, 795, and 900 as applicable.

2.3 Filters may be permanent, cleanable type or throw-away type and shall comply with requirements of UL 900. Face velocity of air at maximum flow rate shall not exceed 360 cubic feet per minute for standard velocity filters and 520 feet per minute for high velocity filters.

2.4 Flues shall be double-walled and constructed of galvanized steel complying with ASTM A 526.

2.5 Controls:

2.5.1 Thermostats shall be low voltage type designed to operate on control circuits not exceeding 30 volts.

2.5.2 Limit Control for Oil or Gas Furnaces shall be designed and installed to shut down the burner when the bonnet air temperature reaches 200 F. Differential shall be fixed at not less than 10 F and not greater than 25 F.

2.5.3 Blower Control shall prevent operation of blower after burner has fired until the discharge air at bonnet reaches a predetermined temperature. Fan "on" setting shall be adjustable within range of 90 F to 140 F. Differential setting may be fixed between 24 F and 36 F or adjustable between 20 F to 50 F. Blower control shall include manual switch.

2.6 Gas furnaces:

2.6.1 Gas Burners shall be of corrosion-resistant steel and shall be designed, adjusted, rated, and certified to fire natural, manufactured, mixed, or propane gas. Burners rated 400,000 Btuh input or less shall be manually or electrically ignited, standing pilot type. Burners rated greater than 400,000 Btuh input shall be electrically ignited, proven pilot type.

2.6.2 Heat Exchangers shall be fabricated from steel complying with ASTM A 568.

2.6.3 Gas Valves shall be provided with a safety shutoff that will, in the event of flame failure, cause safety shutdown of the burner; an automatic pilot; and except for furnaces firing propane gas, an automatic gas pressure regulator.

2.6.4 Furnace Housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424, with baked enamel coating.

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2.7 Oil Furnaces:

2.7.1 Burners shall be of flange-mounted high pressure atomizing type. Burner ignition shall be by continuous, automatic, cadmium cell control. The burner shall incorporate an oil pump, burner motor, combustion air fan, and burner tube.

2.7.2 Heat Exchangers shall be fabricated from cold-rolled steel complying with ASTM A 568 with radiation shield and combustion chamber of stainless steel complying with ASTM A 167.

2.7.3 Furnace Housings shall be constructed of not less than 22gauge steel complying with ASTM A 424 with baked enamel coating.

2.7 Electric Furnaces:

2.7.1 Heater Elements shall be helically coiled, nickel-chromium wire, individually sequenced with individual thermal limit controls and fusible links for each element. Entire design shall be UL 499 listed and shall comply with NFPA 70.

2.7.2 Furnace Housings shall be constructed of not less than 22gauge steel complying with ASTM A 424 with baked enamel coating.

3.1 EXECUTION:

3.2 New Furnace shall be installed in accordance with UL 499, UL 727, or UL 795 as applicable.

3.3 Welding shall be performed in compliance with AWS DI-1.

3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P21035.

3.4 Corroded Heat Exchangers shall be removed and replaced.

3.5 Flue: Replace corroded sections of flue in compliance with UL 378.

3.6 Controls: Replace defective controls in compliance with NFPA 70.

## SECTION 15621

### GAS UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gas unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 New Unit Heater shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NFPA 70; and UL Electrical Construction Materials List and UL 795.

2.3 Heat Exchangers shall be fabricated from steel complying with ASTM A 569 to form a unitized, multi-section type heat exchanger and combustion chamber for each burner.

2.4 Burners shall be of a corrosion-resistant steel with unitized rows of burners to provide one burner per heat exchanger section and shall have crossover igniter to provide positive ignition of each burner row.

2.5 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity and shall include a flue connection. The housing shall be provided with means for suspension or floor mounting as required.

2.6 Fans shall be the propeller type, fabricated of aluminum or steel, dynamically balanced, and direct motor driven. Fan motors shall be totally enclosed type, and built-in thermal overload protection shall be provided for single-phase motors.

#### 2.7 Controls:

2.7.1 Thermal Limit Control shall be provided to shut off gas supply in the event normal operating temperatures are exceeded.

2.7.2 Fan Delay Switch shall be provided for continuous fan operation after burner shutdown until heat exchanger temperature is reduced to prevent excessive heat build-up.

2.7.3 Gas Valve with Safety Shutoff and Manual Main Shutoff shall be provided with automatic pilot and shall automatically regulate gas pressure and, in the event of flame failure, shall cause safety shutdown of burner.

2.7.4 Thermostat shall be wall-mounted, heavy-duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

#### 3.1 EXECUTION:

3.2 Welding shall be in compliance with AWS D1.1.

3.3 Blazing shall be in compliance with ASME Code Section IX.

3.4 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

## OIL UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.1 PRODUCTS:

2.2 Now Unit Heaters shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NFPA 70; UL Electrical Construction Materials List; and UL 296.

2.3 Heat Exchangers shall be of corrosion-resistant steel and shall include a combustion chamber (primary heating surface) and a heat exchanger (secondary heating surface).

2.2 Burners shall be the high pressure or low pressure atomizing type. The burner shall be completely automatic and shall incorporate an oil pump, burner motor, combustion air fan, burner tube, and automatic ignition.

2.3 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity. The housing shall be provided with means of suspension. Housing shall include a flue connection.

2.5 Fan shall be the propeller type fabricated of aluminum or steel.

### 2.6 Controls:

2.6.1 Thermal Limit Control shall be provided to shut off oil supply in the event normal operating temperatures are exceeded.

2.6.2 Fan Delay Switch shall be provided for continuous fan operation after burner shutdown until heater exchanger temperature is reduced to prevent excessive heat build-up.

2.6.3 Thermostat shall be unit- or wall-mounted and shall be heavy duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

### 3.1 EXECUTION:

3.2 Welding and Brazing shall be in compliance with AWs Di.1.

3.3 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

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SECTION 15661

AIR-COOLED CONDENSING UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled condensing units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS: All products shall be rated in accordance with ARI Standards 210 and 270.

2.2 Compressor: Provide a hermetic or semi-hermetic compressor with crankcase heaters, inherently protected motors, spring mounts, and capacity modulation.

2.3 Condenser Coils: Provide copper tubes with mechanically bonded aluminum fins.

2.4 Fans and Motor: Provide propeller-type with direct drive or belt drive and vertical discharge. Protect fan with heavy-gauge wire guard. Provide motors which are inherently protected, permanently lubricated, and weatherproof. Motors shall be totally enclosed type or drip proof.

2.5 Casing: Furnish a unit designed for outdoor mounting. Fabricate the casing of heavy-gauge steel that is zinc coated and finished with enamel.

2.4 Controls: Provide safety and operating controls, factory wired and mounted in an enclosure. Include pressure switches and motor overload devices.

3.0 EXECUTION: Follow manufacturer's recommendations.

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SECTION 15670

CONDENSERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of condensers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Air-Cooled-Condensers:

2.2.1 New Air-Cooled Condenser, when required, shall be a factory-fabricated and assembled unit consisting of coils, fans, and electric motor drive. The condenser shall be designed, fitted, and rated in compliance with recommendations and requirements of ARI 460, ASHRAE 20, and UL 207. Sizing of condenser shall be based on a temperature difference between entering outside air and condensing refrigerant not exceeding 30 F. The saturated refrigerant condensing temperature shall not be over 130 F.

2.2.2 Electric Motor shall be totally enclosed type located within the enclosure and fully protected from the weather. Motor starter shall be magnetic across the line type with general purpose enclosure. Thermal overload protection shall be the manual reset type.

2.2.3 Housing shall be fabricated from sheet carbon steel complying with ASTM A 569.

2.2.4 Refrigerant Piping shall be hard drawn copper, Type L, refrigeration grade complying with ASTM B 75. Valves shall be of brass construction, diaphragm packless or back seating type, specifically designed for refrigeration service.

2.3 Water-Cooled Condensers:

2.3.1 New Condensers shall be of shell-and-tube construction. The condenser shall be designed, fitted, and rated in compliance with the recommendations and requirements of ARI 450, ASHRAE 22, and UL 207. The condenser shall be constructed in compliance with Section VIII of ASME Boiler and Pressure Vessel Code.

2.3.2 Refrigerant Receiver shall comply with Sections II and VIII of the ASME Boiler and Pressure Code.

2.3.3 Condenser materials for repairs shall be in compliance with Section II of the ASME Boiler and Pressure Vessel Code.

2.3.4 Condenser Tubes shall be fabricated of seamless copper tubing with integral fins, and the tubes shall be individually replaceable and rolled or brazed into the tube sheets of the shell-and-tube unit. The entire bundle shall be removable on shell-and-coil units.

3.1 EXECUTION:

3.2 Condensers shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

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3.3 Condenser Tubes shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

3.4 Welding and Brazing shall be performed in compliance with AWS D1.1 and Section IX of the ASME Boiler and Pressure Vessel Code.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P21035.

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SECTION 15680

REFRIGERANT EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigerant equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Performance Ratings: The performance rating of each item of the new refrigerant equipment furnished shall comply with the applicable portions of ARI Standards 450, 460, 495, and 590.

2.3 Bearings shall be an exact replacement. Bearing life shall be equal to the bearing to be replaced.

2.3.1 Bearings for reciprocating equipment shall be precision, oil-cooled or babbitted type.

2.3.2 Bearings for centrifugal equipment or rotary screw equipment shall be precision, oil-cooled type.

2.4 Mufflers shall be a hot-gas muffler or an exact replacement as indicated. Muffler shall be able to reduce vibration and noise from pulsation.

3.1 EXECUTION:

3.2 Welding: All welding shall be in compliance with AWS D1.1.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P21035.

3.4 Controls:

3.4.1 Chiller Controls: Replace, adjust, and recalibrate defective parts and assemblies.

3.4.2 Starter Controls: Replace defective contactors and relays as necessary.

3.4.3 Capacity Controls: Adjust guide vane linkages and actuator control in compliance with the manufacturer's specification.

3.5 Noncondensables: Check accumulation rate of noncondensables in absorption refrigerant equipment for compliance with manufacturer's instructions.

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SECTION 15683

REFRIGERATION SPECIALTIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigeration specialties. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Thermostatic Expansion Valves shall be rated and tested in accordance with ASHRAE Standard 17 or ARI Standard 750.

2.3 Filter Driers shall be sealed in-line type or replaceable core type as required. Filter driers shall be tested and rated in accordance with ASHRAE Standard 63 and ARI Standard 710 and shall meet the requirements of UL Standard 207.

2.4 Sight Glasses for moisture and liquid indication shall be UL listed.

2.5 Refrigerants shall be designated in accordance with ANSI/ASHRAE 34.

3.0 EXECUTION: Installation of all refrigeration equipment shall comply with ASHRAE Standard 15.

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SECTION 15711

## NATURAL DRAFT COOLING TOWERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of natural draft cooling towers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.1 PRODUCTS:

2.2 New Cooling Towers shall be constructed in compliance with NFPA 214 and MIL-C-16278.

### 2.3 Wood Towers:

2.3.1 Framework shall be repaired with or constructed of redwood complying with CTI STD-103, or Douglas fir complying with CTI STD-114. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.3.2 Louvers shall be repaired with or constructed of redwood, Douglas fir or west coast hemlock. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.

2.3.3 Water Basin shall be repaired with or constructed of redwood or Douglas fir. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

### 2.4 Metal Towers:

2.4.1 Framework shall be repaired with or constructed of carbon steel complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123.

2.4.2 Louvers shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.4.3 Water Basin shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

### 2.5 Glass Fiber Towers:

2.5.1 Framework shall be repaired with redwood complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.5.2 Louvers shall be of rigid formed plastic complying with Fed. Spec. L-P-535.

2.5.3 Water Basin shall be repaired or constructed of redwood or Douglas fir or of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

### 3.1 EXECUTION:

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3.2 Existing Cooling Tower to be Repaired shall be repaired in compliance with NFPA 214.

3.3 Welding and Brazing shall be performed in compliance with AWS D1.1.

3.4 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P21035.

3.5 Testing: Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, and with CTI ATP-105 and ASME PTC23 for field performance.

15711-2

SECTION 15712

FORCED DRAFT AND INDUCED DRAFT COOLING TOWERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of forced draft and induced draft cooling towers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 New Cooling Towers shall be constructed in compliance with NFPA 214 and MIL-C-16278.

2.3 Wood Towers:

2.3.1 Louvers shall be redwood, complying with CTI STD-103 or Douglas fir or hemlock complying with CTI STD-114. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS112.

2.3.2 Fill or Contact Surface shall be redwood, complying with CTI STD-103, or Douglas fir or hemlock complying with CTI STD-114. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.

2.3.3 Drift Eliminators shall be redwood, complying with CTI STD103, Douglas fir or hemlock complying with CTI STD-114, or rigid formed plastic complying with Fed. Spec. L-P-535. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.

2.3.4 Water Distribution Basin shall be redwood, complying with CTI STD-103 or Douglas fir complying with CTI STD-114. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.3.5 Water Collection Basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.3.6 Framework shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123.

2.3.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.4 Metal Towers:

2.3.1 Louvers shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.3.2 Fill or Wet Deck shall be carbon steel in compliance with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525, rigid formed plastic complying with Fed. Spec. L-P-535, or stainless steel complying with ASTM A 167.

2.3.3 Drift Eliminators shall be carbon steel, complying with ASTM A 366 and galvanized in compliance with ASTM A 525, rigid plastic complying with Fed. Spec. L-P-535, or stainless steel complying with ASTM A 167.

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2.3.4 Water Distribution Basin shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.3.5 Water Collection Basin or Pan shall be carbon steel, complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525 or stainless steel complying with ASTM A 167.

2.3.6 Framework shall be carbon steel, complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123; or stainless steel complying with ASTM A 167.

2.3.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525; or stainless steel complying with ASTM A 167.

2.4 Glass Fiber Towers:

2.4.1 Louvers shall be formed rigid plastic complying with Fed. Spec. L-P-535.

2.4.2 Fill shall be rigid plastic complying with Fed. Spec. L-P- 535.

2.4.3 Drift Eliminators shall be formed rigid plastic complying with Fed. Spec. L-P-535.

2.4.4 Water Distribution Basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-112.

2.4.5 Water Collection Basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-112.

2.4.6 Framework shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment complying with CTI WMS112.

2.4.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

3.1 EXECUTION:

3.2 Existing Cooling Tower to be Repaired shall be repaired in compliance with NFPA 214.

3.3 Welding shall be performed in compliance with AWS D1.1.

3.4 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P21035.

3.5 Testing: Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, CTI ATP-105, and ASME PTC23, for field performance.

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SECTION 15751

COILS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coils. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Pressures:

2.2.1 Water Coil Design Working Pressure shall be 200 psig.

2.2.2 Steam Coil Design Working Pressure shall be 200 psig steam.

2.2.3 Each Replacement Water or Steam Coil shall be hydrostatically tested at 250 psig at the factory.

2.2.4 Each Replacement Direct Expansion Coil shall be pneumatically tested at the factory under water at not less than 300 psig. Each coil shall be completely dehydrated and sealed at the factory upon completion of pressure tests.

2.3 Water, Steam, and Direct Expansion Coils:

2.3.1 Tubing shall be round, seamless, copper tubing, complying with ASTM B 75.

2.3.2 Fins shall be aluminum or copper.

2.3.3 Coil Casing shall be made of galvanized sheet steel complying with ASTM A 526, minimum thickness of 14 gauge.

2.3.4 Water or Steam Coil Headers shall be fabricated from steel pipe complying with ASTM A 53, Grade B; extra heavy seamless copper tubing complying with ASTM B 75; or semi steel complying with ASTM A 126, Class C.

2.3.5 Direct Expansion Coil Headers shall be fabricated from extra heavy seamless copper tubing complying with ASTM B 75.

2.3.6 Each Water Coil shall be provided with a plugged vent tap and drain tap.

2.3.7 Each Steam Coil shall be provided with a vacuum breaker.

2.3 Electrical Heating Coils (and Heat Strips):

2.3.1 Resistance Wire shall be nickel-chromium wire.

2.3.2 Tubular Sheath shall be corrosion-resisting in the surrounding medium and suitable for the temperatures required by the particular application.

2.3.3 Insulating Material shall be densely packed, high purity magnesium oxide.

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2.3.4 Insulator Supports for directly exposed elements shall be ceramic or porcelain.

2.3.5 Grid and Heat Strip Elements shall have the resistance wire surrounded by the insulation material and enclosed within the tubular sheath. The sheath shall be imbedded and completely sealed within the cast aluminum grid. Electrical terminals shall project through the cast aluminum grid and shall be designed to minimize the entrance of atmospheric moisture into the heating element.

2.3.6 Heat Strip Element resistance wire shall be uniformly spaced along the length of the sheath.

3.1 EXECUTION:

3.2 Fins shall be mechanically bonded or soldered to the tubes. Tubes shall be rolled and bushed, brazed, or welded to headers. Where required, multiple type supports shall be provided to prevent tube sag. The fin tube and header section shall float within the casing to allow free expansion.

3.3 Removing, Saving, Testing, Cleaning, and Recharging Refrigerants:

3.3.1 Refrigerant in a system in which the coil is to be repaired or replaced shall be removed, saved, and reused in recharging the system. When repair or replacement of the coil has been completed, the refrigerant system shall be pressure-tested and recharged with refrigerant.

3.3.2 The Repaired Coil shall be pressure-tested to 300 psig with dry nitrogen and allowed to stand for 24 hours with no pressure drop after repair or replacement of the coil. Then evacuate the system and/or coil with a vacuum pump capable of pulling 1 mm Hg vacuum absolute. Operate the vacuum pump until a vacuum of 2.5 mm Hg absolute is reached. After evacuation, recharge the system with the refrigerant previously removed. Recharge the refrigerant back into the system through a filter drier with capacity capable of removing foreign materials and moisture in the amount of refrigerant removed. The system shall be replenished with refrigerant to provide a fully charged system.

3.3.3 If the system has lost its full charge of refrigerant, a new suction line and liquid line filter drier, sized as recommended by the condenser manufacturer, shall be provided and the system pressure tested, evacuated, and recharged with refrigerant as specified above.

3.4 Welding shall be in compliance with AWS D1.1.

3.5 Brazing shall be in compliance with ASME Code Section IX.

3.6 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P21035.

3.7 Testing: Hydrostatically test repaired water and steam coils at 1-1/2 times the maximum working pressure.

## STEAM AND HOT WATER UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steam and hot water unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.1 PRODUCTS:

2.2 New Unit Heaters shall comply with the requirements of AMCA 99 and 210; NFPA 70; and UL Electrical Construction Materials List.

### 2.3 Coils:

2.3.1 Coils shall be constructed of round seamless copper tubing complying with ASTM B 75, mechanically or hydraulically bonded or expanded into fins constructed of copper or of aluminum complying with ASTM B 209. Tube joints shall be made with high temperature brazing alloys complying with ASTM E 56.

2.3.2 Coil Headers shall be fabricated from seamless carbon steel pipe complying with ASTM A 53, extra heavy seamless copper tubing complying with ASTM B 75 or B 251, or semi-steel complying with ASTM A 126, Class C.

2.4 Housings shall be fabricated from sheet steel complying with ASTM A 569 of a thickness and of sufficient strength to ensure rigidity. Unit heater housings shall be provided with means of suspension or floor mounting as required.

### 2.5 Fan and Drive:

2.5.1 Propeller and Centrifugal Fans shall be fabricated of aluminum or steel.

2.5.2 Centrifugal Fan Shaft shall be sized for maximum fan speed.

2.5.3 Fan Bearings on belt-driven units shall be self-aligning, permanently lubricated, or the periodic lubricating type with accessible lubricating means. Bearings shall be designed to withstand radial and thrust working loads.

2.5 Controls: Unit heaters shall be furnished with unit-mounted line voltage thermostats to provide ON/OFF fan control.

### 3.1 EXECUTION:

3.2 Welding shall be in compliance with AWS D11..

3.3 Brazing shall be in compliance with ASME Code Section IX.

3.4 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

## SECTION 15765

### CLEANING OF HEAT EXCHANGERS

1.0 DESCRIPTION OF WORK: This specification covers the cleaning of heat exchangers. Products and materials used shall be in accordance with the heat exchanger manufacturer's recommendations and/or shall be as directed by the Contracting Officer. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the heat exchanger manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS

2.2 Equipment required for cleaning such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizing tank and pump, power brushes, power cutters, and other related items shall be supplied by the Contractor.

#### 2.3 Chemical Cleaning Materials:

2.3.1 Acid Cleaning Chemicals shall be hydrochloric acid complying with Fed. Spec. 0-H-765, Ammonium bifluoride NH<sub>4</sub>HF<sub>2</sub>, and sulfuric acid complying with Fed. Spec. O-S-809.

2.3.2 Neutralizing Chemicals shall be one percent soda ash solution complying with ASTM D 458 and one percent caustic solution complying with ASTM D 456.

2.3.3 Flushing Water shall be potable having not more than 1,000 ppm total solids.

#### 2.4 Mechanical Cleaning Materials and Equipment:

2.4.1 Hot Water shall be used for high velocity wash.

2.4.2 Powered Brushes shall be of the type for use with power units.

2.4.3 Nylon Brushes shall be of the type blown with high pressure water.

#### 3.1 EXECUTION:

3.2 General: Clean heat exchangers of all scale and deposits. Straighten and clean fins on finned tubes.

3.3 Inspection: After heat exchanger cleaning operation, tubes, will all be given a visual inspection by the Contracting Officer for effectiveness of scale removal.

3.4 Welding and Burning: No welding or burning shall be allowed during cleaning operation.

3.5 Acid Wash Time may vary from four to eight hours depending on scale analysis. Time shall represent actual retention of the solvent in the unit, including filling and draining time.

3.6 Effluent Neutralization: Solvent effluent drained from the unit shall be neutralized with caustic in compliance with ASTM D 456 or soda ash in compliance with ASTM D 458, to a pH of 6.8 to 8.5.

## SECTION 15781

### PACKAGED HEATING AND COOLING UNITS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of air-cooled packaged heating and cooling units, including through-wall, roof top, and computer room type units with electrical heat. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Capacity ratings shall be in accordance with ARI standard 360 for equipment rated at 135,000 Btuh or over and ARI 210 for smaller units.

2.3 Casing shall have a corrosion protective coatings Casing shall have 1/2-inch thick minimum thermal insulation and the compressor compartment shall have acoustical insulation.

2.4 Compressors shall be direct drive semi-hermetic with a maximum operating speed of 1,750 rpm. Each compressor shall have an independent refrigeration circuit with integral sub-cooling unit.

2.5 Evaporator Coils shall be copper tubing with aluminum fins. New coils shall be pressure and leak tested at the factory at 1.5 times the working pressure.

2.6 Filters shall be 2-inch thick throwaway type.

2.7 Condensers shall have copper tubes and aluminum fins. New condensers shall be leak tested at the factory at 1.5 times the working pressure. A separate direct drive fan shall be included for each refrigeration circuit.

2.8 Heating Coil shall be low watt density, fin-tubular construction, protected by thermal safety switches.

2.9 Humidifier of the infrared type shall be provided for computer room type units.

#### 3.1 EXECUTION:

3.2 Welding shall be performed in accordance with AWS D1.1 and/or ASME Code Section IX.

3.3 Brazing shall be performed in accordance with ASME Code Section IX.

3.2 Damage to Galvanized Coatings shall be repaired with paint complying with DOD-P-21035.

SECTION 15782

PACKAGED HEAT PUMPS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled packaged heat pumps, including through-wall and roof top type units with supplemental electric heat. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Capacity ratings shall be in accordance with ARI Standards 240 and 270.

2.3 Casings shall have a corrosion protective coating. Casing shall have 1/2-inch thick minimum thermal insulation, and the compressor compartment shall have acoustical insulation.

2.4 Compressors shall be direct drive semi-hermetic with a maximum operating speed of 1,750 rpm. Each compressor shall have an independent refrigeration circuit with integral sub-cooling unit. Refrigerant accessories shall include a reversing valve and suction line oil/gas accumulator.

2.5 Evaporator Coils shall be copper tubing with aluminum fins. New coils shall be pressure and leak tested at 1.5 times the working pressure.

2.6 Filters shall be 2-inch thick throwaway type.

2.7 Condensers shall have copper tubes and aluminum fins. New condensers shall be leak tested at the factory at 1.5 times the working pressure. A separate direct drive fan shall be included for each refrigeration circuit.

2.8 Auxiliary Heating Coil shall be low watt density, fin-tubular construction, protected by thermal safety switches.

2.9 Controls shall provide for automatic switchover between cooling and heating cycles.

3.1 EXECUTION:

3.2 Welding shall be performed in accordance with AWS D1-I and/or ASME Code Section IX.

3.3 Brazing shall be performed in accordance with ASME Code Section IX.

3.4 Damage to Galvanized Coatings shall be repaired with paint complying with DOD-P-21035.

## SECTION 15800

### HUMIDITY CONTROL EQUIPMENT

1.0 DESCRIPTION OF WORK: This section covers the furnishing and installation of humidifiers and dehumidifiers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Humidifiers shall be pneumatic modulating type.

2.2.1 Steam Separator shall be designed to remove water droplets and particles larger than 3 microns when humidifier is operating at full capacity.

2.2.2 Control Valve shall be stainless steel plug type with pneumatic operator.

2.2.3 Distribution Manifold shall provide uniform dry steam distribution throughout its entire length.

2.2.4 Strainer shall be Y-type.

2.2.5 Steam Trap shall be as recommended by the manufacturer of the steam humidifier and shall be preceded by a drip leg.

2.3 Dehumidifiers shall be free-standing self-contained plug-in type units at are UL listed.

2.3.1 Components shall be housed in a portable 22-gauge steel cabinet.

2.3.2 Capacity Ratings shall be in accordance with ANSI B149. Overflow cutoff control shall be provided.

#### 3.1 EXECUTION:

3.2 Steam Supply Manifold for humidifier shall be installed either perfectly level or extending upward vertically in duct. Discharge holes shall point upstream against airflow.

3.3 Welding shall be performed in accordance with AWS D1.1 and ASME Code Section IX, where applicable.

## SECTION 15830

### RADIATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of radiators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 New Radiators shall comply with AGA Directory of Certified Appliances and Accessories; IBR Testing and Rating Code for Finned Tube (Commercial) Radiation, if applicable; NFPA 70; and UL 499 or UL 795, as applicable.

#### 2.3 Cast-Iron Radiators:

2.3.1 Core shall be small tube section constructed of cast iron complying with ASTM A 48.

2.3.2 Core Sections shall be assembled with malleable iron or polytetrafluoroethylene coated steel push nipples.

#### 2.4 Baseboard-Fintube Radiators:

2.4.1 Nonferrous Fintube shall be fabricated of seamless copper tubing, complying with ASTM B 75 and mechanically expanded into aluminum fins.

2.4.2 Ferrous Fintube shall be fabricated of steel pressure tubing complying with ASTM A 450 and mechanically expanded into fins of steel sheet complying with ASTM A 568.

2.4.3 Enclosure, Dampers, and Element Supports shall be fabricated from carbon steel complying with ASTM A 568.

#### 2.5 Radiant Radiators:

2.5.1 Gas Plenum shall be carbon steel with a porcelain enameled finish complying with ASTM A 424 and Fed. Spec. PPP-P-600, or galvanized in compliance with ASTM A 526.

2.5.2 Air Mixer shall be carbon steel with a corrosion-resistant finish complying with ASTM A 526 or ASTM A 568.

2.5.3 Venturi shall be carbon steel complying with ASTM A 526 or ASTM A 568 with a corrosion-resistant finish.

2.5.4 Enclosure shall be carbon steel complying with ASTM A 526 or ASTM A 568.

#### 2.6 Convectur Radiators:

2.6.1 Electric Heating Element shall be constructed of nickel chromium wire enclosed within a metal sheath and electrically insulated in the sheath with a densely compacted refractory material.

2.6.2 Hydronic/Steam Heating Elements shall be constructed of seamless copper tubing complying with ASTM B 75 mechanically expanded into aluminum fins. The tube and fin assembly shall be encased in a frame of steel complying with ASTM A 568. Tube headers shall be steel or brass joined to the tubes by high temperature brazing alloys complying with ASTM E 56.

2.6.3 Enclosure, Dampers, Element Supports, and Access Doors (when applicable) shall be fabricated from carbon steel complying with ASTM A 568.

3.1 EXECUTION:

3.2 Welding shall be performed in accordance with AWS D1.1.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P21035.

## SECTION 15840

### INDUCTION UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of induction units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Low Induction Units shall include cabinet, primary air plenum with inlet collar, air balancing damper, multi-stage nozzles, coil, drain pan, and discharge stack. Units shall be tested and rated at the factory in accordance with ARI standard 445.

2.3 Cabinet and Primary Air Plenum shall be constructed of or repaired with 24 gauge galvanized steel with die-cast support frame members. Plenum shall be lined with 3/8-inch thick, 25-pound density insulation, black plastic bonded fiberglass, mat-faced.

2.4 Nozzles shall be provided in vertical strips, precision molded from heat-resistant thermoplastic material. Nozzles shall be designed for temperature range encountered with pressures up to 3-1/2 inch wg. Nozzle strips shall be mechanically sealed and locked to nozzle frame.

2.5 Dampers shall be multiple-hole design and shall extend the full length of the plenum. Adjustment shall be provided by manual pushpull operator located next to the primary air inlet.

2.6 Coils shall be designed for 300 psi working pressure.

#### 3.1 EXECUTION:

3.2 Induction Units shall be installed level, using shims if required, and anchored to the floor.

3.3 Damage to Galvanized Coatings shall be repaired in compliance with Mil. Spec. DOD-P-21035.

## SECTION 15855

### AIR HANDLING UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air handling units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Built-up air handling units (AHUs) shall consist of casings, fan sections, coils, filter boxes, mixing boxes, dampers, and other equipment as required. All AHUs shall be certified in accordance with ARI Standard 430. Coils shall be certified in accordance with ARI Standard 410. Electric heating coils shall meet the requirements of UL and the National Electric Code. AHUs shall also conform to the requirements of NFPA 90A and all applicable SMACNA standards.

3.1 EXECUTION:

3.2 Air-Handling Units shall be installed to conform with NFPA 90A and applicable SMACNA standards.

3.3 Welding shall be performed in compliance with AWS D1.1.

SECTION 15860

CENTRIFUGAL FANS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of centrifugal fans. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Fan Performance:

2.2.1 New Fans shall comply with AMCA 210, 300, and 301.

2.2.2 Capacity and Performance of New or Repaired Fans shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.

2.3 Fan Wheel and Shaft:

2.3.1 Aluminum Fan Wheels shall comply with Fed. Spec. QQ-A-596. Fan wheels for wall exhaust fans shall be constructed of aluminum complying with ASTM B 209. Steel for the fan wheels shall comply with ASTM A 366.

2.3.2 Fan Shaft shall be turned, ground, and polished carbon steel alloy.

2.3.3 Fan Shaft shall be tubular with swaged ends accurately finished.

2.3 Fan Housing:

2.3.1 Fan Housing shall be carbon steel sheet complying with ASTM A 569, except wall exhaust fan housings shall be spun aluminum complying with ASTM B 209.

2.3.2 When the fan discharge of the existing housing to be replaced is changeable, discharge of the new housing shall be easily changed in compliance with AMCA Bulletin 99.

2.4 Inlet Boxes: Steel for repairs shall be carbon steel sheet complying with ASTM A 569.

2.5 Bearings:

2.5.1 Precision Antifriction Bearings shall comply with Fed. Spec. FF-B-171.

2.5.2 Sleeve Bearings shall be self-aligning sleeve bearings.

2.5.3 Roller Bearings shall be self-aligning, high load capacity, grease-lubricated, heavy-duty, pillow block type.

2.5.4 Wall Exhaust Fan Bearings shall be sealed-in lubrication, antifriction type adequate for both radial and thrust loads occurring in the mounting.

2.6 Fan Belts shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only.

2.7 Insulation in fan housing shall be mineral fiber complying with Fed. Spec. HH-E-558, Form B, Type 1. Adhesive shall be fire resistive adhesive complying with Mil. Spec. MIL-A-3316.

3.1 EXECUTION:

3.2 Balancing: Centrifugal fan wheels, repaired or new, shall be balanced statically and dynamically.

3.3 Welding shall be performed in compliance with AWS D1.1.

3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair point in compliance with Mil. Spec. DOD-P-21035.

## SECTION 15865

### AXIAL FLOW FANS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of axial flow fans. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Capacity and-Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. New fans shall comply with AMCA 210, 300, and 301.

2.3 Fan Wheel repair material shall be sheet aluminum complying with ASTM B 209. New wheels shall be of airfoil design and shall be statically and dynamically balanced at the factory.

2.4 Fan Shafts shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.

2.5 Fan Housing shall be 22 gauge, welded carbon steel complying with ASTM A 569.

2.6 Propeller Guards, when required, shall be sheet metal complying with ASTM A 366 or hot-dip galvanized wire complying with ASTM A 641.

2.7 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust loads occurring in the mounting.

2.8 Fan Belt shall comply with RHA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only. Belt guards shall comply with OSHA.

2.9 Insulation in fan housing shall be mineral fiber complying with Fed. Spec. HH-I-545. Adhesive shall be fire resistive adhesive complying with Mil. Spec. MIL-A-3316.

#### 3.1 EXECUTION:

3.2 Welding shall be performed in compliance with AWS D1.1.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair in compliance with Mil. Spec. DOD-P21035.

## SECTION 15871

### POWER ROOF VENTILATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of power roof ventilators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

##### 2.2 PRV Performance:

2.2.1 New PVRs shall comply with AMCA 210, 300, and 301.

2.2.2 Capacity and Performance of new and repaired PRVs shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.

2.2 Fan Wheel shall be centrifugal, axial flow, or turbine type, non-overloading, constructed of aluminum complying with ASTM B 209.

2.3 Fan Shaft shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.

2.4 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust load occurring in the mounting.

2.5 Fan Housing shall be spun aluminum complying with ASTM B 209. The housing shall be weatherproof with 360 degrees discharge air pattern.

2.6 Fan Belt shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only.

2.7 Insulation in fan housing shall be mineral fiber complying with Fed. Spec. HH-I-558, Form B, Type 1. Adhesive shall be fire resistive adhesive complying with Mil. Spec. MIL-A-3316.

2.8 Roof Curb shall be prefabricated, with continuous welded water-tight seams. The curb shall be of the roofed-over, flashing type, with built-in cant strip.

2.9 Back Draft Dampers for installation in the roof curb shall be multiple blade type, constructed of aluminum complying with ASTM B 209.

#### 3.1 EXECUTION:

3.2 Balancing: Centrifugal fan wheels, repaired or new, shall be balanced statically and dynamically. Propeller fans shall be statically balanced.

3.3 Welding shall be performed in compliance with AWS D1.1

3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint in compliance with Mil. Spec. DOD-P-21035.

## SECTION 15881

### DIFFUSERS, REGISTERS, GRILLES, AND LOUVERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of diffusers, registers, grilles, and louvers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Supply Air Ceiling Diffusers shall be constructed of aluminum or steel and shall be furnished with volume control dampers. Provide ceiling-mounted diffusers with rubber gasket sponge and ceiling frames for anti-smudging protection.

2.3 Supply Air Slot Diffusers for sidewall, sill, or floor mounting shall have 1/2-inch bar spacing with 0 degrees or 15 degrees deflection. Construction shall be extruded aluminum. Furnish with volume control damper.

2.4 Return Air Registers shall be constructed of aluminum or steel and shall be furnished with opposed blade volume control dampers.

2.5 Return Air Ceiling Registers shall be constructed of aluminum with aluminum or plastic egg crate grille.

2.6 Grilles shall be as specified for registers, without volume control damper.

2.7 Louvers shall be in accordance with SMACNA Low Pressure Duct Construction Standards. Louvers shall be constructed of aluminum or steel and shall be furnished with birdscreens. Louvers shall bear the AMCA Certified Ratings Seal for air performance and water penetrations ratings as described in AMCA 500.

2.8 Inlets and Outlets shall be sound rated and certified in accordance with ADC 1062R4 in sound power level, dB referenced to 10 to the minus 12 watt, in octave bands 2 through 5. Performance shall be certified in accordance with ADC 1062R4.

2.9 Inlets and Outlets shall follow recommended noise levels as stated in SMACNA Manual for HVAC Systems Duct Design.

3.1 EXECUTION: Diffusers and registers shall be installed in accordance with applicable SMACNA Standards.

3.2 Return Air Registers/Grilles shall be similar to Supply air registers/diffusers when applicable.

## AIR CLEANING DEVICES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air cleaning devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.1 PRODUCTS:

2.2 Throwaway Panel Filters shall be constructed of glass, paper, or fabric media with a UL listing of Class 2 and shall be 1 or 2 inches thick as required. The filters shall have an initial resistance not greater than 0.30 inch w.g. at a face velocity of 500 fpm.

2.2 Extended Surface Self-supporting Filters shall be constructed of UL-listed Class 1 or Class 2 fibrous media, integral media support, and a rigid galvanized steel frame. Nominal thickness shall be 12 inches. Filter dustspot efficiency shall be rated in accordance with ASHRAE 52 Test Standard.

2.2.1 Filters Rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.50 inch w.g. at 500 fpm face velocity.

2.2.2 Filters Rated at 80-85 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.60 inch w.g. at 500 fpm face velocity.

2.2.3 Filters Rated at 90-95 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.70 inch w.g. at 500 fpm face velocity.

2.3 Extended Surface Non-S ported Filters shall be constructed of UL-listed Class 1 or Class 2 fibrous media. Individual bags shall be retained by a galvanized steel frame. Filter dustspot efficiency shall be rated in accordance with ASHRAE 52 Test Standard.

2.3.1 Filters Rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.35 inch w.g. at 500 fpm face velocity.

2.3.2 Filters Rated at 80-85 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.45 inch w.g. at 500 fpm face velocity.

2.3.3 Filters Rated at 90-95 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.55 inch w.g. at 500 fpm face velocity.

2.4 Automatic Renewable Roll Filters shall be constructed of 2inch thick, viscous-coated, UL-listed Class 1 or Class 2 fibrous media Filter initial resistance shall be not greater than 0.50 inch w.g. at 500 fpm face velocity. Filter efficiency shall be 80-85 percent when tested in accordance with the NBS Cottrell Precipitate Test.

2.5 Permanent Washable Panel Filters shall consist of galvanized steel media and frames, 1-inch or 2-inch thickness as required. Filters shall have an initial resistance not greater than 0.10 inch w.g. at 500 fpm face velocity.

2.6 HEPA Filters shall be constructed of UL-listed Class 1 glass fiber media sealed in a rigid casing. Filters shall be rated by the DOP Test Method on 0.3 micron particles. Filter initial resistance shall not be greater than 1.0 inch w.g. for the rated airflow. Filters shall be furnished complete with necessary gaskets.

2.6.1 Filter Rated for 150 fpm Face Velocity with 95 percent DOP efficiency; 6-inch filter depth.

2.6.2 Filter Rated for 250 fpm Face Velocity with 95 percent DOP efficiency; 12-inch filter depth.

2.6.3 Filter Rated for 150 fpm Face Velocity with 99.99 percent DOP efficiency; 6-inch filter depth.

2.6.4 Filter Rated for 250 fpm Face Velocity with 99.99 percent DOP efficiency; 12-inch filter depth.

2.7 Activated Carbon Filters shall be constructed of epoxy-coated perforated steel trays containing the activated carbon. Individual trays shall mount in a gasketed side access housing. The unit shall have an initial resistance of 0.35 inch w.g. at 500 fpm face velocity.

2.8 Electronic Aircleaners shall consist of an electrostatic agglomerator section and a renewable fibrous glass collector. The unit shall provide a dustspot efficiency of 90 percent at 500 fpm face velocity. Typical operating resistance shall be 0.40 inch w.g.

2.9 Dust Collectors shall be the dry centrifugal type complete with integral blower, dust separator, and hopper.

3.0 EXECUTION: Install filters in accordance with applicable sections of NFPA 70, 90A, and 90B.

## SECTION 15887

### TAILPIPE EXHAUST EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of tailpipe exhaust equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Capacity and Performance shall be based on standard air density (0.075 pound per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.

2.3 Blowers and Accessories shall comply with AMCA 210, 300, and 301. Fan impellers shall be constructed of heavy gauge steel and accurately balanced both statically and dynamically when installed in the assembled fan unit. Impeller and housing in the air stream shall be coated with neoprene, epoxy, phenolic resins, or other material suitable to resist the corrosive gases and temperatures encountered. Fans to be mounted on exterior of building shall be provided with weatherproof covers.

2.4 Exhaust Duct and Fittings for vehicle tailpipe exhaust systems shall be constructed of galvanized sheet steel. Sheets shall conform to Fed. Spec. QQ-S-775, Class D or ASTM A 525. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SMACNA High Pressure Duct Construction Standards.

2.4.1 Tailpipe Adapter shall be not less than 20-gauge corrosion resisting steel. The adapter shall be of the tapered cone type with spring clip or other suitable device for exhaust pipe attachment.

2.4.2 Flexible Exhaust Tubing shall be 0.012 minimum thickness galvanized sheet steel or heat-resistant, reinforced wire, fiberglass, and neoprene tubing.

2.4.3 Dampers shall be of the circular disk type with quadrant locking device or blast gate type.

2.4.4 A Flexible Tubing Suspension System shall be furnished and installed for repaired tailpipe exhaust systems where no such suspension system exists. The flexible tubing suspension system shall suspend the flexible tubing overhead when not in use, allowing it to be lowered to the operating level, when required. The suspension system installed shall be complete with cable, pulleys, and operating mechanism.

#### 3.1 EXECUTION:

3.2 Ductwork joints in galvanized sheet steel ductwork shall be soldered or otherwise sealed. The lock seam in straight sections shall be located on top of the duct. Seams shall be suitable for 10-inch water gauge static pressure. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SHACNA High Pressure Duct Construction Standards.

3.3 Weather-Resistant Finishes of items located outdoors shall meet the requirements of ASTH B 117.

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SECTION 15890

## DUCTWORK AND ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ductwork and accessories. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

### 2.1 PRODUCTS:

2.2 Metal Duct and Equipment Casings, Housing, and Plenums shall be fabricated in accordance with SMACNA Low Pressure Duct Construction Standards or High Pressure Duct Construction Standards, as applicable, and shall comply with NFPA 90A, 90B, and 91. Metal gauge shall generally be in accordance with SMACNA standards but in no case shall be less than existing duct gauge.

2.2.1 Galvanized Steel shall comply with ASTM A 527 and with ASTM A 525 for zinc coating.

2.2.2 Black Steel shall comply with ASTM A 569.

2.2.3 Aluminum shall comply with ASTM B 209.

2.2.4 Stainless steel shall comply with ASTM A 167.

2.2 Fibrous Glass Duct shall be fabricated in accordance with SMACNA Fibrous Glass Duct Construction Standards.

2.3 Flexible Duct shall be in accordance with NFPA 90A and SMACNA Flexible Duct Performance and Installation Standards and shall be UL listed.

2.4 Flexible Connectors shall be in accordance with NFPA 90A and shall be UL listed.

2.5 Sealants shall be in accordance with SMACNA High Pressure Duct Construction Standards.

2.6 Hangers and Supports shall be constructed of galvanized steel or other corrosion-resistant material in accordance with SMACNA Duct Construction Standards.

2.7 Ductwork Accessories shall be in accordance with SMACNA Duct Construction Standards.

2.8 Paint for Repair of Galvanized Surfaces shall comply with Mil. Spec. DOD-P-21035.

### 3.1 EXECUTION:

3.2 Ductwork: Damaged sections of duct shall be repaired by patching or by replacing complete sections. Work shall comply with the applicable sections of SMACNA Low Pressure Duct Construction Standards, High Pressure Duct Construction Standards, and NFPA 90A, NFPA 90B, or NFPA 91.

3.3 Flame Cutting: No cutting by torch or flame shall be done without authorization from the Contracting officer.

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3.4 Welding shall be performed in compliance with AWS D1.1.

3.5 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.

15890-2

SECTION 15915

CONTROL AND FIRE DAMPERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control and fire dampers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 New Control Dampers may be of parallel or opposed blade design and shall be tested in accordance with the requirements of AMCA 500 for the specific performance characteristics required. Construction shall be in accordance with the requirements of SMACNA construction standards, as well as ASHRAE recommendations pertaining to construction of duct accessories.

2.3 New Fire Dampers may be of single blade, multi-blade, or curtain design and shall be tested in accordance with the requirements of UL 555. Fire dampers shall be UL listed and/or FM approved for their intended use. Fire dampers shall also conform to the requirements of the SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.

3.1 EXECUTION:

3.2 Control Damper Installation and Repair Work shall be in compliance with applicable portions of details of construction, as shown in ASHRAE and SMACNA standards.

3.3 Fire Damper Installation and Repair Work for dampers in air conditioning and ventilating duct openings, through walls and floors, shall be in compliance with the requirements of NFPA Standard 90A and the SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems. Fire damper installation and repair work for dampers in wall openings without ducts shall be repaired or replaced in compliance with the requirements of NFPA 80, when such openings are not passageways.

15915-1

SECTION 15920

SOUND ATTENUATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound attenuators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Sound attenuators shall be constructed of galvanized steel with acoustical baffle as required to provide the desired attenuation. Methods for presenting sound attenuation data shall be consistent with the ASHRAE Handbook Series.

3.0 EXECUTION: Installation shall comply with the SMACNA duct construction standards.

15920-1

SECTION 15951

CONTROL DEVICES FOR MECHANICAL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control devices for mechanical equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Controls may include sensors, transducers, controllers, controlled devices, and other accessories as required. Typical items include thermostats, humidistats, aquastats, controllers, control valves, dampers, specialized control packages, air supply packages, tubing, control wiring, and panels. Where a complete control system is replaced, all new control components shall be by the same manufacturer.

3.1 EXECUTION:

3.2 All Control Components other than those located in finished spaces shall be clearly tagged.

3.3 Control Valves shall be mounted horizontally with operator up unless otherwise directed by the Contracting officer.

3.4 Instrument Air for pneumatic controls shall be clean, dry, oil-free compressed air.

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## SECTION 15990

### TESTING AND BALANCING OF HVAC SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers testing and balancing of HVAC systems.

2.0 PRODUCTS: (Section not used.)

3.1 EXECUTION:

3.2 Test and Balance Contractor shall be certified by the National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC).

3.3 Certified-Test Reports shall be submitted by the Contractor to the Contracting Officer. Test reports shall comply with the standards, listed below, of the selected test and balance association.

3.3.1 NEBB, Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

3.3.2 AABC, Manual MN-1, AABC National Standards.

3.4 Test and Balance Work shall be in accordance with the standards of the selected test and balance association. The work shall also comply with the recommendations of ASHRAE pertaining to instruments, measurements and procedures and with SMACNA's Manual for Balancing and Adjusting of Air Distribution Systems.

3.5 Systems shall be tested at near maximum load conditions. Cooling systems shall be tested in summer; heating systems shall be tested in winter.

3.6 Equipment Settings including dampers, valves, and similar equipment shall be marked to show final positions at the completion of balancing.

## SECTION 16050

### BASIC ELECTRICAL MATERIALS AND METHODS

1.1 DESCRIPTION OF WORK: This specification covers the furnishing and installation of the Basic Electrical Materials and Methods. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations.

A. Distribution for primary/secondary electrical power and lighting will be indicated on the submitted drawings, including, but not limited to, disconnect switches and circuit breakers, feeders, sub feeders, grounding, panelboards, and motor starters.

B. Branch circuit wiring including conduits, EMT, wireway and unistrut, wire, lighting outlets, switches, receptacles, and power outlets will also be indicated on the submitted drawings.

C. Connect all motors, electrically operated equipment and metering devices, and controls for same, furnished under this or any other division of these specifications, or noted on the SOW, including, but not limited to, boilers, pumps, automatic doors and air conditioning and ventilation equipment.

D. Conduits, outlets and terminal cabinets, with pull wires, for telephone requirements shall be shown on the submitted drawings.

E. Lighting Fixtures and Lamps, see Section 16500.

F. Fire Alarm System, see Section 16721.

G. Demolition and relocation of equipment.

H. Provide a Jet Line No. 232 polyolfin 200 lbs. test pullwire in all empty conduits, and weather seal the same.

I. All electrical equipment shall be installed in a neat and workmanlike manner.

1.1 General Condition Requirements: The General Conditions, Supplementary Conditions and Division 1-General Requirements apply.

1.2 Related Work Specified Elsewhere in The Specifications:

A. Basic Mechanical Materials and Methods - Section 15050.

B. Air Distribution - Section 15800.

1.3 Codes and Standards:

A. Comply with the latest editions of the codes and standards of the following as a minimum standard unless specifications or request for proposal (RFP) or SOW require a higher minimum standard:

1. American National Standard Institute (ANSI)

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2. National Electrical Code (NEC)

3. National Electrical Manufacturers Association (NEMA)

4. National-Fire Protection Association (NFPA)

5. Underwriters Laboratories, Inc (UL)

1.4 Minor Deviations: The submitted drawings and schematics shall indicate the extent and general arrangement of equipment and systems. If minor deviations from the Contract Drawings or Schematics are necessary, submit details of such deviations to Contracting Officer for approval prior to doing the work.

1.5 Temporary Light and Power: Supply temporary light and power as required during construction for all trades requiring same.

1.6 Project Record Documents: Prepare up-dated As-Built Drawings, Schematics, Specifications and Maintenance and Operation Manuals. Submit as per applicable, foregoing sections of the specifications to the Contracting Officer.

1.7 Demonstration:

A. Demonstrate the essential features of all systems installed under the various sections of this specification in the presence of the Contracting Officer, or his designated representative, and appropriate Civil Engineering personnel.

B. Demonstrate how to "Stop-Start", reset, replace, and any emergency procedures.

C. Demonstrate one system at a time.

1.8 Submittals: Furnish 4 Copies of complete sets of the listed submittals to the Contracting Officer for approval on the items following:

A. Catalog Data:

1. Wiring devices and wall plates 2. Circuit breakers 3. Conduit, raceways and fittings (each type)  
4. Ground rods 5. Insulated conductors and cables 6. Outlet, junction and pull boxes 7. Starters and Contactors

B. Shop Drawings:

1. Panelboards 2. Dry-type transformers

2.1 PRODUCTS:

2.2 Identification: Label all switches, starters, disconnects, equipment, etc., with 1/2" high plastic labels equal to dymo. Show type of system and voltage of contained conductors outside and inside of all junction box covers.

2.3 General:

A. Applicable Publications: The following publications, of latest issue at time of contract solicitation, are hereby incorporated in, and by reference, made part of this specification.

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1. Federal Specifications (FS):

W-S-610c: Splice, Conductor

W-C-581e: Conduit, Metal Rigid and Coupling, Elbow and Nipple, Electrical Conduit;  
Steel, Zinc Coated

B. Furnish new materials of a commercial or heavy duty grade, free from defects and of the best

quality available in each specified grade or class.

C. All materials to bear the label of the Underwriters' Laboratory for the intended use or to be materials approved by the code enforcing authorities and the Contracting Officer.

D. Store and protect all materials from injury prior to installation.

1. Do not store materials directly on the ground or floor. Keep as dry and clean as possible and free from damage or deteriorating elements.

2. Materials damaged during transit or storage shall be replaced prior to installation.

E. Equipment of a similar nature to be identical. For example, all fixtures or panels to be of the same manufacturer and of the same style.

F. All hardware and accessory fittings to be of a commercial grade and type designed, intended and appropriate for the use installed and shall complement the items with which they are used. Corrosion protection shall be suitable for the atmosphere in which they are installed.

#### 2.4 Motors:

A. Voltage, phasing and cycles to be as indicated on the drawings or specified herein and generally as follows:

1. Up to and including 1/2 HP: Operate at 120/1/60.

2. 3/4 HP and larger: operate at 208/3/60.

B. Furnish motors manufactured or supplied by the related equipment supplier.

C. Integral horsepower and 3 phase motors shall be of drip-proof design except motors in wet locations shall be epoxy-encapsulated, TEFC.

D. Provide all electric motors installed out of sight of its starter or circuit protector (fusible switch or breaker) with a non-fusible disconnect switch applicable to amperage, voltage, and phases at the motor.

E. Meggar each motor winding before energizing the motor. Do not energize if insulation resistance is found to be low.

F. Verify and check the motor nameplate with the overload heaters in the starters.

G. Phase protection is required for all polyphase electrical equipment which shall shut down the equipment if a single phase condition occurs.

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#### 2.5 Motor Starters:

A. Manual Starters: Install at the motor to serve as a disconnect. Provide In NEMA 1 enclosure unless otherwise noted.

B. Fractional Horsepower: Quick-Make, Quick-Break, toggle action, inoperative unless thermal unit is in position. One piece melting alloy thermal units.

C. Magnetic Starters:

1. NEMA 1 enclosures unless otherwise specified.
  2. Full voltage non-reversing unless otherwise specified with 3 overload elements.
3. Hand-off-automatic switch with reset in cover.
- D. Acceptable Manufacturers: Square "Du, Westinghouse, General Electric, Cutler Hammer or equal.

2.6 Outlet Boxes:

A. Exterior Outlet boxes shall be of Cadmium plated malleable iron with fiberglass flip covers and non-rusting stainless steel screws.

B. Surface Outlet boxes shall be 4-inch-square by 1 1/2-inch-deep steel fabricated boxes, galvanized after fabrication with a 4-inch square raised cover with openings for single or dual gang devices. Use 4-inch octagon boxes with bar hangers.

C. Flush Outlet boxes shall be the same as specified for surface except that plaster device covers, with depth to suit wallboard used shall be provided.

1. Ceiling Outlets: Recessed Fixtures: 4-inch square boxes with blank covers and 1/2-inch flex drops to fixtures.
  2. Fire Alarm Pull Stations: 1-gang device cover on flush 4-inch square box.
  3. Telephone Outlets: Wall Stations: 1 gang device cover on flush 4-inch square box.
  4. Furred Ceiling: Fit with plaster ring and fixture stud if required.
  5. Lay-in Ceiling: 4m x 4" x 1-1/2" deep above grid with 1/2- inch flex conduits run out to lighting fixtures.
- D. Increase or decrease box size where required by the NEC.

2.7 Pull Boxes and Junction Boxes: Code gauge galvanized steel sized in accordance with the NEC.

2.8 Wire and Cable:

A. Conductors:

1. All conductors to be stranded copper unless otherwise noted. Insulation to be rated 600 volts with permanently marked size, grade of insulation, voltage and manufacturer's name at regular intervals on outer covering.

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2. Feeders and Sub-feeders:

- a. Type THW or THWN insulation.
- b. Aluminum may not be used.
- c. Branch circuits:

- (1) Minimum No 12 AWG, stranded, unless otherwise shown.

- (2) Factory color coded with same color throughout system for same phase.
- d. Run one #12 insulated green grounding wire in receptacle circuits all the way back to the panel. Furnish grounding point and grounding bars in all panels, switches and load centers.
- e. Minimum No 10 stranded for all branch circuit runs exceeding 75 feet to first outlet.
- f. No. 14 stranded, color coded control conductors for 100 to 600 volts.
- g. No. 16 single conductor copper plastic jacketed thermostat cable for 50 volt and under, multi-conductor as required.
- h. Fixture wire shall be type AF plain, 300 volt, No. 14, 150 degree C for 120 volt fixtures and type TFFN No. 16 for fluorescent lighting pigtails.
- i. Portable Cord to be stranded, UL listed, resistant to water, acid, and alkalis--Type SO minimum 12 AWG. stranded.
- j. Provide each cord with one green insulated grounding conductor.
- k. Telephone cable and thermostat cable shall have solid copper conductors, thermoplastic insulation and vinyl jacket. Use No. 22 AWG for telephone and No. 18 AWG for thermostats.

B. Grounding Cable:

- 1. Shall be either bare or insulated copper rated as current carrying conductor. Minimum to be No. 12 AWG.

C. Ground Rods:

- 1. Copper clad steel, size as indicated on the submitted drawing, minimum 10 feet long.

2.9 Wire Connections and Devices:

- A. Comply with F.S. W-S-610c and the NEC for connections.

B. Connectors:

- 1. For temperatures to 105 degrees C: Ideal Wire Nut, 3M Scotchlok or equal.
- 2. For temperatures to 150 degrees C for use in fixtures: Ideal Wire Nut.

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- C. Taped Connections to be made using Scotch 33, slip knot gray or equal. Fill voids with rubber tape or Scotchfill.

2.10 Safety Disconnect Switches:

- A. Switch blades to be fully visible in OFF position when door is open. UL listed lugs for copper cables shall be front removable. All current carrying parts to be plated.

- B. Mechanism: Quick-make, Quick-break operating handle and mechanism, integral with box to match number of phases required. Provide with external operating handles interlocked to prevent opening the

door over fuse compartment except with handle in OFF position. Include padlocking provisions on handle mechanism.

C. Rating: Horsepower rated for 600 volts with provisions for Class K-5 fuses, (indicate on the submitted drawings).

D. Enclosure: NEMA I unless otherwise indicated ( NEMA 3R indicates Rain tight).

E. Type: Heavy duty in compliance with NEKA KSL-1969 and UL 98.

F. Acceptable Manufacturers: Cutler-Hammer, Square "D", General Electric, Westinghouse, or equal.

#### 2.11 Raceways:

A. General: 1/2" minimum diameter and conforming in size to NEC requirements for the number and type of conductors installed.

1. Uniform thickness, smooth circular bore, standard lengths and free from defects.

2. Rigid Galvanized Steel (RGS), Intermediate Metallic Conduit (IMC), or Electrical Metallic Tubing (EMT) as indicated or required by NEC requirements.

B. Rigid Conduit: Hot dipped galvanizing including threads conforming to FS W-C-581.

C. EMT: Zinc plated or sheradized, as manufactured by Triangle, Republic Steel Co., or Allied.

D. Flexible Conduit: Regular galvanized, 1/2" minimum diameter, by National or American.

E. Liquid Tight Flexible Conduit: Galvanized steel with PVC covering by Anaconda.

F. PVC Conduit: Heavy wall, schedule 80.

G. Surface Non-metallic Raceway System: NEC approved PVC wiremold.

H. Fittings: Manufactured for service required.

1. Steel fittings only for EMT and RGS.

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2. Threadless coupling and connectors not permitted on RGS.

3. PVC fittings for PVC conduit.

4. M4T: Compression type fittings only.

2.12 Device: A unit of an electrical system which is intended to carry but not utilize electric energy. Units, such as switches, circuit breakers, fuseholders, receptacles, attachment plugs, and lampholders, that distribute or control, but do not consume electricity, are termed "devices".

A. Switches:

1. Single pole toggle switch: Rated 20 Amps, 120/277 volt, specification grade, back or side wired, grounding type. Sierra 5021, Leviton 1221-1, or Hubbell 1221-1 or equal.
2. Three-way toggle switch: Rated 20 Amps, 120/277 volts, specification grade, back or side wired, grounding type. Sierra 5023, Leviton 1223-1, or Hubbell 1223-I or equal.
3. Single pole pilot light toggle switch: Rated 20 Amps, 120 volt, specification grade, side wired, grounding type, lights in on position. Hubbell 1221-PL (120 volt ), or equal.

B. Receptacles:

1. Duplex receptacles: Rated 20 Amps, 125 volts, specification grade, back or side wired, grounding type. Sierra 1404, Leviton 5262-1, or Hubbell 5262-1 or equal.
2. Single receptacles:
  - (a) Rated 20 Amps, 125 volts, specification grade, side wired, grounding type. Hubbell 5351-I, Leviton 5351-1, or equal.
  - (b) Recessed clock receptacles: Rated 15 Amps,-125 volts, specification grade, grounding type, Leviton 5261-CH, or equal.
3. Ground Fault Receptacles: Duplex 15A, 125 volts, with 20 Amp feed through capacity, specification grade, with test and reset switches in the center of the face; Hubbell No. GF-5262-1 or equal, with matching wall plate having rectangular opening and wide spaced holes for mounting screws.
4. Weatherproof Receptacles: Leviton No. 6198-1 with LED, weatherproof cover No. 6196, or equal, mounted horizontal, 15 Amps with 20 Amp feed through capacity.

C. Wall Plates:

1. Color shall be as specified by the Contracting officer or his authorized representative.
2. Switches and receptacles: Unbreakable, nylon plastic, color to match device.
3. Telephone Outlet: 3 pair modular jack with terminal block and smooth plastic wall plate.
4. Single recessed clock outlets: Leviton, or equal, brushed aluminum, with clock hanger peg.

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D. Furnish engraved legend plates on all switches and receptacles having special functions remote control. Plates shall be laminated plastic or color filled engraving in the wall plate itself, or furnish separate engraved plate as specified in paragraph 2.1(A) Identification as specified herebefore, mounted above the switch or outlet.

2.13 Contactors and Relays:

- A. When not included as part of factory assembled HVAC and mechanical packaged equipment,

provide operating contactors and relays as required for air conditioning and handling equipment. Provide operating contactors and fusible protection for each step of multi-step heaters. Refer to paragraph 2.4 Motor Starters for detailed specifications.

B. Provide lighting contactore and control devices.

2.14 Receptacle Strips:

A. Single circuit with duplex outlets mounted horizontally along the entire length spaced 12 inches on center unless indicated otherwise; Wire mold Plug mold DGB 3000, other equal. Housing shall be cold rolled steel, 2-piece, color as specified.

2.15 Fuses:

A. Dual element of type and interrupting capacity Class K-5.

B. Acceptable Manufacturers: Busainan, Gould, Shawmut, General Electric, or Square "D" or equal.

2.16 Backboards: Exterior marine grade plywood, 3/40. Plywood to be new and painted on front and edges with flat gray oil paint for all surface mounted safety switches, panels, starters, combination starters, contactors, relays, telephone equipment, etc.

2.17 Hangers and Supports:

A. Use materials manufactured by Unistrut, Steel City, or equal.

B. Materials to be installed in accordance with applicable provisions of National Electrical Code.

3.1 EXECUTION:

3.2 General:

A. Prior to commencement of work, verify dimensions at site of work. Bring discrepancies or differences to the attention of the Contracting Officer, or his designated representative, for resolution prior to any installations or work commencement.

B. Verify limitations of space available for installation clearances of all materials specified herein or indicated on approved drawings to insure compliance with NEC and other applicable Codes.

C. Provide accurate layout, grades, and elevations. Take proper precautions to protect work and equipment from damage. Provide all necessary supports required for the safe and proper installation of all materials and equipment and to meet all NEC Code requirements.

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D. Cut all openings, chases, and trenches required for introduction of work and equipment. Do all backfilling and repair floors, walls and ceilings in conformance with the various Specifications Sections.

E. Work shall be accomplished by licensed journeyman electricians or by apprentices working with a licensed journeyman electrician.

F. Installation to conform to the applicable standards, codes, regulations, and specifications listed in this Specification section.

G. Set all equipment level, align properly and bolt together where in sections. Secure all materials and equipment firmly in place. Make all fastening devices and fittings tight.

H. Install materials and equipment as recommended by the Manufacturer.

I. Repair or replace materials damaged during transit, storage, or installation. Touch up scratched or marred surfaces.

### 3.3 Installation:

A. Raceways:

1. During construction temporarily plug, or otherwise protect, all installed raceways from the entrance of moisture, dirt, trash, plaster, etc. Replace any raceways, which may become clogged with dirt, trash, plaster, moisture, etc., through neglect to so protect them, without additional expense to the Government.

2. Cut raceway to proper length so that ends will fit accurately in the outlets or fittings. Kinked or deformed raceway systems will not be permitted on the job.

3. All electrical wiring shall be contained within a raceway or conduit system with covers required on all outlets and openings.

4. Properly align, group, and support raceways. Install exposed raceways at right angles to or parallel to the principal structural members. Concealed raceways, unless otherwise indicated, may take the most direct route between outlets, according to Article 300 of the NEC. Firmly attach all raceways in place. Run raceways to avoid tripping wherever possible. Provide necessary inserts in poured concrete areas, and furnish and install all necessary sleeves through walls, floors and passage of raceways. Properly seal sleeves through roofs and/or exterior walls of the building.

5. Provide a Jet Line No. 232, or equal, polyolefin 200 lbs. test pull wire in all empty conduits.

6. Provide a minimum of 24 inches of cover over all underground raceways or meet NEC Code requirements.

7. Rigid Conduit:

(a) For exposed in shop areas, mechanical rooms, underground, in slab, and for all types of wiring.

(b) Make up all joints tight with no running threads.

(c) Ream inside edge of cut conduit to prevent wire damage during pulling

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(d) Intermediate metal conduit (I.M.C.) may be used where specified to be rigid except in hazardous locations.

8. Electro-metallic Tubing (ENT): May be installed for all branch circuit wiring (lighting and power) in areas above grade within the building. Make up all couplings tightly, install bonding jumpers at all outlets and connect equipment grounding conductors on grounding terminals.

9. Flexible Metal Conduit:
- (a) May NOT be used as a grounding means when conduit and fittings are approved for the purpose.
  - (b) Use flexible conduit for the connection of light fixtures in ceiling, dry type transformers, electric motors, and all equipment subject to vibration.
  - (e) Make connections to equipment having motors with flexible metal conduit. Where exposed to weather or moisture, use liquid tight flexible metal conduit, unless otherwise shown.
10. PVC Conduit: Limited to underground installation and communications. Where PVC is substituted for metallic conduit, install a bonding conductor in compliance with the N.E.C. Where PVC is proposed as a substitute for metal conduit, submit for approval to the Contracting Officer before installation.
11. Hangers and Supports:
- (a) Support all raceways in accordance with the NEC. Supports shall be of an approved type.
  - (b) All bends to be factory made or bent with an approved bender. Radius shall be not less than minimum permitted by NEC.
12. General Installation:
- (a) Conduit larger than 10, except as indicated, in reinforced concrete slabs to be parallel to, or at right angles to, the main reinforcement. When at right angles to the reinforcement, the conduit to be close to one of the supports of the slab.
  - (b) Locate conduit in concrete so as not to affect the structural strength of the slab.
  - (c) Conceal all conduits in walls, above ceilings, in or under slabs, or in furring, except in mechanical and electrical rooms and as indicated.

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- (d) Route feeders, home runs and conduits as shown, with the exception of minor deviations as approved to eliminate conflicts with existing conditions and the work of other trades. Circuits shall be shown on the approved drawings. Use accepted methods of the trade to make a neat, secure installation.
- (e) Paint any conduit installed under floor, and not within slab thickness, with bituministic paint prior to installation. Paint exterior underground conduit with bituministic paint.

13. EMT:

(a) Support all EMT at a maximum spacing of 5 feet. Supports of the approved type (Mineral, Power Strut, one-hole clamps, Unistrut) or equal.

(b) All bends to be factory made or bent with an approved bender. Radius not less than minimum permitted by NEC.

14. PVC: Schedule 80 for runs underground with rigid galvanized steel bends at slab penetration (marked as "PVC conduit"). ID to be above the floor.

15. Conductors and Conduit identification:

(a) Tag all conductors and identify major conduits in or at wireways, panels, pull boxes, motor controllers, cabinets, and similar items to assist in future circuit tracing. Conductor tags shall be non-conductive. Identify all circuits and equipment to correspond with the approved drawings and specifications.

16. Splice and Terminations:

(a) Feeders, sub-feeders, and branch circuit conductors: Use Solderless type copper conductor splices, pressure or mechanical lugs and connectors.

(b) Branch Circuits (up to # 10): Scotchlock, or equal, insulated conical spring connectors over twisted conductors.

(c) Branch-Circuits: Scotchlock Connectors or ideal Wire-nut Connectors or equal.

(d) Identify all circuits and equipment to correspond with the plans and specifications.

(e) Number and size of conductors between motor and control, or protective apparatus, to be as recommended by the manufacturer of apparatus or as required by NEC.

17. Pull and Junction Boxes:

(a) Provide pull and junction boxes where required by the National Electrical Code, all locations to be shown on the submitted drawings.

(b) Identify conductors where more than one feeder passes through a junction, or pull box with electrical characteristics, system designations, source and destination. Provide barriers where required by code.

(c) Independently support pull boxes on the building structure. Do not depend on the conduit system for support.

(d) Provide tap connections to paralleled conductors between the tap conductor and each of the paralleled conductors: Connector used for this purpose to be designed to connect the paralleled conductors, electrically, to each other and to the tap conductor, without breaking or splicing the paralleled conductors.

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18. Grounding Conductors:

(a) All receptacle circuits shall have a continuous grounding conductor #12 minimum to all devices and back to panel ground bus.

(b) Install as indicated on approved drawings, and as required by the N.E.C.

(c) Make connections to ground bus, ground rod and equipment as necessary. Connections to be of a type that will insure against corrosion and electrolysis.

(d) Connections to ground rod to be exothermic welded, equal to Cadweld or Burndy. Follow manufacturer's directions explicitly and use clean molds.

19. Receptacle Strip: Mount at height indicated at feeding junction box. Run level with fasteners installed 24-inches on center (maximum).

3.4 Field Quality Control:

A. After the systems, equipment, and fixtures are completely installed, and at such time as the Contracting Officer directs, conduct an operating test for approval and acceptance by Contracting Officer. Perform the test in the presence of the Contracting officer, or his designated representative. Advance approval of equipment and materials will not constitute a waiver of the requirements that the equipment, fixture or materials be demonstrated to operate in accordance with these specifications.

## SECTION 16051

### WIRING SYSTEMS EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of wiring systems equipment. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Copper Wire: ANSI C7.1, C7.8,

2.3 Aluminum Wire: ANSI C7.20, C7.21

2.4 Busways and Fittings: ANSI C33.34.

2.5 Plugs and Receptacles: ANSI C33.77.

2.6 Conduit: ANSI C80.1, C80.3, C80.4 and C80.5 and NEMA RN 1.

2.7 Enclosures: NEMA IS 1 and OS 1.

2.8 Specific Purpose Wiring Devices: NEMA WD 5.

2.9 General Electrical: NFPA 70 and 70B.

2.10 Flexible Metal Conduit: ANSI C33.92.

2.11 Surface Metal Raceways and Fittings: UL 5.

2.12 Liquid-Tight Flexible Steel Conduit: UL 366.

3.1 EXECUTION:

3.2 Coordination: Contractor shall determine that the wiring system has been de-energized. Before de-energization, the Contractor shall ensure that equipment served by the wiring system will not be damaged by the power outage.

3.3 Clearances: Working clearances shall comply with NFPA 70.

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SECTION 16211

## MOTOR GENERATOR SETS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of motor generator sets. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Batteries: Fed. Spec. W-B-134C or W-B-137C, as applicable.

2.3 Instrument Transformers: ANSI C12-11 or NERA EI-2, as applicable.

2.4 Motor and-Generator: NEMA MG-1 and MG-2.

2.5 Battery Charger: UL 1236.

2.6 Switchgear: NEKA SG-5.

2.7 Electrical Instruments: ANSI C39.1.

3.1 EXECUTION:

3.2 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.3 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.4 Maintenance, Repair, or Replacement Work: The Contractor shall check the generator sets in accordance with the manufacturer's instructions and Military Standards MIL-STD-705B, Notices 1, 2, and 3, MIL-HDBK-705B, IEEE-43, IEEE-115, and SSPC-PA-1-82. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair or replace any piece of equipment requiring work.

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SECTION 16310

## ELECTRICAL DISTRIBUTION SYSTEM SUBSTATION EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of electrical distribution system substation equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS: The maintenance and repair work shall include but not be limited to the following major equipment:

- a. Power Transformers.
- b. Station Service Transformers.
- c. Automatic Tap Changing Transformers.
- d. Switchgear.
- e. Oil Circuit Breakers.
- f. Isolating Switches.
- g. Metering Equipment.
- h. Relaying Equipment.
- i. Station Battery System.
- j. Articulated Secondary Unit Substation.
- k. Integral Transformer-Load Center.

2.2 Power Distribution Panel: Fed. Spec. W-P-115.

2.2 Insulating Oil, Electrical (For Transformers, Switches, and Circuit Breakers): Fed. Spec. VV-I-530.

2.3 Distribution, Power, and Regulating Transformers: ANSI C57.12 series as applicable.

2.4 Instrument Transformers: ANSI C57.13.

2.5 Installation and Maintenance of Oil-Imersed Transformers: ANSI C57.93.

2.6 Voltage Air Switches, Bus Supports, and Switch Accessories: ANSI C37.32.

2.7 Low-Voltage AC Power Circuit Breakers: ANSI C37.50.

2.8 Electrical Analog Indicating Instruments: ANSI C39.1.

2.9 Primary Unit Substation: NEKA 201.

2.10 Secondary Unit Substation: NEMA 210.

2.11 Molded Case Circuit Breakers: NEKA AB1.

2.12 Watt-hour Meters: NEMA EI 20.

2.13 Switchboards, Dead Front Distribution: NEMA PB 2.

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3.1 EXECUTION:

3.2 Coordination and Scheduling: outages shall be scheduled and coordinated in advance with the Contracting officer.

3.3 Protection.: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.4 Workmanship: Work shall be completed in accordance with NFPA-70 and NFPA-70B.

3.5 Interruptions: During interruptions, equipment and standby systems shall be provided to maintain existing electrical service.

3.6 Fences shall be checked for security. Gates and locks shall be checked for proper operation and grounding.

3.7 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest federal and state requirements.

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SECTION 16320

TRANSFORMERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of transformers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Transformer Assemblies and Components for replacement purposes shall be designed for the same service as existing.

2.3 Transformers covered under this specification are as follows:

2.3.1 Dry Type Transformers.

2.3.2 Instrument Transformers.

2.3.3 Control Transformers.

2.3.4 Grounding Transformers.

2.3.5 Liquid-Filled Transformers.

3.1 EXECUTION:

3.2 Safety: Take precautions in compliance with the National Electrical Safety Code, ANSI C2; execute work in compliance with NFPA 70 and 70B.

3.3 Coordination: Coordinate the work schedule with the Contracting Officer.

3.4 Repairs: Repair and retighten burnt or broken lugs, windings, loose bolts, nuts, and screws. Repair windings in accordance with NEKA ST 20.

3.5 Testing: Perform electrical insulation tests to verify the integrity of any repairs prior to re-energization of the transformers, unless written permission is obtained from the Contracting Officer stating otherwise.

3.6 Oil Handling and Disposal: Handle and dispose of oil and oil contaminated materials in compliance with the latest Environmental Protection Agency requirements.

3.7 Deficiencies, Safety Hazards, and Code Violations: Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that is not indicated or specified to be corrected under the contract, it shall be promptly reported to the Contracting Officer. The Contractor may submit recommendations for correction of the deficiency, safety hazard, or code violation with his report.

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3.8 Additional Execution Requirements Specific to Each Type of Transformer:

3.8.1 Dry Type Transformers:

3.8.1.1 General: Replacement transformers shall have a winding configuration identical to that of the existing transformer and shall comply with NEKA ST 20 and ANSI C57.12.22.

3.8.1.2 Noise Isolation Pads shall be checked for excessive wear and replaced if necessary.

3.8.1.3 Dust shall be cleaned from transformer winding and enclosure ventilation louvers.

3.7.2 Instrument Transformers:

3.7.2.1 Current Transformers shall be manufactured in compliance with NEKA EI 21 and shall have an accuracy Class of 0.6 at burden designation of B-0.1 and B-0.2 and an accuracy of 1.2 at B-0.5 as defined in ANSI C57.13 for instrument transformers.

3.7.2.2 Potential Transformers shall have an accuracy of 0.3W, 0.3X, 0.3Y, 1.2Z as defined in ANSI C56.13 for instrument transformers.

3.7.2.3 Fuses: Potential transformers shall be protected on the high and low voltage side by fuses.

3.7.2.4 Repair: No attempt to repair current or potential transformers shall be made.

3.7.3 Control Transformers:

3.7.3.1 Core shall be in compliance with ANSI C33.4.

3.7.3.2 Fuses: All ungrounded conductors of primary and secondary of potential transformers shall be protected by fuses.

3.7.3.3 Repair: No attempt to repair control transformers shall be made.

3.7.4 Grounding Transformers:

3.7.4.1 Replacement Zig-Zag Grounding Transformers shall be three-phase zig-zag auto transformers or six single-phase transformers connected zig-zag and shall comply with UL 506.

3.7.4.2 Replacement Wye-Delta Grounding Transformers shall be three-phase transformers or three single-phase transformers connected wye-delta and shall be in compliance with ANSI C57.12.00.

3.7.4.3 Core shall be in compliance with ANSI C57.12.00.

3.7.5 Liquid-Filled Transformers:

3.7.5.1 Replacement Oil-Filled Transformers shall have a winding configuration identical to the existing transformer and shall comply with ANSI C57.12.00.

3.7.5.2 Gaskets shall match existing type removed.

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3.7.5.3 Oil Added to Transformers shall be the same type as existing or shall be an oil recommended by the transformer manufacturer. Dielectric strength of oil shall not be less than 30 kV. Mineral oil shall comply with NERA TR P8. Mineral oil shall not be added to high fire point oils such as askarel and silicone.

3.7.5.4 Repair Leaks by cleaning the leak area and welding or by applying 1/4-inch thick steel plate patch and welding in place. After welding, check the repaired area for leaks, reweld if leaking, reclean, and touch up with paint. Welding shall comply with AWS D1.1.

3.7.5.5 Gaskets, Vacuum, and Liquid Level Gauges found to be defective shall be replaced.

3.7.5.6 Ground Resistance Test Readings shall be performed across phase-to-phase windings and phase-to-ground windings. Tabulate results, and submit them to the Contracting Officer.

3.7.5.7 Dielectric Test shall be performed on oil samples taken from top and bottom filter press connections. Record and submit results to the Contracting Officer.

3.7.5.8 Transformer Liquid Levels shall be checked for correct level and filled if low. Oil added to transformers shall be same type as existing oil or shall be an oil recommended by the transformer manufacturer. Dielectric strength of oil shall not be less than 30 kV. Mineral oil shall comply with NEKA TR P8. Mineral oil shall not be added to high fire point oils such as askarel and silicone.

3.7.5.9 Transformer Tap Connections and tap changer shall be tightened.

3.7.5.10 Pressure of Inert Gas in cylinders used to maintain positive pressure inside transformer tank shall be checked. Replace cylinder if pressure fails below transformer manufacturer's recommended level'-for gas cylinder pressure.

3.7.6 Outages and Testing of Transformers:

3.7.6.1 Service Interruptions shall be held to a minimum. Deenergization will be accomplished by others.

3.7.6.2 Preinstallation Test: Existing transformers that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests as outlined in NFPA 70B. The results of the tests shall be furnished to the Contracting Officer.

3.7.6.3 Oil Test: Transformers shall have insulating oil tested.

3.7.6.4 Insulation Test: Transformers shall have insulation tested.

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## SECTION 16321

### ELECTRICAL DISTRIBUTION TRANSFORMERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution transformers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

- 2.1 PRODUCTS:
- 2.2 Poles-Mounted Transformers: Fed. Spec. W-T-631 and ANSI C 57.12 series as applicable.
- 2.3 Pad-Mounted Transformers: Fed. Spec. W-T-631, NEKA TR-1, ANSI C 57.12 series as applicable.
- 2.4 Transformer Oil for Oil-Filled.Units: Fed. Spec. VV-I-530.
- 3.1 EXECUTION:
- 3.2 Outages shall be scheduled and coordinated in advance with the Contracting Officer.
- 3.3 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
- 3.4 Preventive Maintenance, Repair, or Replacement Work: The Contractor shall perform all required tests in accordance with applicable codes and standards and the manufacturer's instructions. The Contractor shall perform preventive maintenance work, repair, replacement of any defective part, or furnish new material when required.
- 3.5 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of in compliance with the latest Environmental Protection Agency requirements. Oil tests shall be in accordance with ASTM standards.
- 3.6 Reports: Upon completion of the work, a report of the results of the tests made shall be furnished to the Contracting Officer.

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## SECTION 16350

### HIGH-VOLTAGE DISCONNECTING DEVICES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of high-voltage disconnecting devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

- 2.1 PRODUCTS:
- 2.2 Insulating Oil: Fed. Spec. VV-1-530a and ASTM standards applicable to the oil in use.
- 2.3 General Electrical: ANSI C2.
- 2.4 Power Fuses and Fuse Disconnecting Switches: ANSI C37.46, NEKA SG-2.
- 2.5 Automatic Circuit Reclosers For AC Systems: ANSI C37.60.
- 2.6 Automatic Line Sectionalizers For AC Systems: ANSI C37.63, C37.63a.
- 2.7 Power Switching Equipment: NEKA SG 6.
- 2.8 Distribution Cutouts and Arrestor Combination Mounting: NEMA 100.
- 3.1 EXECUTION:
- 3.2 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.
- 3.3 Protection: Precaution, in compliance with ANSI C2, shall be taken to prevent injury to personnel and to avoid damage to equipment and property.
- 3.4 Oil Handling and Disposal: Oil and oil contaminated materials shall be handled and disposed of to comply with the latest federal and state regulations.

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## SECTION 16370

### OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of overhead electrical distribution systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Conductors: Fed. Spec. J-C-145, QQ-W-343, ANSI C2, C7.8, C7.18, C7.19, C7.20, C7.21, C7.22, CS.35, NEMA WC3, WC5, and WC7.

2.2 Insulators: ANSI C29.1, C29.2, C29.3, C29.4, C29.5, C29.6, C29.7, C29.8, C29.9, and EEI TD 24.

2.3 Poles: ANSI 05.1. AWWA C4, C25, Pl, P8, P9, and CSA A14.1.

2.4 Crossarms: EEI TD-90 and TD-91.

2.5 Hardware: EEI TDJ-1, TD-2, TDJ-3, TD-4, TDJ-5, TDJ-6, TDJ-7, TDJ-9, TDJ-10, TD-11, TD-12, TDJ-17, TDJ-22, and TDJ-23 as applicable.

2.6 Right of Way Clearing: EEI-K-10.

3.1 EXECUTION:

3.2 Scheduling and Coordination: Contractor shall ensure that power interruptions and blocking of thoroughfares have been scheduled and approved.

3.3 Line Clearing: Chemicals used in line clearing operations shall be in compliance with the latest federal and state requirements.

3.4 Safety Precautions: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

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SECTION 16375

UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of underground electrical distribution systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Conductors: Fed. Spec. J-C-30A, W-S-610C & AM-1, ASTM D 57474, D 752-73, D 1352-74, D 1679-74, ACIE NO. 1-68, IPCEA NO. S-19-81, NO. S-61-402, NO. S-65-375, NO. S-66-524, NO. S-68-516, and INT. STD. NO. 1, NEMA WC7, WC8, and UL 854, as applicable.

2.2 Conduits: Fed. Spec. W-C-571b, W-C-581b, W-C-586B, W-C1094A, W-F-406b, W-F-408C, W-J-800C & AM-3, WW-C-563A, WW-C-566C, WW-C581E, NEKA BC1, TC2, TC6, UL 6, UL 514, and UL 543 as applicable.

2.3 Tape: Fed. Spec. HH-I-510D, HH-I-553C, Mil. Spec. MIL-I3825B & AM-1, MIL-I-15126F & AM-2, and MIL-I-24391A & AM-1.

2.4 Insulators: ANSI C29-8 and C29-9.

2.5 General Electrical: ANSI C2, NFPA NO. 70.

2.6 Testing: IEEE 48.

2.6 Concrete: Aggregate, ASTM C 33; Portland cement, ASTM C 150, Type 1; compressive strength 4,000 psi at 28 days.

3.1 EXECUTION:

3.2 Coordination: Contractor shall ensure that power interruptions and blocking of thoroughfares have been scheduled and approved.

3.3 Tests: All underground lines, splices, and terminations that have undergone maintenance, repair, or are new installation shall be tested before placement in service.

3.4 Ductbank: No dips or low points that retain water are permissible. Conduit shall be encased with not less than 3 inches of concrete when not direct-buried.

3.5 Manholes and Handholes shall be spaced and installed so as not to exceed the pulling tensions of the cables to be pulled. Maximum pulling tensions shall be as recommended by the cable manufacturer.

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## SECTION 16390

### ELECTRICAL DISTRIBUTION SYSTEM GROUNDING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system grounding. Products shall match existing materials and/or shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: (Section not used.)

3.1 EXECUTION:

3.2 Coordination and Scheduling: Contractor shall ensure that power interruptions have been scheduled and approved.

3.3 Outages: Service interruptions shall be limited in number and duration, and the extent of lines involved shall be held to a minimum.

3.4 Protection: Take precautions, in compliance with ANSI C2, to prevent injury to personnel and to avoid damage to equipment and other property.

3.5 Workmanship: Installation shall be in compliance with IEEE 80 and 142. Install protective molding, staples and conduit as recommended by these standards.

3.6 Trenching: Exercise care when digging trenches for installation or testing of ground equipment. Protect adjacent structures and properly shore excavations.

3.6 Grounding shall comply with NFPA 70, ANSI C2, and IEEE 80 and 142. Ground neutral conductors, cable shields, metallic cable sheaths and armor, metallic conduits, pothead bodies, junction boxes, lightning arresters, fence enclosures, and noncurrent-carrying metallic parts of equipment. Ground rods shall be made of copper, or copper-clad steel not less than 1-inch by 8 feet long and, except those installed in manholes, shall be driven into the earth at least 9 feet. Ground connections in earth shall not be backfilled until after inspection by the Contracting Officer. Repairs and maintenance of the grounding system shall include resistance measurements and tightening of all bolted connections.

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## SECTION 16411

### ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR BANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system capacitor banks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Material: New capacitors shall comply with NEMA CP1 and shall not use impregnant containing polychlorinated biphenyls (PCB).

3.1 EXECUTION:

3.2 Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.3 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.4 Maintenance and Repair Work: Workmen shall allow the capacitor time to discharge and then short capacitor terminals together and ground before touching any live parts. Capacitors shall be checked in accordance with NEMA CP1 and NFPA 70. Perform the necessary preventative maintenance, repair, or replacement of any of the components.

3.5 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.

16411-1

## SECTION 16415

### ELECTRICAL DISTRIBUTION SYSTEM VOLTAGE REGULATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system voltage regulators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Material: New regulators shall comply with ANSI C57.15. New oil shall comply with Fed. Spec. VV-I-530.

3.1 EXECUTION:

3.2 Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.3 Protection.: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.4 Maintenance and Repair Work: All maintenance and repair work shall be accomplished and in compliance with applicable ANSI C57-series and ASTM standards.

3.5 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.

3.6 Test Reports on field tests made in compliance with ANSI C57.15 shall be submitted to the Contracting Officer.

16415-1

## SECTION 16440

### INTERIOR LOW-VOLTAGE DISCONNECTING DEVICES

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for repair and maintenance of interior low-voltage disconnecting devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Switch Box (Enclosed): Fed. Spec. W-S-865.

2.3 Fuse Holders and Fuses: ANSI C33.10, C33.99, C33.114, and C97.1 as applicable.

2.4 Molded Case Circuit Breakers: NEKA AB-1.

2.5 General Electrical: NFPA 70 and 70B.

3.1 EXECUTION:

3.2 Coordination: Contractor shall determine that the disconnecting device has been de-energized. Before de-energization, the Contractor shall ensure that equipment served by the disconnecting device will not be damaged by the power outage.

3.3 Clearances: Work clearances required by NFPA No. 70 shall be provided.

16440-1

## SECTION 16470

### PANELBOARDS AND LOAD CENTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of panelboards and load centers. Products shall match existing materials and/or shall be as directed by the Contracting officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Panelboards: Fed. Spec. W-P-115A, NEKA PBI, and PBI.1.

2.3 Fuses and Fuse Holders: ANSI C33.10 and C33.42.

2.4 Molded Case Circuit Breakers: NEKA AB-1.

2.5 General Electrical: NFPA 70 and 70B.

2.6 Enclosures Beyond Repair: Replace with the same size and type in compliance with NEKA ICS and Fed. Spec. W-P-115A. Carbon steel, ASTM A 366; stainless steel, ASTM A 176; galvanized sheet steel, ASTM A 526.

3.1 EXECUTION:

3.2 Coordination: Contractor shall determine that equipment served by panelboards and load centers will not be damaged before or after power is cut off and that power to the panelboards and load centers has been disconnected or cut off.

3.3 Clearances: Working clearances required by NFPA No. 70 shall be provided.

3.4 Tests: All devices and systems that have undergone maintenance, repair, or are new installation shall be tested before placement in service.

## SECTION 16480

### ELECTRIC MOTORS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for repair and maintenance of electric motors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 **General:** Parts shall be factory-made. Existing bolts and screws that are rusted, corroded, cross-threaded, or otherwise defective and are removed due to repair work shall be replaced with new bolts and screws.

2.3 **Motor Assemblies and Components** for replacement purposes shall be designed for same service as existing. Repaired rotors shall be balanced. Brushes worn to within 20 percent of usable length shall be replaced with same type and size brushes.

2.4 **New Motor** shall be of like kind and of the same size, performance rating, and characteristics as the existing motor to be replaced and shall comply with NEMA MG 1, UL 1004, and Fed. Spec. CC-M1807.

#### 2.5 Products included in these specifications are:

2.5.1 Single Phase Induction Motor.

2.5.2 Universal Motor.

2.5.3 Polyphase Squirrel-Cage Induction Motor.

2.5.4 Polyphase Wound Rotor Induction Motor.

2.5.5 Polyphase Synchronous Motor.

2.5.6 Direct Current Motor.

#### 3.1 EXECUTION:

3.2 **Compliance:** Take precautions in accordance with the National Electrical Safety Code. Workmanship shall be executed in compliance with NFPA 70 and 70B.

3.3 **Scheduling and Coordination:** Contractor shall determine that required notices have been given and that equipment served by the motor will not be damaged due to motor shutdown.

3.4 **Lubrication, operation, and Adjustment:** Before operational testing, thoroughly clean electric motor of all foreign material, and lubricate all electric motors or parts requiring lubrication with the types of lubricants recommended by the electric motor manufacturer.

3.5 **Deficiencies, Safety Hazards, and Code Violations:** Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that is not indicated or specified to be corrected under the contract, it shall be promptly reported to the Contracting officer. The Contractor may submit recommendations for correction of such deficiency, safety hazard, or code violation with his report.

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#### 3.6 Requirements Specific To Each Motor Type:

3.6.1 Single-Phase Induction Motors:

3.6.1.1 Single-Phase Induction Motors shall comply with ANSI C50.21.

3.6.1.2 Frame Sizes shall comply with NEMA MG 13.

3.5.2 Universal Motors:

3.5.2.1 Armature: Core of armatures shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEKA MG 1.

3.5.2.2 Armature Assembly shall be dynamically balanced for smooth operation in compliance with NEMA MG 1.

3.5.2.3 Bearings shall be sleeve bearing or ball bearing type complying with NEKA MG 1.

3.5.2.4 Brushholders shall be in compliance with NEKA MG 1.

3.5.2.5 Brushes shall be in compliance with NEKA CB 1.

3.5.2.6 Shaft shall be in compliance with NEKA MG 1.

3.5.3 Polyphase Squirrel-Cage Induction Motors:

3.5.3.1 Polyphase Squirrel-Cage Induction Motors shall comply with NEKA MG 1.

3.5.3.2 Frame Size shall comply with NEKA MG 13.

3.5.4 Polyphase Wound Rotor Induction Motors:

3.5.4.1 Polyphase Wound Rotor Induction Motor shall comply with NEMA MG 1.

3.5.4.2 Frame Size shall comply with NEMA MG 13.

3.5.4.3 Brushes shall be in compliance with NEMA CB 1.

3.5.4.4 Stator shall be rewound with conductors of same gauge and material as the existing stator.

3.5.4.5 Rotor shall be rewound with conductors of same gauge and material as the existing rotor.

3.5.5 Polyphase Synchronous Motors:

3.5.5.1 Polyphase Synchronous Motor shall comply with NEKA MG 1.

3.5.5.2 Frame Size shall comply with NEMA MG 13.

3.5.5.3 Brushes shall comply with NEKA CB 1.

3.5.6 Direct Current Motors:

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3.5.6.1 Armature core shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEKA MG 1.

3.5.6.2 Armature Assembly shall be dynamically balanced for smooth operation in compliance with NEKA MG 1.

3.5.6.3 Bearings shall be ball bearing or sleeve bearing type in compliance with NEKA MG 1.

3.5.6.4 Brushholders shall be in compliance with NEKA MG 1.

3.5.6.5 Frame size shall comply with NEKA MG 13.

3.5.6.6 Shaft shall be in compliance with NEMA MG 1.

3.5.6.7 Brushes shall be in compliance with NEKA CB 1.

3.6 Outages and Testing of Electric Motors:

3.6.1 Outages and service interruptions shall be held to a minimum. De-energization will be accomplished by station forces.

3.6.2 Preinstallation Test: Existing motors that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests as outlined in NFPA 70B. Furnish the results of the tests to the Contracting Officer.

16480-3

SECTION 16501

POLES FOR STREET AND AREA LIGHTING SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for poles for street and area lighting systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Wood Poles: ANSI 05.1 and shall be preservative-treated.

2.3 Steel, Aluminum, and Concrete Poles: NEMA SH5.

2.4 Steel Poles:

2.4.1 Structural Steel: ASTM A 36.

2.4.2 Zinc Coating: ASTM A 123.

2.4.3 Poles shall be chemically cleaned after fabrication and shall be hot-dipped galvanized in compliance with ASTM A 123.

2.5 Aluminum Poles shall be of high-strength aluminum having a yield strength of 34,000 psi.

2.6 Concrete Poles: Prestressed steel reinforced, cast type in compliance with ACI 318 and 437. Cement shall comply with ASTM C 150.

2.7 Painting: Materials shall match that of existing or adjacent pole finish.

3.1 EXECUTION:

3.2 Safety Precautions shall comply with applicable requirements of the National Electrical Safety Code.

3.3 Wood Pole Setting: In normal firm ground, minimum pole setting depths shall be as follows: for pole lengths of 20 feet, 25 feet, 30 feet, and 35 feet the minimum depth shall be 5 feet, 5 feet 6 inches, and 6 feet, respectively. For pole lengths up to 100 feet the minimum depth shall be 10 percent of length for both straight and curved lines, plus 2 feet for straight lines and 10 percent of length plus 2 feet 6 inches for curves and corners. In rocky or swampy ground, pole setting depths shall be respectively decreased or increased as required by local power company published standards and as approved by the Contracting Officer. In swampy ground, a bog shoe may be used.

3.4 Wood Pole Inspections:

3.4.1 Visually Inspect Standing Wood Poles for ground-line heart rot, aboveground heart rot, pole top heart rot, shell rot, mechanical damage, eroded foundations, large splits, and lightning damage.

3.4.2 Coat Surfaces with creosote-base wood preservative coating compound and wrap with impregnated felt bandage in compliance with wood pole preservative materials supplier's instructions.

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3.5 Wood Pole Decay Maintenance:

3.5.1 Ground-Line Heart Rot shall be treated with an approved fumigant.

3.5.2 Wood Poles with surface decay below grade shall be replaced with new poles.

3.6 Concrete Repair: Repair spalling in pole foundations and concrete poles by thoroughly coating with 2,000 psi shear strength epoxy resin, applying 3,000 psi 28-day concrete, and finishing to restore original configuration of the concrete.

3.7 Steel Pole Maintenance: Steel poles that are corroded shall be chemically cleaned of rust and scale and painted.

16501-2

SECTION 16502

BALLASTS AND TRANSFORMERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaire ballasts and transformers. Products shall match existing materials and/or shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Constant-Current Transformers shall be of the automatic, moving-coil types designed to maintain the secondary current within 1 percent of rating when operating under normal loading conditions. A protective relay that will automatically disconnect the transformer from the line on open series circuit shall be provided as an integral component of the transformer. Transformers shall be rated 10 kW, 2,400 volts, 60 hertz primary and 6.6 amperes secondary.

2.3 Fluorescent Ballasts shall be high-power factor type, Class P rated, and CBM certified rated for single or two-lamp operation. Ballasts shall be lead type for minimum starting temperature of plus 50 F.

2.4 High-Intensity Discharge Ballasts shall be high-power factor, single lamp type. Ballasts shall be Type 2, weatherproof for outdoor use.

2.5 Lam-D Ballasts: ANSI C82.1, C82.4, UL 935, and UL 1029 as applicable.

2.6 Series Isolation Transformers for airfield lighting systems shall be equal to the original transformers in accordance with Air Force Manual (AFM) 14, Part II, Visual Air Navigation Facilities.

2.7 Transformers, Regulators, and Reactors shall be in compliance with the requirements of NERA TR-1.

3.1 EXECUTION: Contractor shall comply with provisions of the National Electric Code.

3.2 Maintenance and Repair of Regulators shall include cleaning or replacement of dirty or burned contacts, replacement of worn or broken mechanical parts and electrical insulation, cleaning and tightening connections, replacement of leaking seals and gaskets, replacement of burnt oil, stopping of tank leaks, securing of loose or broken mounts, repair of shorted windings, and testing of regulator against varying loads and for shorts and high resistances.

3.3 Temporary wiring Modifications shall be made in order that the lighting system shall remain in operating condition, except for the item being repaired or replaced, during normal lighting periods.

3.4 Outages: Service interruptions shall be scheduled in advance with the Contracting Officer.

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SECTION 16503

STREET AND AREA LIGHTING CONTROLS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for street and area lighting controls. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Photocontrols shall be of the light-sensitive photo conductor cell type with integral line resistor and relay circuit having a line voltage circuit contact and capacitor and an across-the-line protective lightning arrester. Plug-in locking type shall be in compliance with UL 773.

2.3 Replacement Relay for control of circuit shall match mounting, voltage, and wattage of existing relay.

2.4 Electronic Control Units shall be solid-state, transistorized, printed circuit type having no operating moving parts.

3.1 EXECUTION:

3.2 Temporary Wiring Modifications shall be made in order that the lighting system shall remain in operating condition during normal lighting periods, except for the control unit being repaired or replaced.

3.3 Photocontrol, Timers, and Electronic Control Units shall be inspected for proper operation and repaired or replaced as required.

3.4 Safety: Contractor shall comply with applicable provisions of the National Electric Code.

16503-1

SECTION 16510

LUMINAIRES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaires. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Lamps: ANSI C78, C79, Fed. Spec. W-L-00116, W-L-101.

2.2 Fixtures: UL 781, 844, 57, 595. 1570, 1571, 1572, Fed. Spec. A-A-1534A, A-A-1535, W-F-414E, W-F-1234A, and W-F-1662A.

2.3 Lamy Bases and Holders: UL 496, 542, and ANSI C81.

2.4 Ballasts: UL 935, 1029, and ANSI C82.

2.5 General Electrical: NFPA 70.

2.6 All Luminaires shall be designated "IES distribution type" as referred to in the IES Lighting Handbook.

2.6.1 Luminaires shall be adjusted to achieve lighting levels and patterns specific to the application as recommended by the manufacturer. Each luminaire shall bear the UL label.

2.6.2 Only the Luminaire Being Repaired or Replaced shall be disconnected from its source of supply during the normal operating hours of the lighting system.

2.6.3 Luminaire Heads or Housings shall be die-cast aluminum with slip-fitter mounting and provided with 1-1/4 inch through 2-inch slipfitter fittings. Luminaire heads shall have standard dimensions for interchangeable standard optical assemblies. Heads shall be internally wired and rated at 600 volts.

2.6.4 Enclosed Luminaire shall consist of an Alzak-finished aluminum reflector and enclosing refractor mounted on a standard luminaire head.

2.6.5 Open Luminaires shall consist of an Alzak-finished aluminum reflector with shielding reflector on a house side providing IES Type I distribution, mounted on a standard luminaire head.

2.7 Incandescent Luminaires:

2.7.1 Luminaires Shall Be Enclosed Type for filament lamps with IES Type I distribution and shall have a glass refractor providing IES Type I distribution.

2.7.2 Floodlights Shall Be Enclosed Type with adjustable support brackets. Enclosed floodlights shall be Class HD having a beam spread of 10 to 18 degrees. Open type floodlights shall have a beam spread of 70 to 100 degrees.

2.8 Fluorescent Luminaires shall be the enclosed type.

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2.9 High Intensity Discharge Luminaires shall be enclosed type for HID lamps with IES Type I distribution. Enclosed luminaires shall have an enclosing glass refractor providing IES Type I distribution.

3.1 EXECUTION:

- 3.2 Protection: Take precaution in accordance with ANSI C2.
- 3.3 All Service Interruptions shall be scheduled in advance with the Contracting Officer.
- 3.4 Workmanship: NFPA 70 and 70B.

16510-2

SECTION 16611

UNINTERRUPTIBLE POWER SYSTEM (UPS)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of uninterruptible power systems. Products shall match existing materials or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Batteries: NEKA IB 7 or Fed. Spec. W-B-137, as applicable.

2.3 Battery Charger: UL 1236.

2.4 Switchgear: NEMA SG-5.

2.5 Emergency and Standby Power Systems: IEEE No. 446.

3.1 EXECUTION:

3.2 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.3 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.4 Maintenance, Repair, or Replacement Work: The Contractor shall check the UPS in accordance with the manufacturer's instructions and Mil. Std. MIL-STD-202 and IEEE 446. If instructed by the Contracting Officer, the Contractor shall check for electromagnetic compatibility in accordance with Mil. Std. MIL-STD-461 and MIL-STD-462. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair, or replace any piece of equipment requiring work.

16611-1

SECTION 16640

CATHODIC PROTECTION OF STEEL WATER TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of cathodic protection of steel water tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Contractor's Qualification: A qualification such as NACE accredited corrosion specialist or a Senior Corrosion Technologist is required to perform or to supervise the inspection of the cathodic protection system. The contractor making the repair and installing new equipment, materials, or components shall be under the direct supervision of a NACE accredited corrosion specialist or a Senior Corrosion Technologist.

2.3 Approval: All repair or replacement material and equipment shall be NACE approved.

3.1 EXECUTION:

3.2 Inspection: The inspection of the cathodic protection system shall be made in compliance with applicable NACE standards. The inspection shall include a potential profile of the submerged structures together with visual and electrical tests.

3.2.1 Tank-to-Water Potential Tests: Adjust the rectifier voltage or amperage so as to satisfy design current densities or specified voltage. Document readings, and note any reading below -0.85 volts versus the copper-copper sulfate half-cell or silver-silver chloride half-cell (using conversion chart). Successive potential readings shall be made with the tank full of water and the reference electrode placed at various depths, starting at 1 foot below the surface of the water and continuing at 3-foot intervals to the bottom of the tank. (A vertical inspection profile shall be taken along the wall between each anode string.) The tank bottom shall also be traversed equidistant from all distributed anodes. Inspect risers by placing reference electrode along the side wall of the riser and measuring at 3foot intervals as far as possible.

3.2.2 Polarization of the submerged steel surfaces to a tank-to-water potential shall be at least a negative 0.85 volts.

3.2.3 Voltage Measurements Between Tank and Electrode: When inspecting new well-coated tanks, the voltage measured between the tank and reference electrode that is placed at any point along the coated surface shall not exceed negative 1.2 volts.

3.2.4 The Rectifier shall be free from any restriction that inhibits free air circulation. Keep air-cooled rectifiers free from dust accumulation, clogged filters or screens, brush, grass, or nests. Fill oil-cooled rectifiers to the proper level, and change the oil when it becomes cloudy. Dispose of oil that is removed as directed by the Contracting Officer.

3.2.4.1 Output Measurement: Measure and record the current and voltage output. Compare the readings obtained against the previous readings.

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3.2.4.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.

3.2.4.3 Meter Tests: Check the meters in the rectifier for accuracy by using portable instruments (voltmeter and ammeter) of known accuracy.

3.2.5 Visual Inspection of the water tank shall be conducted while the Contractor is inspecting the anodes and wiring. At the direction of the Contracting Officer, lower the water level to expose as much of the wiring as practical to inspect for deteriorated insulation, faulty connections, etc. Inspect the interior surface for condition of coating and apparent ruse or calcareous build up. In systems using permanent anodes, determine if the anode shall last until the next inspection. Record broken, damaged, and missing anodes. Inspect wiring to the anodes. Replace wire that has deteriorated insulation.

3.2.6 Reference Electrodes and Connecting Wires shall be inspected by the Contractor to determine whether they are capable of operation until the next annual inspection.

3.2.7 Reports: Record and submit all data. Corrosion control records shall follow recommendations found in NACE RP-01.

### 3.3 Maintenance and Repair:

3.3.1 Compliance: The maintenance, repair, and installation of replacement materials shall be in compliance with accepted NACE practices. Install all materials and equipment in compliance with the recommendations of NACE or the manufacturer or to comply with the contract documents. Contractor shall replace all broken, missing, deteriorated, or otherwise unserviceable components determined during inspection.

3.3.2 Workmanship: The maintenance, repair, and installation of repair materials shall be under the supervision of the Contractor's NACE Accredited Corrosion Specialist or Senior Corrosion Technologist. Installation shall be performed by personnel who are specifically trained in this work by the manufacturer and who are engaged full time in the installation and servicing of cathode protection equipment. Electrical work shall be in compliance with the requirements of the National Electrical Code.

3.3.3 Testing Methods: Upon completion of repair, the Contractor shall test, adjust, and place in service the cathodic protection system by the following methods:

3.3.3.1 Testing: Adjust the voltage of the rectifier so as to cause a sufficient current to flow to polarize all parts of the structure to at least -0.85 volts. With a given amount of current flowing, voltage measurement shall be made from the tank to a copper sulfate reference electrode in contact with the water. Successive potential readings shall be made with a calibrated voltmeter, with the tank full of water and the reference electrode placed at various depths starting at 1 foot below the surface of the water and continuing at 3foot intervals to the bottom of the tank. The tank bottom shall also be traversed and readings taken every 3 feet in a single horizontal direction. In making these tests, place the reference electrode midway between two tank anodes and suspend close to, but not touching, the side or bottom of the tank. The distance between the reference electrode and the wall shall not exceed 1 inch for all readings. If any parts of the structure register voltages more negative than minus 1.2 volts, note this in a deficiency checklist.

3.3.3.2 Rectifier Adjustment: Final adjustment of the rectifier output current shall be made so that repeated voltage readings taken as specified above for testing fall between the limits of minus 0.75 to minus 1.2 volts when measured against the reference electrode.

16640-2

3.3.3.3 Signs: The Contractor shall paint or stencil his name, date of inspection of the system, and due date of next inspection at a place on site designated by the Contracting Officer.

3.3.3.4 Reports: After final adjustment, place the cathodic protection system in service, record the conditions of the system as left by the Contractor, and submit the report to the Contracting Officer.

3.4 Operating and Maintenance Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the installation. These technical records shall include such items as: manufacturer's data on installed equipment, operating instructions, lists of repair parts, names and addresses of sources of parts and services, current price lists, repair and maintenance instructions, and construction specifications and shop drawings. When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Contracting Officer two complete sets of typewritten or printed instructions covering the maintenance and operation of the installation. The instructions shall cover proper adjustment of the direct current flow, a brief description of cathodic protection principles, a single line operating diagram, anode consideration with reference to local freezing conditions, trouble-shooting checklists, and any other pertinent information concerned with the proper care and maintenance of the installation.

16640-3

SECTION 16641

CATHODIC PROTECTION SYSTEM FOR UNDERGROUND UTILITIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cathodic protection systems for underground utilities. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Contractor's Qualification: A qualified person, such as a NACE-accredited Corrosion Specialist or a Senior Corrosion Technologist, is required to perform or supervise the inspection of the cathodic protection system. The contractors making the repair and installation of new equipment, materials, or components shall be under the direct supervision of a NACE accredited Corrosion Specialist or a Senior Corrosion Technologist.

2.3 Standard Products: Materials and equipment to be used in the repair or replacement of a cathodic protection system shall be a product of a manufacturer regularly engaged in the manufacture of the product, shall meet the NACE requirements, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

3.1 EXECUTION:

3.2 Inspection: A complete inspection of the system shall be made in compliance with NACE RP-01. All findings shall be made in the form of a written report as directed by the Contracting Officer.

3.2.1 Sacrificial (Galvanic) Anode System: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil (electrolyte) potentials indicate that a neighboring structure is being made more positive, bonding shall be required to avoid damage.

3.2.2 Impressed Current (Rectifier Ground Bed) System:

3.2.2.1 Component Inspection: Make inspection of the individual components to ensure that all parts are operating properly. The inspection shall include, but not be limited to, checking unevenness of the temperature of the stacks, hot or warm joints or contacts, arc burn paths, discolored insulators, watt-hour meter for creep, poor insulation, faulty lightning arresters, fuses, and cleanliness of the rectifier stack.

3.2.2.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.

3.2.2.3 Interference Tests: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil potentials indicate that a neighboring structure is being made more positive, the Contractor must make recommendations in report to avoid damage.

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3.2 Maintenance and Repair: After the installation of anodes, the Contractor shall inspect the system and reinspect it again 2 to 4 weeks later. In the event that the system, when repaired, will not provide the required protection, as evidenced by the final tests and measurements, the Contractor, together with the Contracting Officer, shall determine the cause of the deficiency and the corrective measures necessary. After the necessary corrective measures have been determined, the contract may be modified as required. All repair or

replacement material/equipment shall be NACE approved and similar to original materials. Installation shall be in compliance with the recommendations of the manufacturers as approved by the Contracting Officer to comply with the contract documents. Replacement materials that are installed shall comply with the applicable portions of NACE RP-01.

3.2.1 Sacrificial (Galvanic) Anode System:

3.2.1.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures found in NACE RP-01.

3.2.1.2 Anode Output Adjustment: If required, install a resistor or resistance wire to prevent the anode from delivering excess current. The resistance wire, if used, shall be a nichrome wire, No. 16 or 22 AWG with type TW insulation.

3.2.1.3 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.

3.2.2 Impressed Current (Rectifier Ground Bed) Systems:

3.2.2.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures in NACE RP-01.

3.2.2.2 Installation: Install anodes similarly to the anodes in the initial installation. Replacement anodes are normally installed in auger-bored holes drilled adjacent to the damaged or deteriorated anode. Install anodes below the centerline of the protected structure. Anodes may be emplaced horizontally if obstructions are encountered. Backfill material shall consist of coke breeze compacted in 6-inch layers. Foreign material shall be excluded from the backfill.

3.2.2.3 Electrical Splices and Connections: Negative cable connections shall be thermit-welded in compliance with the weld manufacturer's instruction. Cover the connection with an approved backfill shield placed over the weld connection. The shields shall be sized to cover the exposed metal.

3.2.2.4 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.

3.2.2.5 Interference Testing: Make interference testing on all structures installed under this contract to locate damage being caused by existing or new impressed current cathodic protection systems or other sources of interference. It shall be the Contractor's responsibility to correct all interferences.

3.3 Maintenance and Operating Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the installation. These technical records shall include such items as manufacturers' data on installed equipment, operating instructions, lists of repair parts, names and addresses or sources of parts and services, current price lists, repair and maintenance instructions, construction specifications and shop drawings, and as built drawings of the system.

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3.3.1 Consolidation of Records: The Contractor shall consolidate all cathodic protection records including surveys, inspections, operating data, maps, charts, location of leaks (leak maps), and manufacturers' parts manual.

3.3.2 Updating Records: Update existing cathodic protection location maps to show any changes in location or addition of test points or stations, anodes, wiring, etc.

3.3.3 Manuals: When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Contracting Officer six copies of operation and maintenance manuals of the cathodic protection system for guidance of using agency personnel. Prepare manual with contents as determined by the Contracting Officer.

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SECTION 16670

LIGHTNING ARRESTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of lightning arresters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Arresters shall comply with ANSI C62.1 and ANSI C62.2.

3.1 EXECUTION:

3.2 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.

3.3 Workmanship shall be in compliance with ANSI CZ.

3.4 Cleaning: Clean work areas and materials of dirt, grime, grease, and debris.

3.5 Expulsion Arresters shall be inspected for depleted fiber material and thin walls. Report deficiencies to the Contracting officer.

## SECTION 16721

### FIRE ALARM AND DETECTION EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire alarm and detection equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.1 PRODUCTS:

2.2 Control Unit and Annunciator: FM Approval Guide, Fed. Spec. W-F-391 and W-F-398.

2.3 Lamps shall be long-life neon.

2.4 Contacts shall be rated 5 amperes, 120 volts.

2.5 Power Supply shall be solid-state, NEMA RI-3 for dc systems, FMS for ac systems. No attempt to repair solid-state components shall be made.

#### 2.6 Heat Detectors:

2.6.1 Fixed Temperature, Self-Restoring Heat Detector shall have bimetallic element to close electrical contacts when heated.

2.6.2 Combination Fixed Temperature and Rate-of-Rise, SelfRestoring Heat Detector shall have both a bimetallic element to close electrical contacts and a rate-of-rise element with an air chamber, a flexible metal diaphragm, and a moisture-proof vent. Rate-of-rise element shall be independent of fixed temperature action and shall respond when the rate of temperature rise exceeds 15 F per minute.

2.6.3 Fixed Temperature Rate Compensated Heat Detectors shall have an expansible outer shell sensitive to surrounding air temperature, which compensates for thermal lag of external temperature.

2.6.4 Fixed Temperature, Nonrestorable Heat Detector shall have phosphor bronze spring held under tension by a fusible link to hold open contacts. Indicator hole shall appear in the detector chamber seal to indicate the fired detector.

2.6.5 Combination Fixed Temperature and Rate-of-Rise, Nonrestorable Heat Detector shall have a phosphor bronze spring held under tension by a fusible link to hold open contacts and a rate-of-rise element with an air chamber, a flexible metal diaphragm, and a moistureproof vent. Rate-of-rise element shall be independent of fixed temperature action and shall respond when the rate of temperature rise exceeds 15 F per minute.

2.7 Flame Detector shall consist of a silicon photo-electric cell located behind a convex, infrared filter lens. Time delays to prevent false actuation shall be three seconds, ten seconds, or thirty seconds.

#### 2.8 Fire Alarm Transmitters and Receivers:

2.8.1 Emergency Power Supply shall be a completely automatic unit consisting of batteries, battery charging unit to automatically maintain the batteries, and an inverter to change dc battery power to 120 volt, 60 hertz ac power.

2.8.2 Control Relays: Replacement relays shall be totally enclosed with heat and shock-resistant dust covers.

2.8.3 Trouble Buzzer shall be integrally mounted in the control unit.

2.8 Single Station Smoke Detectors (Self-Contained):

2.8.1 Detector Base shall be plug-in type plastic base.

2.8.2 Detectors shall be self-contained control unit that accepts either ionization, photo-electric, or flame detectors. Ionization detectors shall be of the dual chamber type. Ionization detectors shall comply with UL 167 and UL 217. Photo-electric detectors shall comply with UL 168.

2.9 Duct Smoke Detectors shall be either ionization type or photo-electric type. Ionization detector shall be of the dual chamber type. Ionization detectors shall comply with UL 167 and photo-electric detectors shall comply with UL 168.

2.10 Interlocks:

2.10.1 Contact Rating: At 277 volts, contacts shall be rated 15 amperes at 75 percent power factor.

2.10.2 Horsepower Rating: Contacts shall be rated for 1/2 -horsepower at 230 volts.

2.10.3 Contact Voltage: Minimum contact voltage rating shall be 277 volts.

2.10.4 Coil Voltage shall be selected to suit voltage of system.

2.11 Batteries: Fed. Spec. W-B-134.

2.12 End-of-Line Resistors, Balancing Resistors, and Diodes: Fed. Spec. W-F-391 and W-F-398.

2.13 Manual Stations: UL 38, flush or semi-flush mounted, pull-lever type.

2.14 Wiring: NFPA 72A and 72D.

2.15 Audible Alarms: Fed. Spec. W-F-391 and W-F-398.

3.1 EXECUTION:

3.2 Coordination: Prior to commencement of work in any facility having any form of fixed fire protection, contact the fire department. Contractor shall determine that disconnection of equipment will not create a false alarm.

3.3 Workmanship: NFPA 70, 72A, 72D, and 72E.

3.4 Defective Ionization Detectors that are replaced shall be returned to manufacturer for proper disposal.

## CLOCK AND PROGRAM SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of clock and program systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Time and Control: UL 863 and 916.

2.3 General Electrical: NFPA 70 and 70B.

3.0 EXECUTION: Contractor shall determine that required notices have been given and that power to the equipment has been disconnected.

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SECTION 16770

PUBLIC ADDRESS EQUIPMENT

1.0 DESCRIPTION OF WORK: The specification covers the furnishing and installation of public address equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Broadcast Microphone Cables: EIA RS-215.

2.3 Audio Cable Connectors: EIA RS-297.

2.4 Capacitors: EIA RS-153, RS-164, RS-198, and RS-395, as applicable.

2.5 Ceramic-Base Printed Circuits: EIA RS-161 and RS-162.

2.6 Component Parts: Standard test method of EIA RS-186.

2.7 Thermoplastic Hook-Up Wire: EIA RS-230 and ASTM B 286.

2.8 Inductors: EIA RS-175 or RS-197.

2.9 Loudspeakers: EIA RS-278 and RS-SE-103.

2.10 Microphones: EIA RS-SE-105.

2.11 Panel Mounting Racks: EIA RS-310.

2.11 Resistors: EIA RS-155, RS-172, RS-196, RS-303, RS-322, and RS-344.

2.12 Sound System: EIA RS-160.

2.13 Tape Equipment: NAB Magnetic Tape (Reel-to-Reel) Recording and Reproduction Standards.

2.14 Transformers: EIA RS-174, RS-180, RS-183, and RS-393.

2.15 AM-FM Tuners: The AM-FM tuners shall have a tuning range of 540 kHz to 1605 kHz for AM and 88 to 108 MHz for FM and shall comply with FCC Rules and Regulations, Part 15. Controls shall include AM-FM selector switch, power switch with pilot light, signal strength meter, and tuning control with illuminated dial scale.

2.16 Phonograph: Phonograph shall conform to the requirements of NAB Disc Recording and Reproducing Standard and shall play in the automatic and manual modes. The phonograph shall have two speeds of operation, 33-1/2 rpm and 45 rpm, adjustable over 3 percent of the range. Deviation from the mean speed (wow and flutter) shall not exceed 0.1 percent.

2.17 Magnetic Tape Equipment: Tape equipment shall be provided for monophonic recording and playback, of at least 30 dB dynamic range of input signal. The record and playback heads shall be separate with the playback head arranged to monitor while the recording is made. Hum and noise shall be at least 50 dB below full output.

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2.17.1 Cassette Tape Equipment: Tape speed shall be 1-7/8 ips. Frequency response shall be within 3 dB from 40 hertz to 14,000 hertz, with less than 0.16 percent wow and flutter. Signal to noise ratio shall be at least 50 dB.

2.17.2 Automatic Tape Reproducer: At a tape speed of 7-1/2 ips, the reproducer shall have a frequency response within 2 dB from 40 hertz to 15,000 hertz. Wow and flutter shall be not greater than 0.25 percent; and signal to noise ratio, not less than 50 dB.

2.18 Preamplifiers:

2.18.1 Microphone Preamplifiers: If required, microphone preamplifiers shall be matched to the microphone.

2.18.2 Mixer Preamplifier: Preamplifier shall be of the general purpose type, to mix and control at least five inputs. Equalization shall meet the requirements of RIA& Publication, Standard Recording and Reproducing Characteristics. Preamplifier shall be provided with independent low-frequency and high-frequency tone controls to adjust bass and treble response at the output, a monitor volume control, monitor jack, illuminated volume unit meter, power switch, and master volume controls.

2.18.3 Radio Frequency Preamplifier: The preamplifier shall have a minimum of 14 dB gain over the FM band with a noise figure not greater than 4.2 dB.

2.19 Power Amplifiers: Frequency response shall be within 1 dB from 25 hertz to 19,000 hertz, and total harmonic distortion shall not exceed 0.5 percent at rated output. Output shall incorporate automatic resetting, protective electronic circuitry to prevent amplifier damage of any kind due to amplifier output opens or shorts.

2.20 Equipment Racks: Equipment shall be mounted in 19-inch racks in accordance with EIA RS-310. Ventilated rear panels, solid side panels, and solid top panels shall be provided.

2.21 AM/FM Antenna. The AM/FM antenna shall be roof-mounted suitable for both AM and FM reception and shall cover all frequency bands specified for radio tuners. Coaxial cable attenuation shall not exceed 2.5 dB over the FM radio band.

3.1 EXECUTION:

3.2 Connections to Existing System: Alarm or emergency systems shall not be interrupted. If required, work shall be scheduled after normal working hours. Existing disturbed work shall be restored to its original condition, including maintenance of wiring continuity.

3.3 Temporary Shutdowns: Temporary shutdowns of existing systems shall be made at times that will not interfere with normal operation of existing facilities, and only with written consent of the Contracting Officer.

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SECTION 16865

INSTITUTIONAL ELECTRIC HEATING EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of institutional electric heating equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Controls: NEMA DC 4, UL 20, UL 917, and UL 1020.

2.3 Heaters: NEKA HE 2 and UL 499.

2.4 General Electrical: NFPA 70 and 70B.

2.5 Asbestos Usage: Materials containing asbestos shall not be used if nonasbestos materials are available.

3.1 EXECUTION:

3.2 Coordination: Contractor shall determine that heating equipment has been de-energized. Temporary heaters shall be supplied if required to maintain temperature.

3.3 Motor Repair: Electric motors to be repaired shall be done by a shop specializing in the repair of motors.

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SECTION 16870

ELECTRIC UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Heating Element shall have nickel-chromium wire packed in high purity magnesium oxide enclosed in a corrosion-resistant sheath. The embedded sheath shall be the manufacturer's standard design.

2.3 Housing shall be fabricated from sheet steel complying with ASTM A 569. The housing shall be provided with means for suspension. Deflector blades shall be constructed of same material as housing and shall be manufacturer's standard design and operation.

2.4 Fan shall be the propeller type fabricated of aluminum or steel.

2.5 Controls:

2.5.1 Thermal Overload Cutout of the Manual Reset Type shall be provided to disconnect elements in the event normal operating temperatures are exceeded.

2.5.2 Thermostat shall be unit or wall mounted and shall be heavy-duty type with enclosed contacts as specified by the manufacturer, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

2.6 Asbestos Usage: Materials containing asbestos shall not be used if nonasbestos materials are available.

3.1 EXECUTION:

3.2 Coordination and Scheduling: Contractor shall ensure that power interruptions have been scheduled and approved.

3.3 Workmanship: Installation work shall be in compliance with the National Electric Code.

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SECTION 16901

CENTRAL MONITORING, CONTROL, AND INSTRUMENTATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of central monitoring, control, and instrumentation equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.1 PRODUCTS:

2.2 Drawings and Data: Drawings and data on existing monitoring control and instrumentation equipment should be requested from the Contracting Officer.

2.3 Sensing Elements or Transducers: Devices that sense the condition, state, or value of a process variable and produce an output that reflects that condition.

2.4 Measurement and Signal Conditioning: Devices that condition and transmit the signal generated by the sensing element and transducers.

2.5 Control Devices: Include any device that performs a definite function in control system, such as any switch (limit, pressure, temperature, on-off, etc), valves, solenoid, relays, and solid-state control elements.

2.6 Central Monitoring and Control Devices: Include any device that either monitors the signal generated by the transmitters or control devices (indicators, recorders, annunciators, etc.) or provides a final control action from the signal generated by the transmitter such as controllers, computers, etc.

2.7 Product Codes and Standards:

2.7.1 Safety Requirements for Electrical Measuring and Controlling: ANSI-C39.5.

2.7.2 Industrial Control Equipment: ANSI C33.76.

2.7.3 Electrical Analog Indicating Instruments: ANSI C39.1.

2.7.4 Instrument Transformers: ANSI C57-13.

2.7.5 Industrial Controls and Systems: NEKA-ICS.

2.7.6 National Electrical Code: NFPA-70.

2.7.7 Electrical Equipment Maintenance: NFPA-70B.

2.7.8 Limit Controls: UL-353.

2.7.9 Test Code for Industrial Controls: IEEE-74.

2.7.10 Master Test Code for Resistance Measurement: IEEE- 118.

2.7.11 Master Test Code for Electrical Measurement in Power Circuits: IEEE-120.  
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2.6-12 Dynamic Response Testing of Process Control Instrumentation: ISA-S26.

3.1 EXECUTION:

3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment

and other property in compliance with ANSI C2.

3.3 Power Supplies that may be a hazard during the performance of the work shall be locked out.

3.4 Testing: Check the operation of each instrument after it is returned to service. Adjust each instrument to operate properly over the design range.

3.5 Report: A final report shall be prepared after the maintenance, repair, or replacement has been accomplished. A list of all equipment worked on, the service performed on each piece of equipment, and calibration data shall be included in the report. The report shall be typed and furnished to the Contracting Officer.