SECTION 05 58 00

FORMED METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section includes the work necessary to furnish and install the following fabricated metalwork, castings and miscellaneous items:

1. Bollards
2. Backflow Preventer Enclosure (Shop fabricated and factory fabricated)
3. Miscellaneous Items as Listed on the Plans

B. Reference standards include but are not limited to:

1. San Francisco Building Code, latest edition.
2. American Welding Society Structural Welding Code.
3. Manufacturer's recommendation and specifications.

1.2 GENERAL

A. Like items of materials provided hereunder shall be the end products of one fabricator in order to achieve standardization for appearance, maintenance, and replacement.

1.3 SUBMITTALS

A. In addition to the requirements of the General Conditions, Submittals shall include the following:

1. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
2. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections and all other detail necessary to evaluate the submittal.
    a. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.
3. Test pieces and samples representative of materials and finished products as may be requested by the Engineer.
4. Certificates and test reports including welder certificates signed by Contractor certifying that welders comply with requirements specified under Article "Quality Assurance."

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firms experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel," and D1.2 "Structural Welding Code - Aluminum."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved.

D. Engineer Qualifications: Professional engineer licensed to practice in the State of California and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

E. Workmanship:

1. Verify dimensions and conditions at job.

2. Weld by shielded electric arc method according to American Welding Society Code.

3. Grout all plates, bolts and similar items with non-shrink grout.

4. Set all work plumb, true, rigid and neatly trimmed out.

5. Protect dissimilar metals from galvanic corrosion with pressure tapes, coating or isolators as approved.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 GENERAL

A. The use of a manufacturer's name and model or catalog number are for the purpose of establishing the standard of quality and general configuration desired only.

2.2 BOLLARDS

A. General: The bollards shall be fabricated from a Schedule 80 galvanized steel pipe filled with concrete and imbedded in a concrete footing. The bollard diameter, length and

footing dimensions shall be as shown on the Plans.

B. The bollard shall have a threaded top end to accept a standard size galvanized malleable iron threaded pipe cap which shall be tack welded in place after being screwed tight onto the bollard along with a through hole to provide for lifting of the bollard.

2.3 PREFABRICATED BACKFLOW PREVENTER ENCLOSURE 2-INCH BACKFLOW PREVENTER

A. Manufacturer: GuardShack Enclosure Model Number GS-4, size as required to meet the clearance dimensions and equipment dimensions as shown on the drawings or an approved equal.

B. The enclosure shall have half circular end frames manufactured from 1 ¼-inch schedule 40 ASTM A-53 steel pipe, base from 1 x 1 x 1/8-inch steel angle iron, and covered with die formed ½-inch 13-gauge diamond pattern expanded metal. Unit shall be welded to form a solid structure and hinged in order that the unit can be tilted to access the equipment inside.

C. The completed unit(s) shall be finished by first cleaning in a five part process and undergo an iron phosphate solution treatment. The powder coat process shall include applying a 2.0 mil thickness polyester powder to ASTM D-2794 for impact resistance and ASTM D-3559 for adhesive. The powder coat color shall be approved by the Engineer prior to application.

D. The unit shall include tamper-proof hardware, be lockable and mounted on a concrete equipment pad as shown on the drawings.

2.4 PREFABRICATED BACKFLOW PREVENTER ENCLOSURE 4-INCH BACKFLOW PREVENTER

A. Manufacturer: GuardShack Enclosure Model Number GS-5, size as required to meet the clearance dimensions and equipment dimensions as shown on the drawings or an approved equal.

B. The enclosure shall have half circular end frames manufactured from 1 ¼-inch schedule 40 ASTM A-53 steel pipe, base from 1 x 1 x 1/8-inch steel angle iron, and covered with die formed ½-inch 13-gauge diamond pattern expanded metal. Units shall be welded to form two solid structures that are hinged at the ends in order that the units can be tilted to access the equipment inside-clamshell opening design.

C. The completed unit(s) shall be finished by first cleaning in a five part process and undergo an iron phosphate solution treatment. The powder coat process shall include applying a 2.0 mil thickness polyester powder to ASTM D-2794 for impact resistance and ASTM D-3559 for adhesive. The powder coat color shall be approved by the Engineer prior to application.

D. The unit shall include tamper-proof hardware, be lockable and mounted on a concrete equipment pad as shown on the drawings.

2.5 FERROUS METALS

A. Metal Surfaces, General: Provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A36.

C. Rolled Steel Floor Plates: ASTM A786.

D. Steel Tubing: Product type (manufacturing method) and as follows:

E. Hot-Formed Steel Tubing: ASTM A501.

1. For exterior installations and where indicated, provided tubing with hot-dip galvanized coating per ASTM A53.

F. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade, as follows:

G. Cold-Rolled Structural Steel Sheet: ASTM A611, grade as follows:

1. Grade A, unless otherwise indicated or required by design loading.

H. Hot-Rolled Structural Steel Sheet: ASTM A570, grade as follows:

1. Grade 30, unless otherwise indicated or required by design loading.

I. Steel Pipe: ASTM A53; finish, type, and weight class as follows:

J. Galvanized finish for exterior installations and where indicated.

K. Type F, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.

L. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

M. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A153. E70XX low hydrogen, conforming to AWSD1.1 except different requirement.

N. Welding Rods and Bare Electrodes: In accordance with AWS specifications for the metal alloy to be welded.

O. Steel Studs: ASTM A108.

2.6 STAINLESS STEEL

A. Bar Stock: ASTM A666, Type 316, unless otherwise shown on drawings or individual specification sections.

B. Plate or Shape: ASTM A666, Type 316, unless otherwise shown on drawings or individual specification sections.

2.7 GROUT AND ANCHORING CEMENT

A. See specification Section 03 30 00 - Cast-In-Place Concrete.

2.8 FASTENERS

A. General: Provide stainless steel fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A otherwise shown on drawings.

C. Lag Bolts: Square head type, FS FF-B-561.

D. Machine Screws: Stainless steel, FS FF-S-92.

E. Plain Washers: Round, stainless steel, FS FF-W-92.

F. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.

G. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

H. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

2.9 ANCHOR SYSTEMS FOR CONCRETE

A. Wedge Anchors:

1. Wedge anchors shall be 100 percent Type 316 stainless steel and shall not be used below a point 1-foot 6-inches above the peak (maximum) water surface in any water-holding structure. See adhesive anchors or coated anchor bolts specified elsewhere in this Specification.

2. Wedge anchors shall be Type 316 stainless steel, manufactured by ITT Phillips Drill Division, Hilti Kwik-bolt, stud type manufactured by Hilti, Inc., Wej-It, stainless steel bolts, completely assembled, manufactured by Wej-It Corporation, Parabolt Concrete Anchors, manufactured by Molly Division of Emhart Corp., or an approved equal. Furnish sizes shown on Drawings. Provide ICBO (International Conference of Building Officials) or other similar building code organization recommendations regarding safe allowable design loads.

B. Expansion Anchors:

1. Expansion anchors shall not be used to anchor pumps or vibrating equipment.

2. Expansion anchors shall not be used except in dry areas where future corrosion is not a problem unless the expansion anchors are Type 316 stainless steel. In the wet or damp areas, use wedge anchors as specified above or adhesive anchors in submerged conditions as hereinafter specified; Type 316 stainless steel expansion anchors may be used as defined for stainless wedge anchors.

3. Self-drilling anchors, snap-off type or flush type: Provide anchors for use with hot-dipped galvanized bolts. Nondrilling anchors shall be flush type for use with a bolt or stud type with projecting threaded stud. Provide ICBO or other similar code organizations' recommendations regarding safe allowable design loads. ITT Phillips-Drill Division, Hilti HDI Drop-In anchors, Hilti, Inc. or an approved equal.

C. Adhesive Anchors/Capsule Type Anchors

1. Adhesive or capsule anchors shall be used for anchoring metal components below ground level pipe trenches or surface elevations in water-holding structures. For embedded anchors refer to coated steel anchor bolts as herein before specified.

2. Adhesive or capsule type anchors shall be Parabond capsule anchors with Type 316 stainless steel stud, nuts, and washers, as manufactured by Molly Division, heavy-duty adhesive anchor with HBP adhesive cartridge and has Type 316 stainless steel anchor rod assembly as manufactured by Hilti, Inc. or an approved equal.

2.10 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

D. Zinc Chromate Primer: FS TT-P-645.

2.11 FABRICATION

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and over stressing of welds and fasteners. Base design calculations on actual surface temperature of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 100 deg F (55.5 deg C)

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Round exposed edges to a radius of approximately 1/32-inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.12 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.13 MISCELLANEOUS STEEL, TRIM

A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joins and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.

B. Galvanize all miscellaneous steel supports in the following locations:

1. Exterior locations.

2. Interior locations where indicated.

2.14 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

C. Interior and exterior steel items: All welds shall be ground smooth after fabrication and completed assembly shall be hot-dip galvanized. If items are too large, fabricate in

smaller sections with proper connectors or sleeves in order that assemblies fit dipping tanks. Stainless steel items shall not be galvanized.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:

1. ASTM A53 for galvanizing iron and steel hardware.

2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299-inch thick and heavier.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."

2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

1. Paint all edges, corners, crevices, bolts, welds, and sharp edges.

2.16 CHECKERED PLATE

A. Steel: A36, plate, thickness as indicated, ¼-inch minimum. Fasten all accessories by welding or stainless steel bolts or screws.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Center nosings on tread widths with noses flush with riser faces and tread surfaces.

C. Set sleeves in concrete with tops flush and finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION OF FABRICATED METALWORK

A. Fabricated metal wok shall be installed in accordance with the shop drawings. Field welding and erection work shall be performed by skilled mechanics. Install fabricated metalwork plumb or level as applicable. The completed installations shall, in all cases, be rigid, substantial, and neat in appearance. Erect structural steel in accordance with the applicable portions of AISC Code of Standard Practice, except as modified. Install commercially manufactured products in accordance with manufacturer’s

recommendations as approved.

3.3 ANCHOR BOLTS

A. All anchor bolts shall be accurately located and held in place with templates at the time the concrete is poured.

3.4 CONCRETE ANCHORS

A. Installation shall not begin until the concrete or masonry receiving the anchors has attained its design strength. An anchor shall not be installed closer than six times its diameter to either an edge of the concrete or masonry, or to another anchor, unless specifically detailed otherwise on the Drawings. Install in strict conformance with manufacturer's written instructions. Use manufacturer's recommended drills and equipment.

3.5 GALVANIZING AND REPAIR

A. All steel items including embedded in concrete shall be galvanized after fabrication.

B. Galvanizing of steel plates, shapes, bars (and products fabricated from these items), and strip 1/8-inch thick or thicker shall conform to ASTM A123. Pipe, welded or seamless steel, shall conform to ASTM A53. Material thinner than 1/8-inch shall either be galvanized before fabrication in conformance with the requirements of ASTM A525, Coating Designation G210; or after fabrication, in conformance with the requirements of ASTM A123, except that the weight of zinc coating shall average not less than 1.2 ounces per square foot of actual surface area with no individual specimen having a weight of less than 1.0 ounce. Unless otherwise provided, galvanizing of material which is thinner than 1/8-inch may be done before or after fabrication, at the option of the Contractor. Galvanizing will not be required for stainless steel, monel metal, and similar corrosion-resistant parts.

C. All welded areas shall be thoroughly cleaned prior to galvanizing to remove all slag or other material that would interfere with the adherence of the zinc. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the zinc coating.

D. In like manner, galvanizing of iron and steel hardware, and nuts and bolts shall conform to ASTM A153. Galvanizing shall be performed after fabrication. Galvanizing of tapped holes will not be required.

E. Fabrication shall include all operations such as shearing, cutting, punching, forming, drilling, milling, bending, welding, and riveting.

F. Components of bolted assemblies shall be galvanized separately before assembly.

G. The minimum pitch diameter of the threaded portion of all bolts, anchor bars, or studs shall conform to ANSI B1.l, having a Class 2A tolerance before galvanizing. After galvanizing, the pitch diameter of the nuts or other internally threaded parts may be tapped over ANSI B1.1, Class 2B tolerance, by the following maximum amounts:

3/8-inch through 9/16-inch:	0.016-inch oversize
5/8-inch through 1-inch:	0.023-inch oversize
1 1/8-inch and layer:	0.033-inch oversize

H. Except for inlet grates not otherwise required to be welded, all edges of tightly contacting

surfaces, where galvanized is repaired, shall be completely sealed by welding before galvanizing.

I. Galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating shall be repaired by solvent cleaning the areas (Steel Structures Painting Council SP 1) by hand or power tool (Steel Structures Painting Council SP 2 or SP 3) removing all loose and cracked coating; the cleaned areas subsequently shall be painted with one of the following coatings:

1. One coat of Inorganic Zinc Silicate (MIL-P-23236, Class 3),
2. Two coats of Galvanizing Repair Paint (MIL-P-21035), or
3. Two coats of Zinc Dust Paint (MIL-E-15145, Formula 102).

J. Paint shall be applied to a cleaned surface. Abrasive blasting is required for inorganic zinc silicate.

3.6 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0-mils.

B. For galvanized surfaces, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION