SECTION 05720 - INSTALLING NEW BRASS, CAST-IRON AND STEEL ORNAMENTAL HANDRAILS AND RAILING SYSTEMS TO MATCH HISTORIC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the contract, including General and Supplementary and Division Sections, apply to this section.

1.2 SUMMARY

A. Related sections include the following:
   1. Division 4 Sections
   2. Division 5 Sections
   3. Division 9 Sections

1.3 SYSTEM DESCRIPTION

A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

B. For cold-formed structural steel: AISI "Specification for Design of Cold-Formed Steel Structural Members".

C. For copper alloys use a safety factor of 1.65 applied to minimum yield strength of alloy.

D. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by using metals that are compatible with one another. In some instances the corrosion can be prevented by inserting a plastic insulator between the dissimilar materials.

F. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of handrails and railings to prevent buckling, opening up of joints, and over-stressing of components, connections, and other detrimental effects. Base design calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Shop drawings showing fabrication and installation of handrails and railings including plans, elevations, sections, details of components, and attachments to other units of Work.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Engineering Responsibility: Engineer handrails and railing systems by qualified professional engineer legally authorized to practice in jurisdiction where Project is located.

C. Engineer Qualifications: Professional engineer legally authorized to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated for handrails and railings similar in material, design, and extent to that indicated for this Project and that have a record of successful in-service performance.

D. Restoration Specialist: Work must be performed by a firm having not less than 5 years successful experience in comparable restoration projects and employing personnel skilled in the restoration processes and operations indicated.

1.6 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

1.7 PROJECT/SITE CONDITIONS

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.8 SEQUENCING AND SCHEDULING

A. Mount handrails only on completed surfaces. Do not support handrails temporarily by any means not satisfying structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Stan Chemical Company
401 Berlin Street
East Berlin, CT 06023
203/828-0571

2.2 MATERIALS

A. NOTE: Provide metal forms and types that comply with requirements of referenced standards and that are free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Copper Alloys: Provide CDA copper alloy of type and form indicated to comply with the following requirements:

1. Extruded Brass Shapes: Alloy suitable to produce US3 finish.

2. Seamless Brass Tube: Alloy suitable to produce US3 finish.

C. Composition Brass Castings: Alloy suitable to produce US3 finish.

D. Steel and Iron: Provide steel and iron in the form indicated complying with the following requirements:

1. Cold-Formed Steel Tubing: ASTM A 500, grade B, unless otherwise indicated or required by structural loads.

E. For exterior installations and as required, provide tubing with hot-dip galvanized coating per ASTM A 53.

F. Steel Plates, Shapes, and Bars: ASTM A 36.

G. Malleable Iron Castings: ASTM A 47, grade 32510.

2.3 ACCESSORIES

A. Grout and Anchoring Cement:

1. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this procedure such as "Bonsal Construction Grout" (W. R Bonsal Co.), "Diamond-Crete Grout" (Concrete Service Materials Co.), "Euco N-S Grout" (Euclid Chemical Co.), or approved equal.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation

that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

C. Paint:

1. 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 SSPC-Paint-20.

2. Zinc Chromate Primer

D. Fasteners:
1. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.
   a. For steel railings and fittings use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
2. For copper alloy railings provide fasteners fabricated from same base metal as railing components or from type 304.
3. Fasteners for Interconnecting Railing Components:
   a. Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
   b. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable.
4. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

E. Cast-In-Place and Post-installed Anchors in Concrete: Cast-in-place anchors and expansion anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

2.4 FABRICATION

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than that required to support structural loads.

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

C. Form changes in direction of railing members by insertion of prefabricated elbow fittings, by radius bends of radius as designated, and by bending, as required.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate railing systems and handrails for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface match those adjacent.

F. Non-welded Connections: Fabricate railing systems and handrails for connection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using epoxy structural adhesive where this represents manufacturer's standard splicing method.

G. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors for connection of handrail and railing members to other construction.

H. Provide inserts and the anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

I. For existing cast iron posts to be reset in concrete: Examine existing anchors to determine if suitable for reuse. Do not reuse unless in good condition. Provide new anchors where necessary of same configurations as existing.

J. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

K. Ease 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.

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

M. For handrails and railing systems that are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.

N. Fabricate joints that will be exposed to weather in a manner to exclude water.

O. Close exposed ends of handrail and railing members by use of manufacturer's standard prefabricated end fittings.

P. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of the railing and wall is 1/4 inch or less.

Q. Fillers: Provide steel sheet or plate filler of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and over-stressing of substrate.

R. Finishes:
1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
2. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are not acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved samples and they are assembled or installed to minimize contrast.
3. Copper Alloy Finishes: Finish designations prefixed by "CDA" conform with the system established by the Copper Development Association for designating copper alloy finish systems.

4. Buffed Finish: CDA M21 (Mechanical Finish: buffed, smooth specular).

5. Buffed Finish, Lacquered: CDA M21 Mechanical Finish: buffed, smooth specular; Coating: clear organic, air dry, such as "Incralac" (Stan Chemical Company), or approved equal.

a. Apply by air-spray in 2 coats per manufacturer's directions, with interim drying, to a total thickness of 1.0 mil.

S. Galvanized Finish:

1. General: Hot-dip galvanize items indicated to be galvanized to comply with ASTM A 123 for galvanizing iron and steel products made form rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.

2. For exterior steel railings and handrails formed from steel tubing with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

T. Factory-Primed Finish: Apply air-dried primer immediately following cleaning and pretreatment, to provide a minimum dry film thickness of 2.0 mils per applied coat, to surfaces that will be exposed after assembly and installation and to concealed, non-galvanized surfaces.

1. Apply shop primer to uncoated surfaces of handrails and railing components, except those with galvanized finish or to be embedded in concrete or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

2. Shop Primer: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 ERECTION, INSTALLATION, APPLICATION

A. General:

1. Fit exposed connections accurately together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of handrails and railings. Set handrails and railing accurately in location, alignment, and elevation, measured from established lines and levels and free from rack. TAKE CARE SO AS NOT TO DAMAGE ADJACENT HISTORIC MATERIALS, SUCH AS MARBLE, GRANITE, OR LIMESTONE.

1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/4 inch in 12 feet.

C. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

D. Field Welding: Comply with the following requirements:
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.

E. Corrosion Protection: Coat concealed surfaces of concrete, masonry, wood, or dissimilar metals, which will be in contact with grout, with a heavy coat of bituminous paint or zinc chromate primer.

F. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by structural loads. MATCH ORIGINAL LOCATION AND SPACING TO AVOID GHOST MARKS.

G. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railing to in-place construction. INSPECT AND REUSE SOUND CONNECTIONS WHEN POSSIBLE.

H. Railing Connections:

1. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fitting designed for this purpose.

I. Non-Welded Connections: Use manufacturer's standard mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed lock screws using plastic filler cement colored to match finish of handrails and railing systems.

J. Anchoring Posts:
1. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
a. Non-shrink, nonmetallic grout: Exterior anchors, if in good condition, may be reused
b. if suitable. To be set in new concrete stairs.

K. Interior posts may be set in existing anchor holes if suitable.

L. Cover interior anchorage joint with a flange of the same metal as post; attach to post by welding after placement of anchoring material.

M. Leave exterior anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch buildup, sloped away from post. For installations exposed on exterior or to flow of water, seal anchoring material to comply with grout manufacturer's directions.

N. For steel railings, weld flanges to post and bolt to metal supporting surfaces.

O. Anchoring Rail Ends:
1. Anchor rail ends to concrete and masonry with required flanges, connected to rail ends and anchored into wall construction with post-installed anchors and bolts.

P. Anchor rail ends to metal surfaces with required flanges. Weld flanges to rail ends, and bolt flanges to metal surfaces.

Q. Attachment of Handrails to Walls: INSPECT AND RE-USE SOUND CONNECTIONS WHEN POSSIBLE. ALSO WHEN POSSIBLE, MATCH ORIGINAL LOCATION AND SPACING TO AVOID GHOST MARKS.

1. Attach handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2-inch clearance from inside face of handrail and finished wall surface.

R. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

S. Secure wall brackets and wall return fittings to building construction. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

T. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lab bolt, as applicable.

U. For hollow masonry anchorage, use toggle bolts with square heads.

V. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

3.3 PROTECTION

A. Protect finishes of railing systems and handrails from damage during cleaning period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the

field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05720