

# APPENDIX B

## (Project Manual)

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## WALNUT ST. PARKING GARAGE SOUTHEAST STAIR REPLACEMENT - 2019

City of Bloomington Public Works Department, Bloomington, Indiana

May 3, 2019

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## SECTION 03 3053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes for metal pan stairs.
- B. Related Sections:
  - 1. 05 5000 – Metal Fabrications.
  - 2. 05 5100 - Metal Pan Stairs.
  - 3. 07 1900 – Water Repellents.
  - 4. 07 9200 – Joint Sealants.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.

#### 1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE, GENERAL

- A. Comply with current edition of ACI 301.
- B. Comply with current edition of ACI 117.

#### 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.3 CONCRETE MATERIALS

### A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I or Type III.
2. Fly Ash: ASTM C 618, Class C or F.

### B. Normal-Weight Aggregate: ASTM C 33/C 33M, ¾" nominal maximum aggregate size.

### C. Air-Entraining Admixture: ASTM C 260/C 260M.

### D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

### E. Water: ASTM C 94/C 94M.

## 2.4 FIBER REINFORCEMENT

### A. Synthetic Micro-Fiber: Monofilament or fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

## 2.5 CURING MATERIALS

### A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

### B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

### C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

### D. Water: Potable.

### E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

### F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

## 2.6 CONCRETE MIXTURES

### A. Normal-Weight Concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum W/C Ratio: 0.48
  3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used. The ratio of the amount of the fly ash to the total amount of fly ash plus cement in the mix shall not exceed 25 percent.
  4. Slump Limit: 5 inches for concrete mixes containing water-reducing admixtures, and 5 to 8 inches for mixes containing high-range water-reducing admixtures.
  5. Air Content: Maintain within range permitted by ACI 301 (ACI 301M). Air content shall be 6% plus or minus 1% for weather exposed slabs.
- B. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd.

## 2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.
1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301 (ACI 301M).

### 3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Isolation Joints in Slabs: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

### 3.5 CONCRETE PLACEMENT

- A. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

### 3.6 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scream surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
  1. Do not further disturb surfaces before starting finishing operations.
- C. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### 3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.

- c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301 (ACI 301M).
  1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
  2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

END OF SECTION

SECTION 03 90 00 – CONCRETE REHABILITATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Epoxy injection of cracks

1.3 SUBMITTALS

- A. Product Data: Include material descriptions, chemical composition, physical properties, test data, and mixing and application instructions.
  - 1. Include Material Safety Data Sheets, if applicable.
- B. Contractor qualifications: See 1.4.A.3
  - 1. Contractor qualifications shall be submitted with the Bid Form.

1.4 QUALITY ASSURANCE

- A. Contractor qualification requirements:
  - 1. If materials selected require manufacturer trained and/or approved installers, retain installers that employ workers trained and approved by manufacturer to apply any materials in this Division. The Contractor shall have a minimum of five years successful experience in concrete rehabilitation using the specified products.
    - a. Contractor shall submit manufacturer certifications
    - b. Contractor shall submit project experience per 1.4.A.3
  - 2. The superintendent assigned to the project must have successfully supervised five prior projects of similar magnitude and type. Job superintendent shall control all operations as necessary for full compliance with all requirements.
    - a. The project experience submitted in accordance with 1.4.A.3 shall be projects supervised by the superintendent assigned to this project (and identified as such in the submittal per 1.4.A.3)
  - 3. The Contractor shall submit a list of at least five projects similar in concept, which the Superintendent of Constructions has completed in the last five years as a certified applicator. Such lists shall include:
    - a. Project name
    - b. Project description
    - c. Project location
    - d. Project superintendent
    - e. Date of construction
    - f. Owner's name, address, and telephone number

- g. Project consultant name, address, and telephone number
  - B. **Manufacturer Qualifications:** In addition to other requirements, manufacturers shall have factory-trained representatives who are available for consultation and Project site inspection at no additional cost.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.
  - B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
  - C. Store cementitious materials off the ground, under cover, and in a dry location.
  - D. Store aggregates, covered and in a dry location, where grading and other required characteristics can be maintained and contamination avoided.
- 1.6 PROJECT CONDITIONS
- A. **Environmental Limitations for Epoxies:** Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.
- 1.7 SAFETY REQUIREMENTS
- A. The Contractor must coordinate fully with Owner site safety requirements. This includes, but is not limited to:
    - 1. Daily work coordination with City of Bloomington officials.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Available Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. **Epoxy Crack Injection Adhesive:**
    - a. Sikadur 35, Hi-Mod LV (cracks equal or greater than 1/16"), Sikadur Injection Gel (cracks greater than 1/16"); Sika Corporation.
    - b. Masterinject 1500; BASF
  - 5. **Epoxy Patching Mortar:**
    - a. Sikadur 31 Hi-Mod Gel; Sika Corporation
    - b. MasterEmaco ADH 327 RS; BASF



- c. MasterFlow 928; BASF
- d. Sikadur 21 LoMod LV; Sika Corporation

B. Alternate Products:

- 1. The use of other than the materials specified above is allowable providing such materials have been accepted in writing by the Engineer as an approved equivalent prior to Bid.

2.2 MISCELLANEOUS MATERIALS

- A. Water: Potable

2.3 MIXES

- A. Mix products in clean containers according to manufacturer's written instructions.

- 1. Add clean silica sand and coarse aggregates to products only as recommended by manufacturer.
- 2. Do not add water, thinners, or additives unless recommended by manufacturer.
- 3. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
- 4. Do not mix more materials than can be used within recommended open time. Discard materials that have begun to set.

2.4 EQUIPMENT

- A. The Contractor shall demonstrate his equipment's ability to pump and dispense the injection resin at sufficient pressures to fully seat all size joints and cracks. Use proper equipment designed for the application of the specified materials.
- B. Operator must demonstrate that pumping equipment can maintain this pressure for five minutes with no leaks or drop in pressure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See construction procedures and General Structural Notes on Drawings for additional information.

3.2 PREPARATION

- A. Protect people, motor vehicles, equipment, surrounding construction, Project site, plants, and surrounding buildings from injury resulting from concrete rehabilitation work.

1. Protect adjacent equipment and surfaces by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
2. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
3. Dispose of runoff from wet operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

END OF SECTION 03 90 00

## SECTION 05 12 00 – STRUCTURAL STEEL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This specification describes structural steel, including the fabrication and erection of steel members and bracing for the replacement of the southeast stair and landings per the contract documents.

#### 1.2 QUALITY ASSURANCE

##### A. Referenced Standards:

1. American Institute of Steel Construction (AISC):
  - a. 360, Specifications for Structural Steel Buildings (referred to herein as AISC Specification).
  - b. Quality Certification Program for Fabricators.
  - c. Erector Certification Program.
  - d. Manual of Steel Construction.
2. American Society of Civil Engineers (ASCE).
3. ASTM International (ASTM):
  - a. A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
  - b. A36, Standard Specification for Carbon Structural Steel.
  - c. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - d. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - e. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - f. A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - g. A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - h. A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  - i. A992, Standard Specification for Steel for Structural Shapes.
4. American Welding Society (AWS):
  - a. A5.1, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.
  - b. A5.5, Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding.
  - c. A5.17, Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.
  - d. A5.18, Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding.
  - e. A5.20, Specification for Carbon Steel Electrodes for Flux Cored Arc Welding.
  - f. A5.23, Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding.
  - g. A5.28, Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding.
  - h. A5.29, Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding.
  - i. D1.1, Structural Welding Code - Steel (referred herein as AWS Code).
  - j. Steel stud connectors and their installation to comply with requirements of AWS Code.

5. Research Council on Structural Connections (RCSC):
    - a. Specification for Structural Joints using ASTM A325 or A490 Bolts, referred to herein as Specification for Structural Joints.
  6. Building code:
    - a. International Code Council (ICC):
      - 1) International Building Code and associated standards, 2012 Edition including all amendments, referred to herein as Building Code. Also included in the State of Indiana Amendments, referenced as the 2014 Indiana Building Code.
- B. Qualifications:
1. Steel fabricator:
    - a. Minimum of 5 years experience in fabrication of structural steel and shall be certified under AISC Quality Certification Program
    - b. Use a professional engineer on fabrication staff.
  2. Qualify welding procedures and welding operators in accordance with AWS.
- 1.3 SUBMITTALS
- A. Shop Drawings:
1. See front end specifications for requirements for the mechanics and administration of the submittal process.
  2. Fabrication and/or layout drawings:
    - a. Prepare Shop Drawings under National Institute of Steel Detailing Quality Procedures Program certification.
    - b. Complete Shop Drawings for all of the work showing clearly all pieces, sizes, dimensions, details, connections materials and shop coatings.
      - 1) All Shop Drawings must be checked and signed "approved" before submittal.
      - 2) Show all cuts, copes, and holes.
      - 3) Indicate all shop and field bolts.
      - 4) Indicate all shop and field welds using AWS symbols.
    - c. Correct any incorrect or unacceptable material or fabrication due to incorrect detailing, shop work, or erection, without additional charge.
  3. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
    - c. Detailed supplemental specification relating to load indicator washers or high-strength bolts (if required) - alternate design for approval of Engineer (submitted at Contractor's option if desired by Contractor for use).
    - d. Source and certification of quality for high-strength bolts, nuts and washers.
  4. Certifications:
    - a. Certificates of compliance with standards specified for all major components and fasteners incorporated into work.
    - b. Copies of current welding certificates for each welder assigned to perform welding indicating compliance with testing specified by AWS.
    - c. Welder qualification data and prequalified procedures.
  5. Test reports:
    - a. Certified copies of mill tests.
    - b. Manufacturer's load test and temperature sensitivity data for expansion anchor bolts and adhesive anchor bolts.
- 1.4 DELIVERY, STORAGE, AND HANDLING
- A. Handle and store steel members above ground on skids or other supports.
1. Keep free of dirt and other foreign material and protect against corrosion.

## 1.5 DEFINITION

- A. Code: AISC 303, Code of Standard Practice for Steel Buildings and Bridges.
- B. Owner: May mean the Owner's Designated Representative for Construction as defined by the Building Code.
- C. Galvanizing: Hot-dipped galvanizing per ASTM A153 with minimum coating of 2.0 OZ of zinc per square foot of metal (average of specimens) unless noted otherwise or dictated by standard.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. High-strength bolts (if required):
    - a. Bethlehem Steel Corporation.
    - b. Lewis Bolt & Nut Company.
    - c. Nucor Fasteners.
    - d. St. Louis Screw and Bolt Company.
  - 2. Load indicator washers for high-strength bolts (if required):
    - a. Bethlehem Steel Corporation.
    - b. Mid-South Bolt and Screw Co., Inc.
    - c. J and M Turner, Inc.
  - 3. Alternate design high-strength bolts (if required):
    - a. T. C. Bolt Corporation.
    - b. Construction Fastener Systems Division of Bristol Machine Company.
    - c. LeJuene Bolt Co.
  - 4. Headed studs and deformed bar anchors (if required):
    - a. Nelson Stud Welding Division, TRW, Inc.
    - b. Stud Welding Products, Inc.
  - 5. Expansion anchor bolts (if required):
    - a. Kwik Bolts by Hilti, Inc.
    - b. Trubolt by ITW Ramset/Red Head.
    - c. Powerbolt by Powers Rawl.
  - 6. Adhesive anchors bolts (if required):
    - a. HVA Adhesive Anchor System by Hilti.
    - b. HIT HY 200 Adhesive Anchor by Hilti.
    - c. HSE 2411 Epoxy Adhesive Anchor by Hilti.
    - d. EPCON Ceramic 6 Epoxy by ITW Ramset/Red Head.
    - e. Power Fast by Powers Rawl.
    - f. Needle Capsule Anchor Systems by Powers Rawl.
  - 7. Anchor bolt sleeves (if required):
    - a. Sinco/Wilson.
- B. Submit request for substitution in accordance with Specification Section 01 6 40.

### 2.2 MATERIALS

- A. Steel, Structural Shapes and Plate (unless noted otherwise on Drawings):
  - 1. All W-shapes and WT-shapes: ASTM A992.
  - 2. All other plates and rolled shapes: ASTM A36.
- B. Plate and Bar: ASTM A36.
- C. Pipe: ASTM A53, Grade B (Type E or S) (Fy=35).

- D. Hollow Structural Sections (HSS):
    - 1. Round: ASTM A500, Grade B (Fy=42).
    - 2. Square or rectangular: ASTM A500, Grade B (Fy=46).
  - E. High-Strength Bolts, Nuts and Washers, ASTM A325 with ASTM A563 nuts:
    - 1. High-strength bolts:
      - a. Provide two (2) ASTM F436 washers for all bolts.
      - b. Provide beveled washers at connections of sloped/tapered sections.
    - 2. High-strength bolts with load indicating devices, ASTM F959, Type 325.
      - a. Provide at Contractor's option and subject to approval of Engineer.
    - 3. Alternate high-strength design:
      - a. Provide at Contractor's option and subject to approval of Engineer.
  - F. Bolts and Nuts, Unfinished: ASTM A307, Grade A.
  - G. Washers, Plain (Unfinished Bolts): ASME B18.22.1, Type B.
  - H. Welding Electrodes (AWS):
    - 1. Shielded metal arc: AWS A5.1 or AWS A5.5, E70XX or E801X-X.
    - 2. Submerged arc: AWS A5.17 or AWS A5.23, F7XX-EXXX or F8XX-EXXX-XX.
    - 3. Gas metal arc: AWS A5.18, E70S-X or E70U-1 or AWS A5.28, ER805-XX, E80C-XXX.
    - 4. Flux cored arc: AWS A5.20, E7XT-X (except 2, 3, 10, GS), AWS A5.29, E7XT-X or E8XTX-X, E8XTX-XM.
  - I. Anchor Rods and Bolts:
    - 1. ASTM F1554, Grade 55 with weldability supplement S1 or ASTM A36 for threaded rods.
    - 2. ASTM A307, Grade A for headed bolts.
    - 3. ASTM F593 Type 304 or 316 stainless steel with matching nut and washer.
  - J. Expansion Anchor Bolts and Adhesive Anchor Bolts for Fastening to Concrete:
    - 1. Use of expansion bolts requires approval by Engineer.
    - 2. Stainless steel, Type 304 or 316.
    - 3. Provide minimum edge distance cover as recommended by manufacturer or as indicated on Drawings.
    - 4. Submit manufacturer's data to verify at least the load test capacities of the following embedment depth:
      - a. Submit manufacturer's load test data to verify at least the anchor bolt capacities for the embedment depths shown on Drawings.
- 2.3 FABRICATION
- A. Comply with requirements of applicable Building Codes and AISC Specification with modifications and additional requirements specified herein.
    - 1. Identify high-strength steel material in fabricated members in accordance with ASTM A6.
  - B. Minimize the amount of field welding.
    - 1. Shop assemble components into largest size possible commensurate with transportation and handling limitations.
    - 2. Shop connections: Bolted with high-strength bolts or welded.
  - C. Connection Details:
    - 1. Connections not fully detailed on Drawings shall be designed by a Professional Engineer registered in the State of Indiana, retained by Contractor, based on requirements of Contract Documents.
    - 2. Design bracing connections for loads indicated on the Drawings.
  - D. Provide as a minimum, two (2) 3/4 IN DIA, high-strength bolts for all bolted connections.

- E. Field Connections: Provide bolts for all field connections except where shown otherwise on the Drawings.
  - 1. Use high-strength bolts unless shown or specified otherwise.
  - 2. Use of high-strength bolts: Conform to RCSC Specification for Structural Joints.
  - 3. Unfinished bolts may be used for attaching stair treads to stringers.
  - 4. If structural steel details (field welds versus shop welds, etc.) shown on design Drawings are not compatible with selected erection procedures, submit proposed modifications for review.
  - 5. Connections to structural steel provided by others: Provide all connectors and coordinate location of bolt holes to match connection holes in steel provided by others.
- F. Accurately mill column end bearing surfaces to true plane.
- G. Fabricate and erect beams with non-specified camber in accordance with AISC Specification Chapter L1.
- H. Cut, drill, or punch holes at right angles to surface of metal.
  - 1. Do not make or enlarge holes by burning.
  - 2. Make holes clean cut, without torn or ragged edges.
  - 3. Remove outside burrs resulting from drilling or reaming operations with tool making 1/16 IN level.
  - 4. Provide holes in members to permit connection of work of other trades or contractors.
- I. Make allowance for draw in all cross bracing to provide small amount of initial tension in members.
- J. Make splices only where indicated or where approved.
- N. Cope at 45 degrees, corners of stiffener plates at junction of member flanges with webs.
- O. Flame cut bevels for welds, provided such cutting is done automatically.
  - 1. Leave free of burrs and slag by grinding or planing the cut edges.
- P. Grind smooth all rough welds and sharp steel edges shall be ground to approximately 1/8 IN radius.
- Q. Tolerances (unless noted otherwise on Drawings):
  - 1. ASTM A6: When material received from the mill does not satisfy ASTM A6 tolerances for camber, profile, flatness or sweep, the Contractor is permitted to perform corrective work by the use of controlled heating, and mechanical straightening, subject to the limitations of the AISC Specification.
  - 2. Fabrication tolerance:
    - a. Member length:
      - 1) Both ends finished for contact bearing: 1/32 IN.
      - 2) Framed members 30 FT or less: 1/16 IN. Over 30 FT: 1/8 IN.
    - b. Member straightness:
      - 1) Compression members: 1/1000 of axial length between points laterally supported.
      - 2) Non-compression members: ASTM A6 tolerance for wide flange shapes.
    - c. Specified member camber (except compression members):
      - 1) 50 FT or less: +1/2 IN.
      - 2) Over 50 FT: +1/2 IN (plus 1/8 IN per 10 FT over 50 FT).
      - 3) Members received from mill with 75 percent of specified camber require no further cambering.
      - 4) Beams/trusses without specified camber shall be fabricated so after erection, camber is upward.
      - 5) Camber shall be measured in fabrication shop in unstressed condition.
    - d. At bolted splices, depth deviation shall be taken up by filler plates.

- 1) At welded joints, adjust weld profile to conform to variation in depth.
- 2) Slope weld surface per AWS requirements.
- e. Finished members shall be free from twists, bends and open joints.
  - 1) Sharp kinks, bends and deviation from the above tolerances are cause for rejection of material.

## 2.4 WELDING

- A. Comply with AWS Code, and other requirements indicated herein, for all welding, techniques of welding employed, appearance and quality of welds, and methods used to correct defective work.
  1. Qualify joint welding procedures or test in accordance with AWS qualification procedures.
- B. Test and qualify welders, welding operators and tackers in compliance with AWS Code for position and type of welding to which they will be assigned.
  1. Conduct tests in presence of approved testing agency.
  2. Certification within previous 12 months will be acceptable, provided samples of the welder's work are satisfactory.
- C. Before Starting Welding:
  1. Carefully plumb and align members in compliance with specified requirements.
  2. Fully tighten bolts.
  3. Comply with Section 5 of AWS Code for assembly and surface preparation.
  4. Preheat base metal to temperature stated in AWS Code.
    - a. When no preheat temperature is given in AWS Code and base metal is below 50 DegF, preheat base metal to at least 70 DegF.
    - b. Maintain temperature during welding.
    - c. Preheat surface of all base metal within distance from point of welding equal to thickness of thicker part being welded or 3 IN, whichever is greater, to specified preheat temperature.
    - d. Maintain this temperature during welding.
  5. Each welder shall use identifying mark at welds.
- D. Make flange welds before making web welds.
- E. Where groove welds have back-up plates, make first three (3) passes with 1/8 IN round electrodes.
  1. Use backup plates in accordance with AWS Code, extending minimum of 1 IN either side of joint.
- F. Flame cut edges of stiffener plates at shop or field butt weld.
  1. Do not shear.
- G. Grind flush web fillets at webs notched to receive backup plates for flange groove welds.
- H. Low Hydrogen Electrodes: Dry and store electrodes in compliance with AWS Code.
- I. Do not perform welding when ambient temperature is lower than 0 DegF or where surfaces are wet or exposed to rain, snow, or high wind, or when welders are exposed to inclement conditions.

## 2.5 SHOP COATING

- A. Coordinate shop primer, surface preparation and coating with field applied primers and coatings where specified. Provide primers that comply with Section 09 96 00 "High-Performance Coatings."
- B. Steel Top Coats: Provide Gloss Urethane Enamel coating that complies with Section 09 96 00 "High-Performance Coatings."
- C. Provide suitable methods of handling and transporting painted steel to avoid damage to coating.
- D. Do not coat following surfaces:



1. Machined surfaces, surfaces adjacent to field welds, and surfaces fully embedded in concrete.
  2. All other members for which no coating is specified.
  3. Contact surfaces at bolted slip-critical connections, unless surface condition conforms to the RCSC Specification for Structural Joints, Part 3b.
- E. Clean thoroughly all surfaces not coated before shipping.
1. Remove loose mill scale, rust, dirt, oil and grease.
  2. Protect machined surfaces.

## 2.6 SOURCE QUALITY CONTROL

- A. Coordinate with Owner on Testing Agency Requirements:
- B. Responsibilities of Testing Agency:
1. Inspect shop and field welding in accordance with Section 6 of AWS Code including the following non-destructive testing:
    - a. Visually inspect all welds.
    - b. In addition to visual inspection, test 100 percent of full penetration welds and 20 percent of fillet welds with liquid dye penetrant.
    - c. Test 20 percent of liquid dye penetrant tested full penetration welds with ultrasonic or radiographic testing.
  2. Inspect high-strength bolting in accordance with the RCSC Specification for Structural Joints, Section 9.
    - a. Verify proper pretension for slip-critical bolted connection.
    - b. Verify direct tension indicator gaps.
  3. Inspect structural steel which has been erected.
  4. Inspect stud welding in accordance with AWS Code Section 7.8.
  5. Prepare and submit inspection and test reports to Engineer.
    - a. Assist Engineer to determine corrective measures necessary for defective work.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Contractor is solely responsible for safety.
1. Construction means and methods and sequencing of work is the prerogative of the Contractor.
    - a. Take into consideration that full structural capacity of many structural members is not realized until structural assembly is complete; e.g., until slabs, decks, bracing or rigid connections are installed.
  2. Partially complete structural members shall not be loaded without an investigation by the Contractor.
  3. Until all elements of the permanent structure and lateral bracing system are complete, provide temporary bracing designed, furnished, and installed by the Contractor for the partially complete structure.
- B. Adequate temporary bracing to provide safety, stability and to resist all loads to which the partially complete structure may be subjected, including wind, construction activities, and operation of equipment is the responsibility of the Contractor.
1. Use temporary guys, braces, shoring, connections, etc., necessary to maintain the structural framing plumb and in proper alignment until permanent connections are made, the succeeding work is in place, and temporary work is no longer necessary.
  2. Use temporary guys, bracing, shoring, and other work to prevent injury or damage to adjacent work or construction from stresses due to erection procedures and operation of erection equipment, construction loads, and wind.

3. Contractor shall be responsible for the design of the temporary bracing system and must consider the sequence and schedule of placement of such elements and effects of loads imposed on the structural steel members by partially or completely installed work, including work of all other trades.
    - a. If not obvious from experience or from the Drawings, the Contractor shall confer with the Engineer to identify those structural steel elements that must be complete before the temporary bracing system is removed.
  4. Remove and dispose of all temporary work and facilities off-site.
- C. Examine work-in-place on which specified work is in any way dependent to ensure that conditions are satisfactory for the installation of the work.
1. Report defects in work-in-place which may influence satisfactory completion of the work.
  2. Absence of such notification will be construed as acceptance of work-in-place.
- D. Field Measurement:
1. Take field measurements as necessary to verify or supplement dimensions indicated on the Drawings.
  2. Contractor is responsible for the accurate fit of the work.
- E. Check the elevations of all finished footings or foundations and the location and alignment of all anchor bolts before starting erection.
1. Notify Engineer of any errors or deviations found by such checking.
- 3.2 ERECTION
- A. Framing member location tolerances after erection shall not exceed the frame tolerances listed in Article 3.3.
- B. Erect plumb and level; introduce temporary bracing required to support erection loads.
- C. Use light drifting necessary to draw holes together.
1. Drifting to match unfair holes is not allowed.
- D. Welding:
1. Conform to AWS D1.1 and requirements of this Specification.
  2. When joining two (2) sections of steel of different ASTM designations, welding techniques shall be in accordance with a qualified AWS D1.1 procedure.
- E. Shore existing members when unbolting of common connections is required.
1. Use new bolts for rebolting connections.
- F. Clean stored material of all foreign matter accumulated during erection period.
- G. Clean bearing and contact surfaces before assembly.
- H. Set beam and column base and bearing plates accurately, as indicated, on non-shrink grout.
1. Set and anchor each base plate to proper line and elevation.
  2. Use metal wedges, shims or setting nuts as required and tighten anchor bolts.
    - a. Use same metal as base plate.
    - b. Cut off protrusions of wedges and shims flush with edge of base plate.
  3. Fill sleeves around anchor bolts with non-shrink grout.
  4. Pack grout solidly between bottom of plate and bearing surface.
- I. Anchor Bolts:
1. Anchor bolt location tolerance per Section 7.5 of the Code.
  2. Tie anchor bolts in position to embedded reinforcing steel using wire.
  3. Welding or tack welding is prohibited.
  4. Provide steel templates for locating anchor bolts.
  5. Coat bolt threads and nuts with heavy coat of clean grease.

- J. Install high strength bolts with hardened washers.
  - 1. Install and tighten in accordance with the RCSC Specification for Structural Joints, Section 8.
  - 2. Coordinate installation with inspection.
    - a. Do not start installation until coordination with Testing Agency is complete.
  - 3. Bearing-type connections: High-strength bolts shall be tightened to snug-tight condition.
  - 4. Slip-critical connections: Perform calibration testing for all methods of installation of high-strength bolts in accordance with the RCSC Specification for Structural Joints, Section 8(b).
    - a. Turn-of-nut tightening: Torque wrenches shall be used only by laboratory personnel.
    - b. Calibrated wrench tightening: Calibrate on a daily basis.
    - c. Direct tension indicator tightening: If previously approved by Engineer.
    - d. Installation of alternate design bolts: If previously approved by Engineer.
  - 5. In the event any bolt in a connection is found to be defective, check and retighten all bolts in the connection.
- K. Do not use gas cutting to correct fabrication errors.
  - 1. In case members do not fit or holes do not match, ream out the holes and insert the next larger size bolt.
    - a. If the connections require new holes, then drill new holes.
    - b. Make no such corrections without prior approval of the Engineer.
  - 2. Burning of holes: Not permitted.
- L. Prior to making field connections to existing structural steel, remove completely all paint from existing steel which will be in contact with new steel and new welds.
- M. Tighten and leave in place erection bolts used in welded construction.
- N. Provide beveled washers to give full bearing to bolt head or nut where bolts are to be used on surfaces having slopes greater than 1 in 20 with a plane normal to bolt axis.
- O. After bolts are tightened, upset threads of A307 unfinished bolts and anchor bolts to prevent nuts from backing off.
- P. After erection, grind smooth all sharp surface irregularities resulting from field cutting or welding; power tool clean welds, bolts, washers and abrasions to shop coat removing all rust and foreign matter.
- Q. Expansion anchor bolts and adhesive anchor bolts:
  - 1. Minimum embedment as recommended by manufacturer or specified herein, whichever is larger.
  - 2. Notify Engineer if required depth of embedment cannot be achieved at a particular bolt location.
  - 3. Follow manufacturer's recommendations for installation and torque.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency responsibilities are described in Article 2.6.
- B. Erected Frame Tolerance (Unless noted otherwise on the Drawings):
  - 1. Overall finished dimensions shall not exceed cumulative effect of rolling, fabrication and erection tolerance.
  - 2. Erection tolerances are defined relative to member working points and working lines as follows:
    - a. Actual centerline of top flange or surface at each end for horizontal members.
    - b. Actual center of member at each end for all other members.
    - c. Other points may be used, providing they are based on these definitions.
    - d. Working line is straight line connecting member working points.

3. Tolerances on position and alignment are as specified in the Code, unless otherwise modified. "Adjustable items" such as lintels, wall supports, curb angles, window mullions and similar members shall be provided with adjustable connections to supporting structural frame.
  4. Steel erector shall certify the location of erected structural steel is acceptable for plumbness, level and aligned within tolerances specified.
    - a. Such certification can be provided upon completion of any part of work and shall be done prior to start of work by other trades that may be supported, attached or applied to structural steel work.
- 3.4 CLEANING AND REPAIR OF SHOP PRIMER PAINT
- A. After erection, clean all steel of mud or other foreign materials, and repair any damage.
    1. Touch-up coatings to comply with Section 09 96 00 "High-Performance Coatings."

END OF SECTION

## SECTION 05 50 00 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Miscellaneous steel framing and stair supports.
2. Removal of existing steel pan stair treads, metal pan landings and all railing from Alley Level to Level 6 and replacement with new concrete-filled metal pan stair system including all associated handrails and guardrails and stair support to the existing concrete beams and masonry walls.

##### B. Related Sections:

1. 05 1200 - Structural Steel Framing.
2. 05 5100 – Metal Pan Stairs.
3. 09 9600 – High-Performance Coatings.

#### 1.2 ACTION SUBMITTALS

- ##### A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections and details of miscellaneous metal framing and supports for metal pan stairs, handrails, guardrail and anchorage into existing masonry walls and concrete beams and columns.

- ##### B. See section 05 5100 – Metal Pan Stairs for Delegated Design of stairs.

#### 1.3 QUALITY ASSURANCE

- ##### A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code - Steel.”

#### 1.4 FIELD CONDITIONS

- ##### A. Field Measurements: Verify actual elevations and locations of walls, concrete beams, concrete columns, landings, stair configuration, steel stingers and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

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

### 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Tubing: ASTM A500, Grade B,  $F_y = 46$  ksi.
- C. Steel Pipe: ASTM A53, Type E or S, Grade B,  $F_y = 35$  ksi.
- D. Steel Rolled Wide Flange W shapes: ASTM A992,  $F_y = 50$ ksi
- E. Steel Rolled S, M, and HP shapes & channels: ASTM A36.
- F. Steel Rolled Plates & Angles: ASTM A36.
- G. All other members: ASTM A36
- H. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- I. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads; exposed.

### 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 or Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless-steel fasteners for fastening aluminum.
  2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593 and nuts, ASTM F 594.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 96 00 "High-Performance Coatings."
- B. Steel Top Coats: Provide Gloss Urethane Enamel coating that complies with Section 09 96 00 "High-Performance Coatings."
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 03 30 53 "Miscellaneous Cast-In-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 4000 psi.
- F. Galvanizing Repair Paint: High-zinc-dust, MPI #18.

#### 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. 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.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

#### 2.6 MISCELLANEOUS STEEL

- A. Fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Use concealed field splices where possible.
- B. Provide anchorages as needed to coordinate assembly and installation with other work.

- C. Paint welds and abraded metal with zinc rich galvanizing repair paint.

## 2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly. Provide overspray protection. Vehicle damage resulting from paint preparation and application will be the responsibility of the Contractor.
- C. Preparation of steel for painting: SSPC-SP6, Commercial Blast Cleaning.
- D. Spray and apply primer per Section 09 96 00 "High-Performance Coatings."
- E. Spray and apply finish paint per Section 09 96 00 "High-Performance Coatings."

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- C. 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

### 3.2 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if



protruding, cut off flush with edge of bearing plate before packing with non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with high performance paint specified in Section 09 96 00 "High-Performance Coatings."

END OF SECTION

## SECTION 05 5100 - METAL PAN STAIRS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Preassembled steel stairs with concrete-filled and formed-metal treads and landings.
2. Steel tube handrails and guardrails attached to metal stairs.
3. Steel tube guardrails attached to metal stairs at landings.
4. Steel tube handrails attached to walls adjacent to metal stairs.

##### B. The scope of work includes removal of existing steel pan stair treads, metal pan landings and all railing from Alley Level to Level 6 and replacement with new concrete-filled metal pan stair system including all associated handrails and guardrails and stair support to the existing concrete beams and masonry walls. The new stair shall maintain the same plan geometry and landing elevations as the existing stairs.

##### C. Related Sections:

1. 03 3053 – Miscellaneous Cast-In-Place Concrete.
2. 05 1200 - Structural Steel Framing.
3. 05 5000 – Metal Fabrications.
4. 07 1900 – Water Repellents.
5. 07 9200 – Joint Sealants.
6. 09 9600 – High-Performance Coatings.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For metal pan stairs.

##### B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Confirm existing conditions, dimensions and elevations are noted and verified in field prior to submitting Shop Drawings.

##### C. Delegated-Design Submittal: For stairs and railings indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the State of Indiana responsible for their preparation.

#### 1.3 QUALITY ASSURANCE

##### A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

- 1.4 Preparation of steel for painting: SSPC-SP6, Commercial Blast Cleaning.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, handrails and guardrails, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft.
  2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
  3. Uniform and concentrated loads need not be assumed to act concurrently.
  4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
- C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
    - b. Infill load and other loads need not be assumed to act concurrently.
- D. Seismic Performance of Stairs: Metal stairs and their components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7-10.
1. Component Importance Factor: 1.5.

### 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Tubing: ASTM A500, Grade B,  $F_y = 46$  ksi.
- C. Steel Pipe: ASTM A53, Type E or S, Grade B,  $F_y = 35$  ksi.
- D. Steel Rolled Wide Flange W shapes: A STM A992,  $F_y = 50$ ksi

- E. Steel Rolled S, M, and HP shapes & channels: ASTM A36.
- F. Steel Rolled Plates & Angles: ASTM A36.
- G. All other members: ASTM A36
- H. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- I. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads; exposed.

### 2.3 ABRASIVE NOSINGS

- A. Extruded Units with anchors run full length of tread, 2" wide with abrasive filler in an epoxy-resin binder or solid abrasive type units without ribs.
  - 1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
  - 2. Provide solid-abrasive-type units without ribs.
- B. Provide anchors for embedding units in concrete, integral units, as standard with manufacturer.
- C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

### 2.4 FASTENERS

- A. Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

### 2.5 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 96 00 "High-Performance Coatings."
- B. Steel Top Coats: Provide Gloss Urethane Enamel coating that complies with Section 09 96 00 "High-Performance Coatings".
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Concrete Materials and Properties: Comply with requirements in Section 033053 "Miscellaneous Cast-In-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 4000 psi unless otherwise indicated.
- E. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches, W2.9 by W2.9, unless otherwise indicated.

## 2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

## 2.7 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Service Class, unless more stringent requirements are indicated.
- B. Stair Framing:
  - 1. Fabricate stringers of steel channels.
    - a. Provide closures for exposed ends of channel stringers.
  - 2. Construct landings of steel channels and steel headers and miscellaneous framing members as needed to comply with performance requirements indicated.
  - 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.106 inch.

## 2.8 STAIR RAILINGS

- A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacing, and anchorage, but not less than that needed to withstand indicated loads.
  - 1. Rails and Posts: 1-5/8-inch outside diameter top and bottom rails and 1-1/2-inch- square posts.
  - 2. Intermediate Rails Infill: 1-1/2-inch outside diameter intermediate rails spaced less than 4 inches clear from face to face of rail.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint as shown in NAAMM AMP 521.
- C. Form changes in direction of railings by bending.
- D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails.
- G. Connect posts to stair framing by direct welding.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
- I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses.

## 2.9 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly. Provide overspray protection. Vehicle damage resulting from paint preparation and application will be the responsibility of the Contractor.

- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP6, Commercial Blast Cleaning.
- D. Spray and apply primer per Section 09 96 00 "High-Performance Coatings."
- E. Spray and apply finish paint per Section 09 96 00 "High-Performance Coatings".
- F. Concrete finish for concrete fill for treads and platforms shall comply with Section 033053 "Miscellaneous Cast-In-Place Concrete." Concrete for treads and platforms shall be air entrained with slip resistant finish.

### PART 3 - EXECUTION

#### 3.1 INSTALLING METAL PAN STAIRS

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints.
- D. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- E. Place and finish concrete fill for treads and platforms to comply with Section 033053 "Miscellaneous Cast-In-Place Concrete."
  - 1. Install abrasive nosings with anchors fully embedded in concrete.

#### 3.2 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
  - 1. Anchor posts to steel by welding to steel supporting members.
  - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.
- B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with high performance paint specified in Section 09 96 00 "High-Performance Coatings.

END OF SECTION



## SECTION 07 19 00 - WATER REPELLENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes penetrating water-repellent coatings for the following horizontal and vertical concrete surfaces: new concrete stair treads and landings
- B. Related Sections include the following:
  - 1. Division 7 Section "Joint Sealants".

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide water repellents with the following properties based on testing manufacturer's standard products, according to test methods indicated, applied to substrates simulating Project conditions using same materials and application methods to be used for this Project.
  - 1. Absorption: Minimum 90 percent reduction of absorption after 24 hours in comparison of treated and untreated specimens.
    - a. Hardened Concrete: ASTM C 642.
  - 2. Water-Vapor Transmission: Maximum 10 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, per ASTM E 96.
  - 3. Durability: Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G 53.
  - 4. Permeability: Minimum 80 percent breathable in comparison of treated and untreated specimens, per ASTM D 1653.
  - 5. Chloride-Ion Intrusion in Concrete: Transportation Research Board, National Research Council's NCHRP Report 244, Series II tests.
    - a. Reduction of Water Absorption: 80 percent.
    - b. Reduction in Chloride Content: 80 percent.

#### 1.4 SUBMITTALS

- A. Product Data: Include manufacturer's specifications, surface preparation and application instructions, recommendations for water repellents for each surface to be treated, and protection and cleaning instructions. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

- B. Samples: Of each substrate indicated to receive water repellent with specified repellent treatment applied to half of each sample.
- C. Applicator Certificates: Signed by manufacturer certifying that the applicator complies with requirements, if applicable.
- D. Certifications by water repellent manufacturer that products supplied comply with local regulations controlling use of VOCs.
- E. Material Test Reports: Indicate and interpret test results for compliance of water repellents with requirements indicated.
- F. Contractor qualifications: See 1.5.A.3.

## 1.5 QUALITY ASSURANCE

- A. Contractor qualification requirements:
  - 1. If materials selected require manufacturer trained and/or approved installers, retain installers that employ workers trained and approved by manufacturer to apply any materials in this Division. The Contractor shall have a minimum of five years successful experience in concrete rehabilitation using the specified products.
    - a. Contractor shall submit manufacturer certifications
    - b. Contractor shall submit project experience per 1.5.A.3
  - 2. The superintendent assigned to the project must have successfully supervised five prior projects of similar magnitude and type. Job superintendent shall control all operations as necessary for full compliance with all requirements.
    - a. The project experience submitted in accordance with 1.5.A.3 shall be projects supervised by the superintendent assigned to this project (and identified as such in the submittal per 1.5.A.3)
  - 3. The Contractor shall provide the Superintendent of Construction with a list of at least five projects similar in concept which he has completed in the last ten years as a certified applicator. Such lists shall include:
    - a. Project name
    - b. Project description
    - c. Project location
    - d. Project superintendent
    - e. Date of construction
    - f. Owner's name, address, and telephone number
    - g. Project consultant name, address, and telephone number
- B. Testing Agency Qualifications: An independent testing agency with experience and capability to conduct testing indicated in "Performance Requirements" Article without delaying the Work, per ASTM E 548.
- C. Regulatory Requirements: Comply with applicable rules of pollution-control regulatory agency having jurisdiction in Project locale regarding VOCs and use of hydrocarbon solvents.
- D. Field Samples: Engineer will select one representative surface for each substrate to receive water repellents. Apply water repellent to each substrate, with either partial or full coverage as directed. Comply with application requirements of this Section.

1. Obtain Engineer's acceptance of field samples before applying water repellents.
2. Maintain field samples during construction in an undisturbed condition as a standard for judging the completed Work.

## 1.6 PROJECT CONDITIONS

- A. Weather and Substrate Conditions: Do not proceed with application of water repellent under any of the following conditions, except with written instruction of manufacturer:
1. Ambient temperature is less than 40 deg F.
  2. Surface repairs have not fully cured.
  3. Rain or temperatures below 40 deg F are predicted within 24 hours.
  4. Application is earlier than 24 hours after surfaces have been wet.
  5. Substrate is frozen or surface temperature is less than 40 deg F.
  6. Windy condition exists that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.

## 1.7 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty, executed by the applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within the specified warranty period. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints and cracks in excess of 1/16 inch wide, fire, vandalism, or abuse by maintenance equipment.
1. Warranty Period: 5 years from date of Substantial Completion.

## 1.8 SAFETY REQUIREMENTS

- A. The Contractor must coordinate fully with Owner site safety requirements. This includes, but is not limited to:
1. Daily work coordination with City of Bloomington officials.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Silanes, 100 Percent Solids: Penetrating water repellent. A monomeric compound containing approximately 100 percent alkyltrialkoxysilanes with alcohol, mineral spirits, water, or other proprietary solvent carrier.

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

1. Silanes: With less than 600 g/L VOCs.
  - a. Sikaguard 705L, Sika
  - b. MasterProtect H 1000, BASF.
  - c. Weather Worker S-100 (J-29-A); Dayton Superior Corporation.
  - d. Iso-Flex 618-100 VOC Silane Sealer; LymTal International, Inc.
  - e. Barcade Silane 100; Euclid Chemical Company.

C. Alternate Products

1. The use of other than the materials specified above is allowable providing such materials have been accepted in writing by the Engineer as an approved equivalent.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Decks shall be power washed at a minimum. After allowing to dry, test for moisture content, according to water-repellent manufacturer's written instructions, to ensure that surface is dry enough.
  1. Cast-in-Place Concrete: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.
- B. Test for pH level, according to water-repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.
- C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.
- D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
  1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

- B. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.
- C. Apply a second saturation spray coating, repeating first application, if required by manufacturer. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

### 3.3 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00

SECTION 07 92 00 – ELASTOMERIC JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
  - 1. New stair and enclosure, see drawings

1.3 PERFORMANCE REQUIREMENTS

- A. Provide joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of elastomeric joint sealant required, provide samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants
- C. Proposed joint seal sizes: for each joint required, indicate the measured joint size and the proposed joint seal size.
- D. Preconstruction field adhesion test reports.
- E. Preconstruction compatibility and adhesion test reports.
- F. Contractor qualifications: See 1.5.A
  - 1. Contractor qualifications shall be submitted with the Bid Form.
- G. Warranties.

1.5 QUALITY ASSURANCE

- A. Contractor qualification requirements:
  - 1. If materials selected require manufacturer trained and/or approved installers, retain installers that employ workers trained and approved by manufacturer to apply any materials in this Division. The Contractor shall have a minimum of five years successful experience in concrete rehabilitation using the specified products.

- a. Contractor shall submit manufacturer certifications
      - b. Contractor shall submit project experience per 1.5.A.3
    2. The superintendent assigned to the project must have successfully supervised five prior projects of similar magnitude and type. Job superintendent shall control all operations as necessary for full compliance with all requirements.
      - a. The project experience submitted in accordance with 1.5.A.3 shall be projects supervised by the superintendent assigned to this project (and identified as such in the submittal per 1.5.A.3)
    3. The Contractor shall submit a list of at least five projects similar in concept, which he has completed in the last five years as a certified applicator. Such lists shall include:
      - a. Project name
      - b. Project description
      - c. Project location
      - d. Project superintendent
      - e. Date of construction
      - f. Owner's name, address, and telephone number
      - g. Project consultant name, address, and telephone number
  - B. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - C. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.
  - D. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- 1.6 PROJECT CONDITIONS
- A. Coordination with City of Bloomington: Work shall be coordinated daily with Owner.
- 1.7 WARRANTY
- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance (water tight joint) and other requirements specified in this Section within specified warranty period.
    1. Warranty Period Elastomeric Joints: Three years from date of Substantial Completion.
  - B. Special Manufacturer's Warranty: Manufacturer's standard form in which sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance (water tight joint) and other requirements specified in this Section within specified warranty period.
    1. Warranty Period Elastomeric Joints: Five years from date of Substantial Completion.

1.8 SAFETY REQUIREMENTS

ELASTOMERIC JOINT SEALANT

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- A. The Contractor must coordinate fully with the City of Bloomington site safety requirements. This includes, but is not limited to:
  - 1. Daily work coordination with City of Bloomington.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

### 2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by City of Bloomington from manufacturer's full range.

### 2.3 ELASTOMERIC JOINT SEALANTS

- A. Multicomponent urethane sealant recommended in writing by manufacturer for substrate and joint conditions indicated; complying with ASTM C 920, Type M, Class 25, Grade NS for sloping and vertical applications or Grade P for deck applications, and Use T where subject to traffic or Use NT elsewhere.
  - 1. Products:
    - a. BASF; Masterseal SL2, Masterseal NP2
    - b. Sika Corporation; Sikaflex -2C NT TG
  - 2. Alternate Manufacturers: The use of other than the materials specified above is allowable providing such materials have been accepted in writing by the Engineer as an approved equivalent prior to Bid.

### 2.4 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.



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

## 2.5 Epoxy Adhesive

- A. Two component epoxy adhesive recommended in writing by manufacturer for substrate and joint conditions indicated substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

## 2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. See construction procedures and General Structural Notes on Drawings for additional information.

### 3.2 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 5 tests for each kind of sealant and joint substrate.
  - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory.

Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION 07 92 00

## 08 44 13 – ALUMINUM CURTAIN WALLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes conventionally glazed aluminum curtain walls installed as stick assemblies.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings.
- D. Structural-Test Performance: Test according to ASTM E 330 as follows:
  - 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  - 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Deflection of Framing Members: At design wind pressure, as follows:
  - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding  $L/175$  of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to  $3/4$  inch, whichever is less.
  - 2. Deflection Parallel to Glazing Plane: Limited to  $L/360$  of clear span or  $1/8$  inch (3.2 mm), whichever is smaller.

3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.
- F. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
- G. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- I. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
  1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
  2. Test Interior Ambient-Air Temperature: 75 deg F.
  3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
  1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Qualification Data: For qualified Installer.
- F. Seismic Qualification Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- G. Welding certificates.

- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.
- I. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.
- J. Warranties: Sample of special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
- D. Preinstallation Conference: Conduct conference at Project site.

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

#### 1.7 WARRANTY

- A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Water penetration through fixed glazing and framing areas.
    - e. Failure of operating components.
  - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer; Series 1602 Wall System or comparable product by one of the following:
1. Arch Aluminum & Glass Co., Inc.
  2. EFCO Corporation.
  3. Tubelite.
  4. United States Aluminum.
  5. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

### 2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
  2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
  3. Extruded Structural Pipe and Tubes: ASTM B 429.
  4. Structural Profiles: ASTM B 308/B 308M.
  5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

### 2.3 FRAMING

- A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally improved.
  2. Glazing System: Retained mechanically with gaskets on four sides.
  3. Glazing Plane: Front.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  2. Reinforce members as required to receive fastener threads.
  3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing Sealants: Manufacturer's standard sealants.

## 2.4 GLAZING

A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Provide Kind FT (fully tempered) float glass.

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

## 2.5 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

B. Perimeter Sealant: Sealant used where aluminum framing abuts dissimilar materials.

1. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use NT.

2. Color: As selected by Architect from manufacturer's full range of colors.

## 2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

5. Provisions for field replacement of glazing from exterior.

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

D. Fabricate components that, when assembled, have the following characteristics:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

E. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.7 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

### 3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.



### 3.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 08 44 13

## SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
  - 1. Exterior Substrates:
    - a. Steel stair components

#### 1.2 DEFINITIONS

- A. MPI: Master Painters Institute

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  - 2. Include statements on the suitability of the material for the intended use.
- B. Samples: For each type of coating system and in each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches (200 mm) square
  - 2. Apply coats on Samples in steps to show each coat required for system
  - 3. Label each coat of each Sample
  - 4. Label each Sample for location and application area

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Coatings: 5 percent, but not less than 1 gallon of each material and color applied.

#### 1.5 QUALITY ASSURANCE

- A. Painting Contractor must possess a valid state license as required for the performance of the painting and coating work called for in this specification and must provide 5 references which show that the painting subcontractor has previous successful

experience with the specified or comparable coating systems. Include the name, address, and telephone number of the owner of each installation for which the painting subcontractor provided the protective coating.

- B. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect or Engineer will select one surface to represent surfaces and conditions for application of each coating system.
    - a. Structural steel: Provide samples of at least 10 lineal feet of steel beam
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect or Engineer specifically approves each deviation in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at the time of Substantial Completion..

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue
  - 2. Remove rags and waste from storage areas daily

## 1.7 FIELD CONDITIONS

- A. Apply coatings only when temperatures of surfaces to be coated and ambient air temperatures are between 50 and 95 degrees F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 degrees above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. PPG Paints (PPG)
  - 2. Sherwin-Williams Company (The). (SWC)

3. Tnemec Company, Inc. (TC)

- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
  3. Products shall be of same manufacturer for each coat in a coating system.
- C. Colors: As selected by Owner from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Supplemental heat sources, as required to maintain both ambient and surface temperatures within range recommended by paint manufacturer for paint system application are not available at the Site.
  1. Provision of supplemental heat energy sources, power, equipment, and operating, maintenance and temperature monitoring personnel is responsibility of Contractor.
  2. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas being painted. Properly locate and vent such heat sources to exterior such that coating systems are unaffected by exhaust.

### 3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  1. Use applicators and techniques suited for coating and sub-straight indicated.
- B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
  1. Contractor shall touch up and restore coated surfaces damaged by testing.
  2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacture's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect or Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

### 3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates: Provide surface Shop Preparation as determined by the coating manufacturer for all systems listed below, but no less than SSPC-SP 6 Commercial Blast Cleaning to remove mill scale and create an anchor profile of 1 to 1.5 mils.
  - 1. PPG System:
    - a. Prime Coat: Primer, Amercoat 240 Hi-Build Epoxy: 8.0 mils dry film thickness
    - b. Topcoat: Urethane, Gloss: High-Build Urethane: Pitthane Ultra 95-812 Gloss Urethane, Two Coats, 2 to 3 mils dry film thickness each coat.
  - 2. SWC System:
    - a. Prime Coat: Sherwin-Williams Recoatable Epoxy Primer, B67-5 Series: 12.0 mils wet, 8.0 mils dry film thickness.
    - b. Intermediate Coat: Sherwin-Williams Hi-Solids Polyurethane Semi-Gloss, B65-350 Series, 4.5 mils wet, 3.0 mils dry film thickness.
    - c. Topcoat: Sherwin-Williams Hi-Solids Polyurethane Semi-Gloss, B65-350 Series, 4.5 mils wet, 3.0 mils dry film thickness.
  - 3. Tnemec (TCI) System:
    - a. Prime Coat: Tnemec Series 90-97; 8.0 mils dry film thickness
    - b. Intermediate Coat: Tnemec Series 73 2.0 to 3.0 mils dry film thickness
    - c. Topcoat: Tnemec Series 740 2.0 to 3.0 mils dry film thickness

END OF SECTION 09 9600

# **APPENDIX A PHOTOGRAPHS & PHOTO LOG**

***WALNUT STREET PARKING GARAGE  
SOUTHEAST STAIR REPLACEMENT - 2019***

**18-197 Walnut St. PG SE Stair Photo Log - 2019-04-17**

Location	Description	Photo #
LEVEL 0	STAIR AND HANDRAIL AT ALLEY LEVEL	094958
LEVEL 0.2	FIRST INTERMEDIATE LANDING AT ALLEY LEVEL	095205
LEVEL 0	STAIR AT ALLEY LEVEL (MASONRY WALL INFILL UNDER LANDING)	095311
LEVEL 0.5	BOTTOM OF FRAMING AT INTERMEDIATE LANDING LEVEL 0.5 (ELECTRICAL CONDUIT AND PIPE)	100342
LEVEL 0.5	BOTTOM OF FRAMING AT INTERMEDIATE LANDING LEVEL 0.5	100450
LEVEL 0.5	INTERMEDIATE LANDING LEVEL 0.5	101216
LEVEL 0 - 1.5	OVERALL INTERMEDIATE LANDINGS FROM LEVEL 0 TO LEVEL 1.5	101315
LEVEL 0 - 2	OVERALL INTERMEDIATE LANDINGS FROM LEVEL 0 TO LEVEL 2	101424
LEVEL 2 - 6	OVERALL INTERMEDIATE LANDINGS FROM LEVEL 2 TO LEVEL 6	101437
LEVEL 0 - 0.2	HANDRAIL AT MASONRY WALL FROM LEVEL 0 TO INTERMEDIATE LANDING 0.2	103212
LEVEL 0.2 - 0.5	HANDRAIL BETWEEN LANDING LEVEL 0.2 TO LANDING LEVEL 0.5	103222
LEVEL 0.2 - 0.5	HANDRAIL AT MASONRY WALL FROM LANDING LEVEL 0.2 TO LANDING LEVEL 0.5	103228
LEVEL 1	LIGHT AND ELECTRICAL CONDUITS AT LANDING LEVEL 1	104837
LEVEL 1 - 1.5	ELECTRICAL CONDUIT UNDER STAIR FROM LANDING LEVEL 1 TO LANDING LEVEL 1.5	104853
LEVEL 0.5	TOP OF LANDING AT LEVEL 0.5	105118
LEVEL 0.5	TOP OF LANDING LEVEL 0.5 WITH PENETRATIONS AT ELECTRICAL CONDUIT AND PIPE	105130
LEVEL 0.5	HANDRAIL AT STAIR/LANDING LEVEL 0.5	105136
LEVEL 0.5	STAIR RAILING (32 1/2" FROM TOP OF TREAD) BETWEEN LANDING LEVEL 0.5 TO LEVEL 1	110242
LEVEL 0.5 - 1	CONDUIT AND HANDRAIL AT MASONRY WALL BETWEEN LANDING LEVEL 0.5 TO LEVEL 1	111335
LEVEL 1.5 - 2	ELECTRICAL CONDUITS AT MASONRY WALL BETWEEN LANDING LEVEL 1.5 TO LEVEL 2	111342
LEVEL 1.5	BOTTOM OF LANDING LEVEL 1.5 (MASONRY WALL, CONCRETE COLUMN AND PIPES)	111539
LEVEL 1.5	BOTTOM OF LANDING LEVEL 1.5 (LIGHT AND ELECTRICAL CONDUIT)	111550
LEVEL 2	BOTTOM OF LANDING LEVEL 2 (LIGHT AND ELECTRICAL CONDUIT)	111855
LEVEL 2	BOTTOM OF LANDING LEVEL 2 (LIGHT AND ELECTRICAL CONDUIT)	112132
LEVEL 2	BOTTOM OF LANDING LEVEL 2 INTO MASONRY WALL AT SOUTH END	112156
LEVEL 1 - 1.5	TOP OF LANDING AND HANDRAIL ON MASONRY WALL AT LANDING LEVEL 1.5	113437



LEVEL 1.5	TOP OF LANDING LEVEL 1.5	113511
LEVEL 1.5	TOP OF LANDING LEVEL 1.5 WITH PENETRATIONS AT ELECTRICAL CONDUIT AND PIPE	113520
LEVEL 1.5 - 2	HANDRAIL AT MASONRY WALL/CONCRETE BEAM BETWEEN LANDING LEVEL 1.5 TO LEVEL 2	113533
LEVEL 2.5	BOTTOM OF LANDING LEVEL 2.5 FRAMING AND MISSING LIGHT FIXTURE	114145
LEVEL 2.5	BOTTOM OF LANDING LEVEL 2.5 FRAMING AND MISSING LIGHT FIXTURE	114202
LEVEL 2.5	BOTTOM OF LANDING LEVEL 2.5 (PIPE PENETRATION)	114219
LEVEL 2.5	LANDING LEVEL 2.5 STEEL COLUMN SUPPORT ON SLOPING CONCRETE BEAM (TYPICAL)	114435
LEVEL 2.5	LANDING LEVEL 2.5 STEEL COLUMN SUPPORT ON SLOPING CONCRETE BEAM (TYPICAL)	114448
LEVEL 2.5	LANDING LEVEL 2.5 STEEL COLUMN SUPPORT ON SLOPING CONCRETE BEAM (TYPICAL)	114511
LEVEL 2.5	STEEL COLUMN TO CHANNEL AND CONNECTION TO CONCRETE COLUMN (TYPICAL)	114751
LEVEL 2.5	STRINGER CHANNELS AND SUPPORT COLUMN AT INTERMEDIATE LANDING LEVEL 2.5 (TYPICAL)	115702
LEVEL 2.5	STRINGER CHANNELS AND SUPPORT COLUMN AT INTERMEDIATE LANDING LEVEL 2.5 (TYPICAL)	115719
LEVELS 2.5	STRINGER CHANNELS AND SUPPORT COLUMN AT INTERMEDIATE LANDING LEVEL 2.5 (TYPICAL)	115738
LEVELS 2.5	STRINGER CHANNEL AT INTERMEDIATE LANDING LEVEL 2.5 (TYPICAL)	121058
LEVEL 2.5	AT INTERMEDIATE LANDING LEVEL 2.5	121353
LEVEL 2	TOP OF LANDING AT LEVEL 2	121456
LEVEL 3	BOTTOM OF LANDING AT LEVEL 3 FRAMING (LIGTHS, CONDUIT AND PIPE)	121615
LEVEL 3	BOTTOM OF LANDING LEVEL 3 (NORTH SUPPORTS) - TYPICAL	121835
LEVEL 3	BOTTOM OF LANDING LEVEL 3 (SOUTH SUPPORTS) - TYPICAL	121845
LEVEL 1.5 - 2	HANDRAIL AT MASONRY WALL/CONCRETE BEAM BETWEEN LANDING LEVEL 1.5 TO LEVEL 2	123246
LEVEL 2 - 2.5	HANDRAIL ON TOP OF CHANNEL AT EXTERIOR STRINGER (TYPICAL)	123341
LEVEL 3	PIPE PARALLEL WITH PT PEAM AT LINE 8 AT LEVEL 3	123555
LEVEL 3	PIPE PARALLEL WITH PT PEAM AT LINE 8 AT LEVEL 3	123617
LEVEL 2.5	TOP OF LANDING AT INTERMEDIATE LEVEL 2.5	134018
LEVEL 2.5	TOP OF LANDING AT INTERMEDIATE LEVEL 2.5 (PIPE PENETRATION)	134038
LEVEL 3.5	BOTTOM OF LANDING AT INTERMEDIATE LEVEL 3.5	134243
LEVEL 3.5	BOTTOM OF LANDING AT INTERMEDIATE LEVEL 3.5 COLUMN SUPPORT	134303
LEVEL 3	TOP OF LANDING AT LEVEL 3 (PIPE PENETRATION)	135044

LEVEL 3.5	TOP OF INTERMEDIATE LANDING LEVEL 3.5	135543
LEVEL 3.5	TOP OF INTERMEDIATE LANDING LEVEL 3.5	135616
LEVEL 4	BOTTOM OF LANDING AT LEVEL 4 FRAMING (LIGTHS, CONDUIT AND PIPE)	135755
LEVEL 4	TOP OF LANDING AT LEVEL 4 (PIPE PENETRATION)	140007
LEVEL 4.5	BOTTOM OF INTERMEDIATE LANDING LEVEL 4.5 FRAMING AND MISSING LIGHT FIXTURE	140132
LEVEL 4.5	BOTTOM OF INTERMEDIATE LANDING LEVEL 4.5 COLUMN SUPPORT	140147
TYPICAL	TYPICAL STAIR RAILING	140929
TYPICAL	TYPICAL STAIR RAILING	140950
LEVEL 4.5	TOP OF INTERMEDIATE LANDING LEVEL 4.5	141245
LEVEL 5	TOP OF LANDING LEVEL 5 (PIPE PENETRATION)	141558
LEVEL 5	BOTTOM OF LANDING AT LEVEL 5 FRAMING (LIGTHS, CONDUIT AND PIPE)	141735
LEVEL 5.5	BOTTOM OF INTERMEDIATE LANDING LEVEL 5.5	142113
LEVEL 5.5	TOP OF INTERMEDIATE LANDING LEVEL 5.5	142218
LEVEL 6	BOTTOM OF LANDING AT LEVEL 6 FRAMING (LIGTHS, CONDUIT AND PIPE)	142408
LEVEL 6	TOP OF LANDING AT LEVEL 6 RAILING	142549
LEVEL 6	TOP OF LANDING AT LEVEL 6 (PIPE PENETRATION)	142639
LEVEL 6	TOP OF LANDING AT LEVEL 6	142650
LEVEL 1.5	CRACK IN BETWEEN 8" AND 12" CMU AT INTERMEDIATE LANDING LEVEL 1.5	154356
LEVEL 3	HAIRLINE CRACKS AT UNDERSIDE OF LEVEL 3 CONCRETE BEAM AT LINE 8	
LEVEL 5	HAIRLINE CRACKS AT LEVEL 5 CONCRETE BEAM AT LINE A	
LEVEL 5	CONCRETE CRACK AT BUMPER WALL AT HANDRAIL AT LEVEL 5 AT LINE 8	
LEVEL 6	HAIRLINE CRACKS AT UNDERSIDE OF LEVEL 6 CONCRETE BEAM AT LINE 8	



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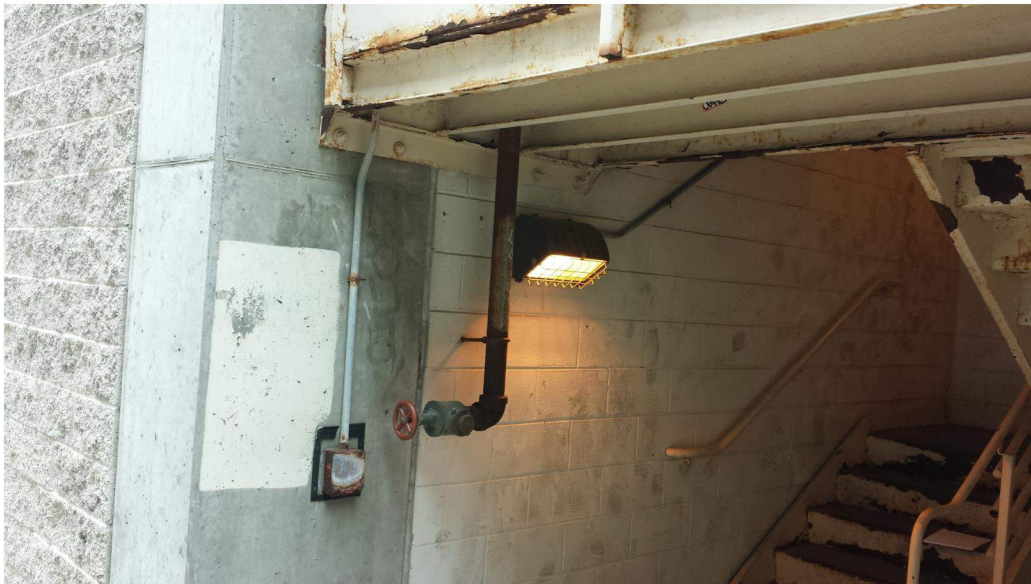


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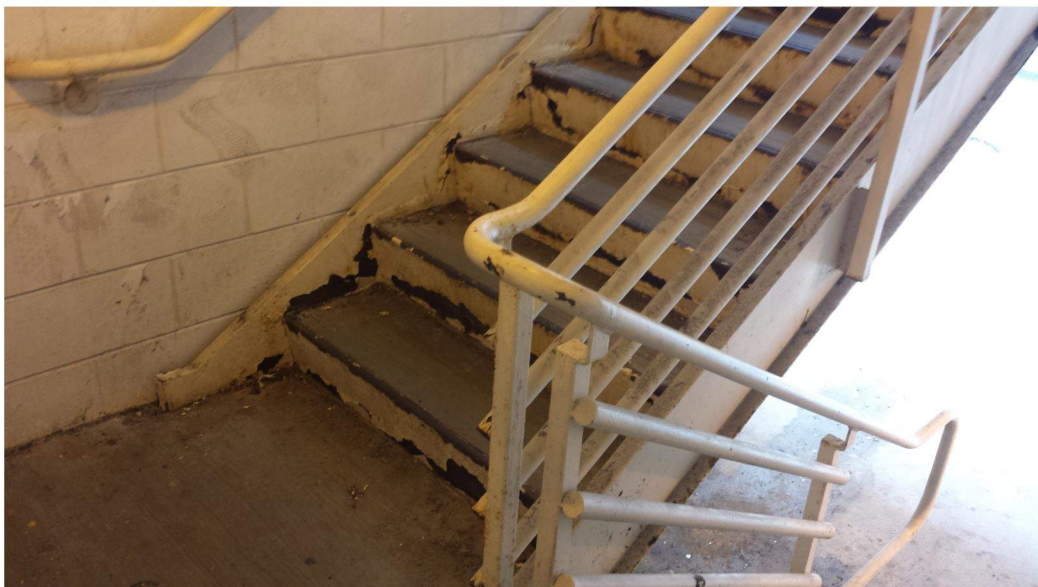
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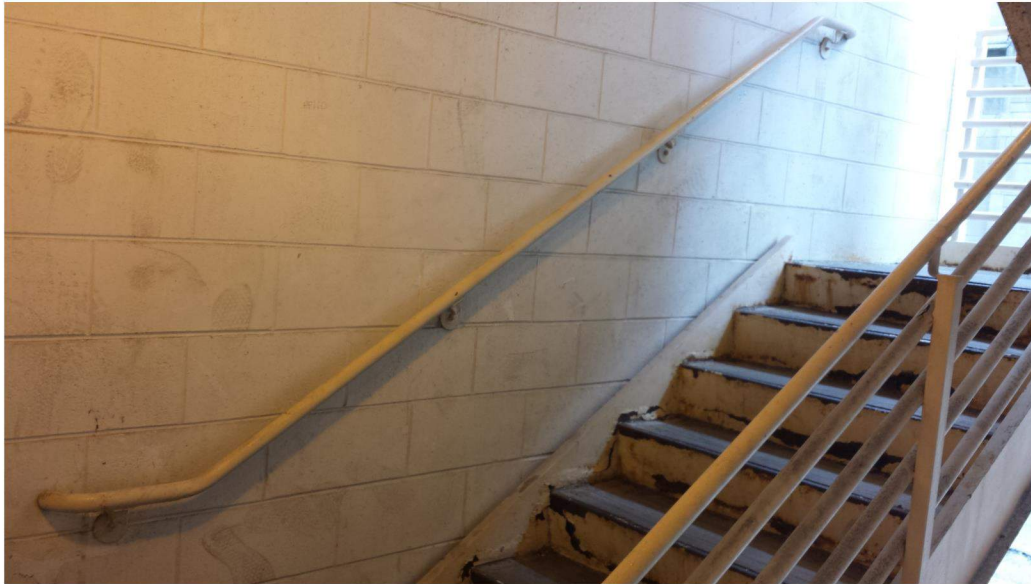


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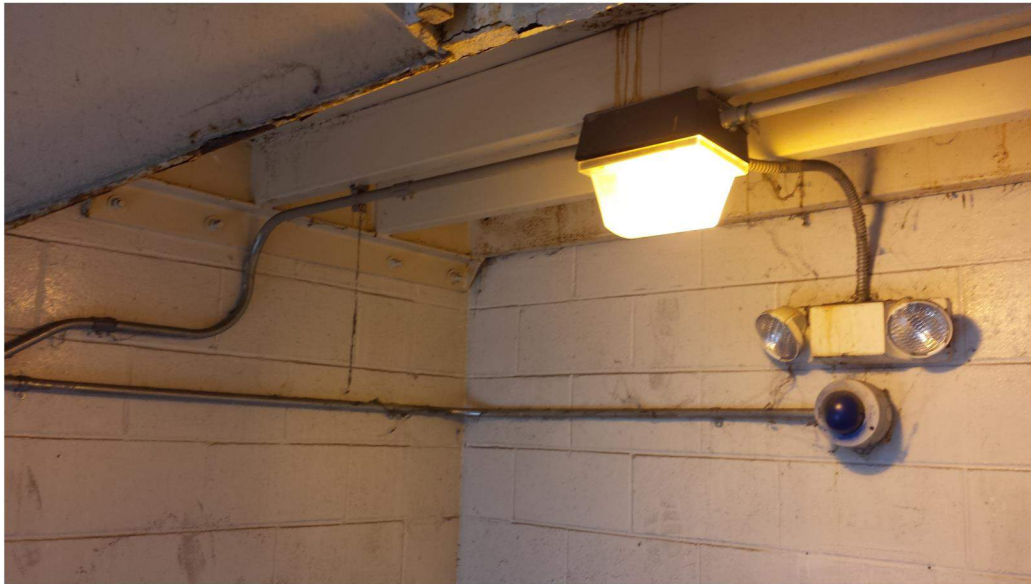


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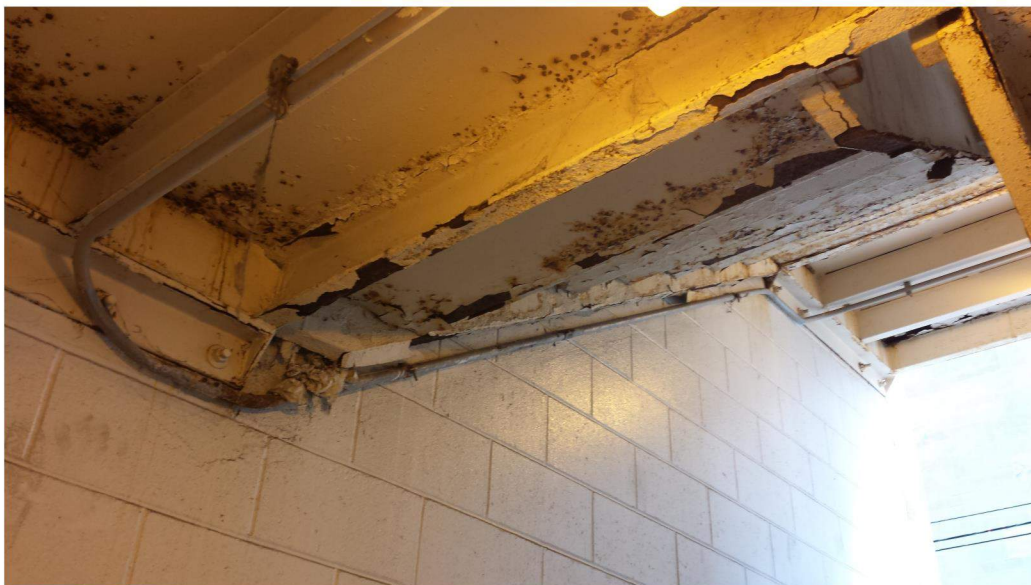
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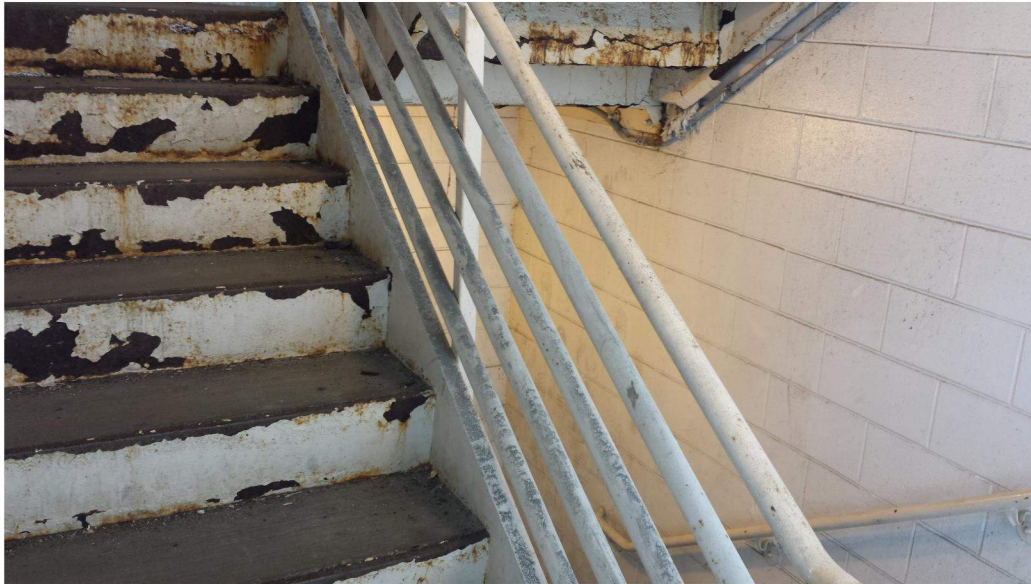


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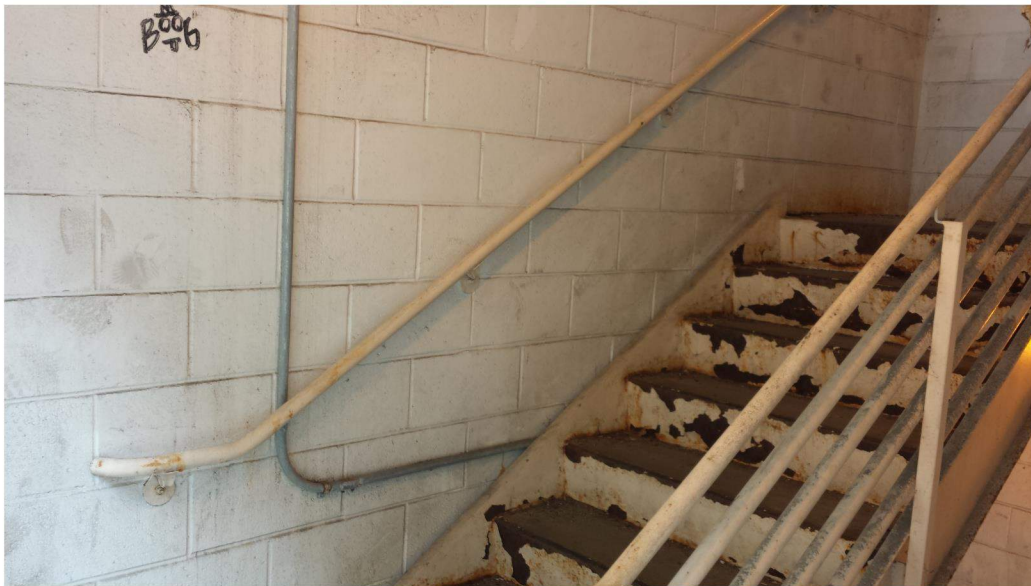


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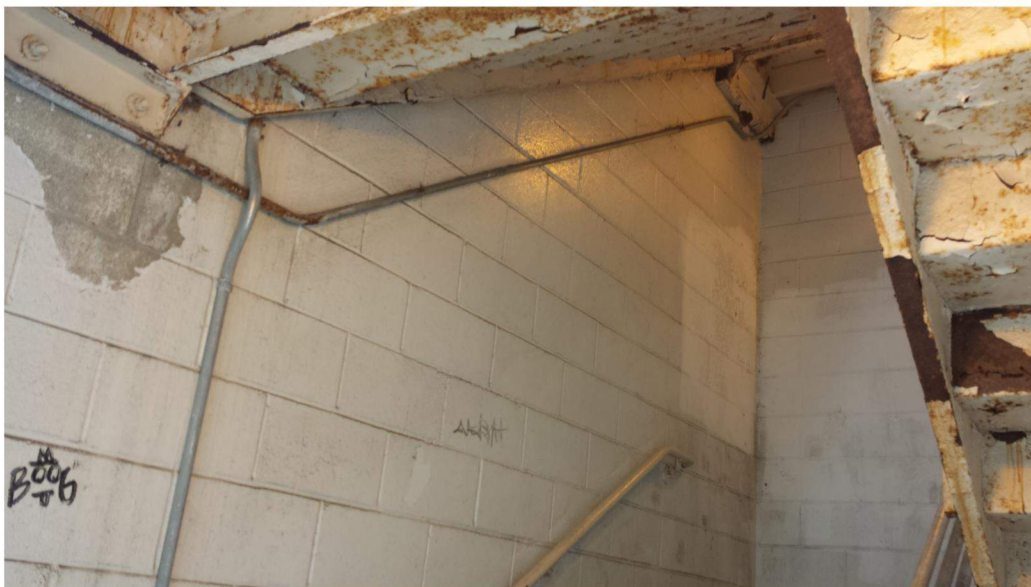
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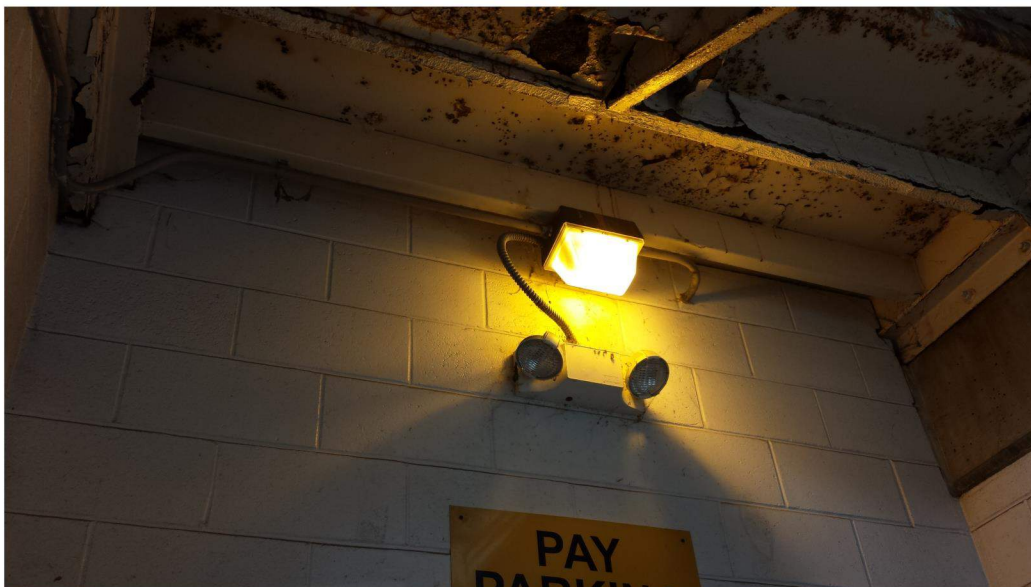
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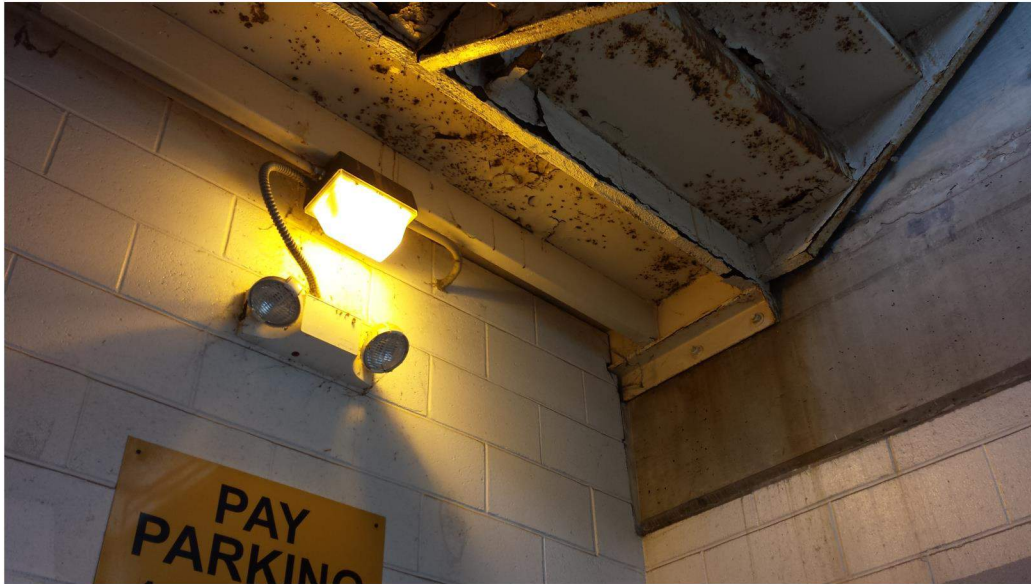


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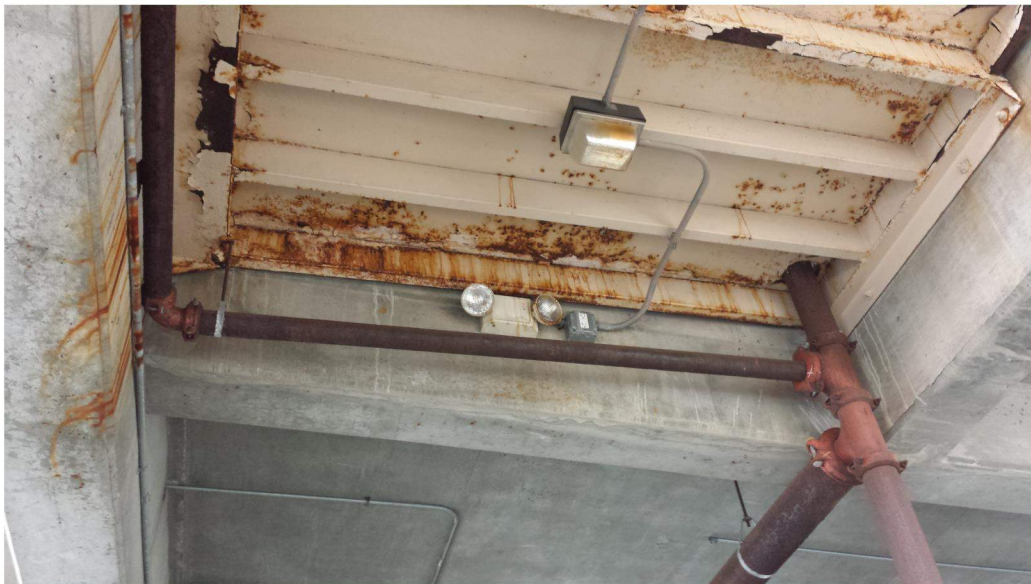


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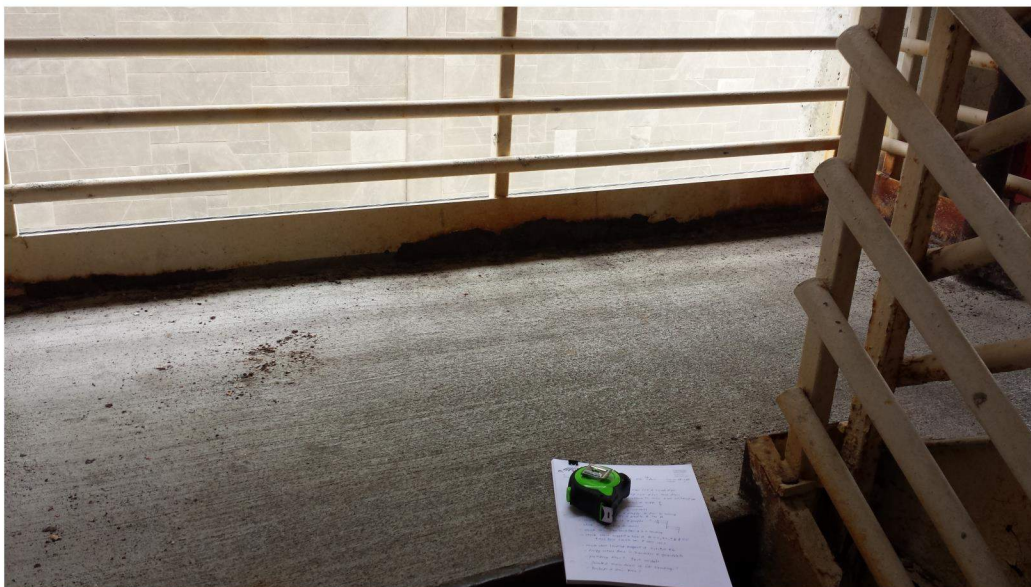
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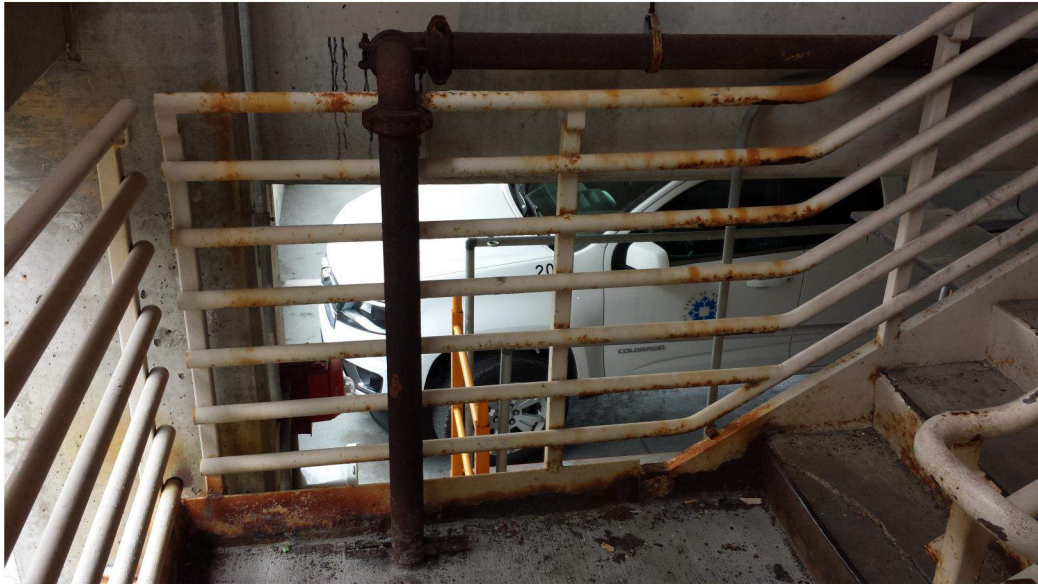


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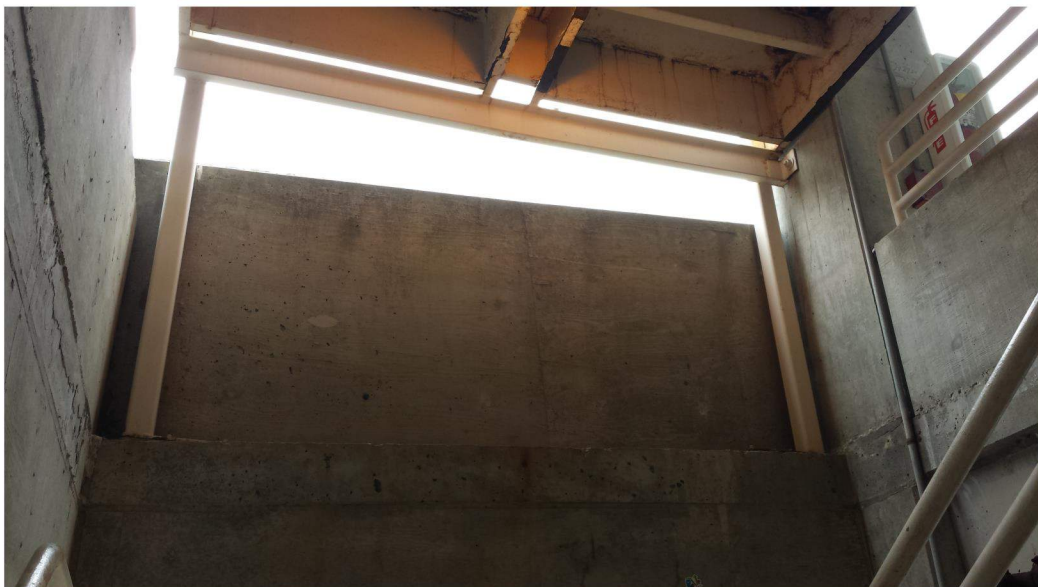
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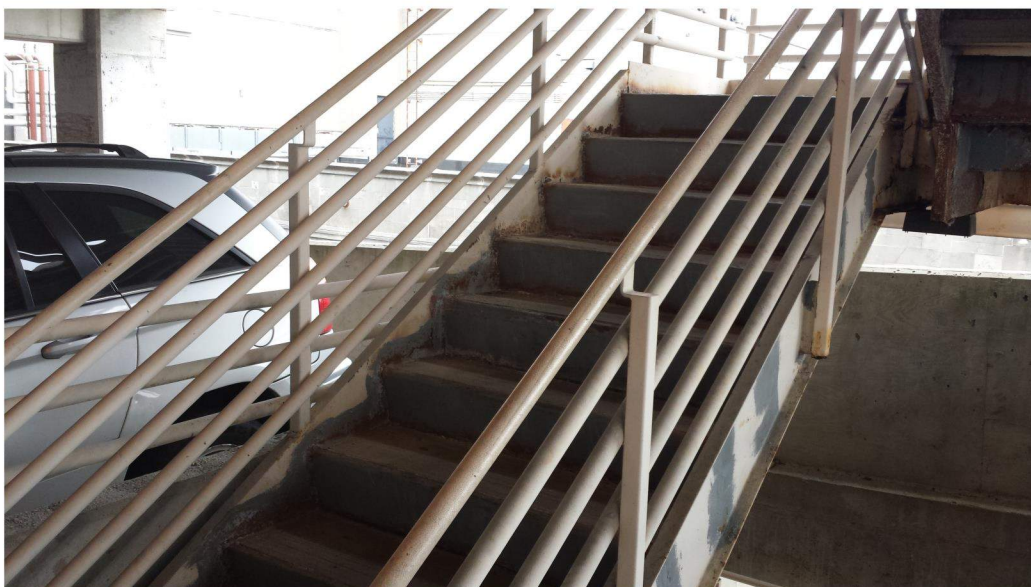
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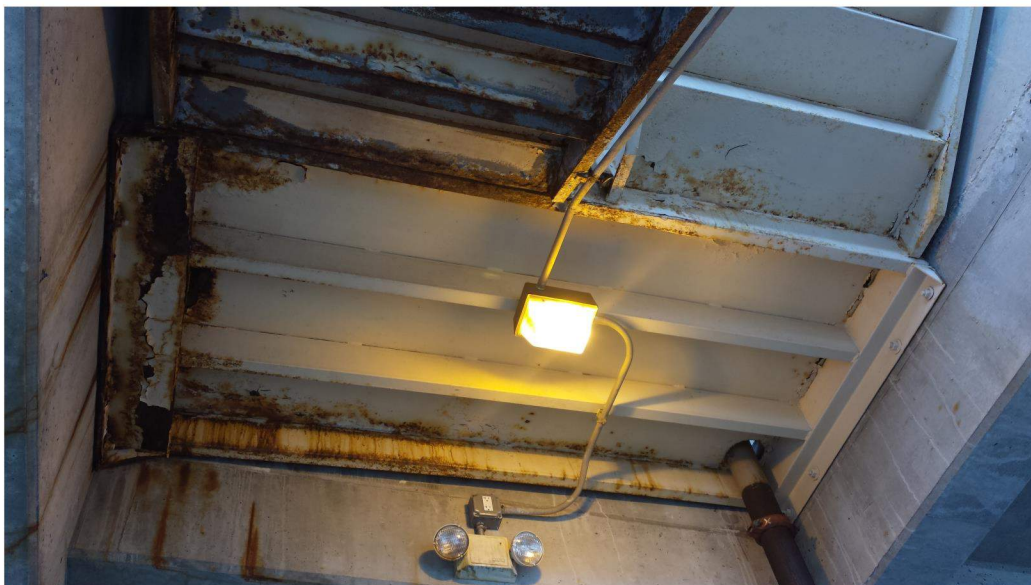




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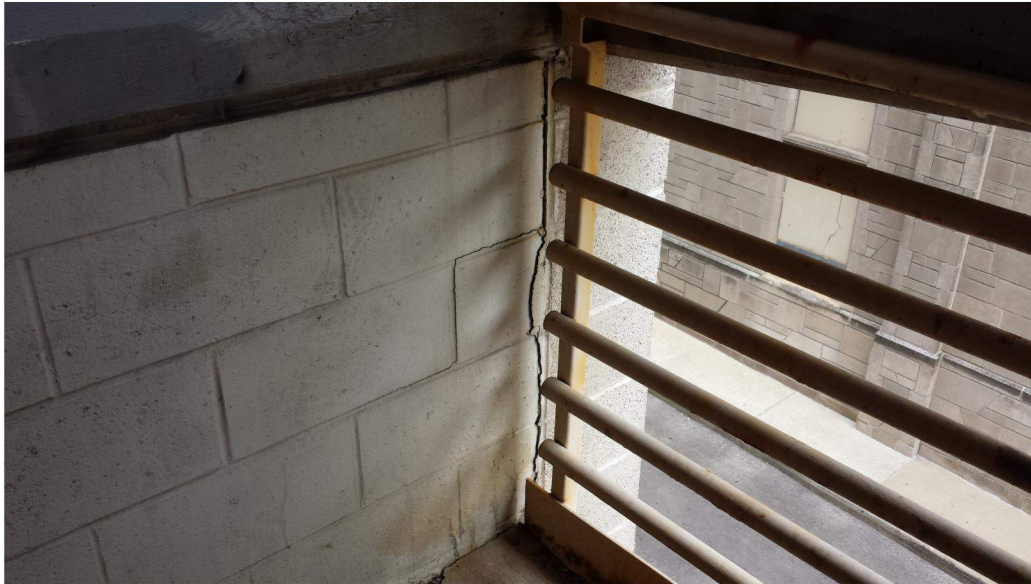


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level5-ei-around beam



level5-ei-barrier wall

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level3-ei-underside of beam



level6-ei-underside of beam

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