CONCRETE STEPS AND HANDRAIL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place Concrete Steps

B. Precast Concrete Steps

C. Ornamental Iron Handrail

D. Pipe Handrail

1.02 DESCRIPTION OF WORK

A. Furnish and install concrete steps and handrails to lines and grades shown on the plans and as specified herein.

B. Furnish and install all related materials required for construction of the concrete steps and handrails at locations called for on the plans.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT FOR PAYMENT

A. Steps: Measured in square feet based on horizontal projection measurements. The length of the steps shall be measured along the center line of the steps from the expansion joint at the bottom to the expansion joint at the top. The width shall include curbs, if constructed.

B. Handrail: Measure in linear feet along the center line of the top rail from the outside edge of end post to outside edge of end post.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete: Concrete used for steps shall meet requirements of Iowa DOT Class C concrete.

B. Reinforcing Steel: Steel rods, dowels, and tie bars shall meet the requirements of ASTM A 615 or ASTM A 617, deformed, Grade 40.

C. Handrail:

1. **Ornamental Iron Handrail:**
   a. Unless otherwise specified on the plans, material shall be wrought iron or mild steel.
   b. The top channel shall be 1/8 inch by 1/2 inch by 1 1/2 inch stock with a "lamb's tongue" extending beyond each end post.
   c. The bottom channel shall be 1/8 inch by 1/2 inch by 1 inch stock to be placed 4 inches above the center of the step tread.
   d. The posts shall be 1 inch square, 14 gage stock with a maximum spacing of 5 feet center to center.
   e. The vertical members (pickets) between posts shall be 1/2 inch square solid stock spread 4 inches center to center ± 1/2 inch. The pickets shall be twisted and plain alternating.
   f. All connections shall be welded and ground smooth. The railing shall be free of all weld spatters and shall be given 2 shop coats of satin black non-rust inhibiting enamel paint.

2. **Pipe Handrail:**
   a. When pipe handrails are specified in the plans, they shall be 1 1/2 inch black pipe with welded connections ground smooth.
   b. The handrail shall be fabricated after the steps are cast and shall have one shop coat and two field coats of aluminum paint.
   c. Maximum post spacing shall be 5 feet.
   d. When handrails are specified to securely fastened to the steps, weld post to a 1/4 inch by 5 inch by 8 inch anchor plate and securely fasten to the steps with 2 3/8 inch diameter approved galvanized anchor bolts with 3 inch minimum length.
   e. When pipe handrails are specified for dwellings, the spacing for vertical pickets and bottom rail shall be as specified in Section 9080, 2.01, C, 1.
   f. Field paint pipe handrail with 2 shop coats of satin black non-rust inhibiting enamel paint.

D. Expansion Joint: All expansion joint material shall meet the requirements of Section 7010.

E. Forms:

1. Material used for forms shall be metal, surfaced lumber, plywood, masonite, hard-pressed composition board, or other approved material backed by suitable studding, walers, etc.

2. Forms shall be free from knotholes, cracks, splits, warps, or other defects which would prevent it from producing the strength, accuracy, and appearance necessary in the finished concrete surface.

3. Reused form material shall be thoroughly cleaned and shall be free of bulges, splits, warps, or bends.

PART 3 - EXECUTION

3.01 INSTALLATION (Refer to Figures 9080.1 and 9080.2)

A. Prepare Subgrade: In fill areas construct and compact to a minimum of 95% of maximum Standard Proctor Density ASTM D 698.

B. Forming:

1. Forms shall be constructed with mortar-tight joints and of material sufficient in strength to hold concrete without bulging between supports.

2. Forms shall be so designed and constructed that they may be removed without injury to the concrete. Blocks and bracing shall be removed with the forms, and in no case shall any portion of wood forms be left in the concrete.

3. Forms shall be so constructed that the finished concrete shall be of the form and dimensions shown on the plans and substantially true to line and grade.

4. Forms shall be filled 3/4 inch at all sharp corners and shall be given a bevel in the case of all projections, sufficient to ensure easy removal.

5. Special attention shall be paid to ties and bracing.

6. Where forms appear to be insufficiently braced or unsatisfactorily built, either before or during placing of concrete, the Engineer shall order the work stopped until the defects have been corrected to the Engineer's satisfaction.

7. Forms shall be painted with a colorless oil, or some other satisfactory means shall be taken to prevent concrete from adhering to forms.

8. Forms shall be thoroughly drenched with water immediately before concrete is placed in them.

C. Placing Concrete:

1. The subgrade shall be thoroughly moistened before placement.

2. Concrete shall be deposited for the full depth of the steps in one operation.

3. Concrete shall be consolidated by vibrating and the excess concrete screeded off flush with the forms.

D. Finishing: Exposed surfaces shall be finished as soon as practicable. After forms are stripped, no sooner than six hours after the pour, all exposed surfaces shall be rubbed with a No. 16 carborundum brick and water until the surfaces are free of all blemishes and have a uniform appearance.

E. Curing: Curing shall be in accordance with requirements for sidewalk construction in Section 7030.

3.01 INSTALLATION (Refer to Figures 9080.1 and 9080.2) (Continued)

F. Handrail:

1. A handrail shall be required on all steps with two risers or more. Stairways with a total rise of more than 30 inches shall have a handrail on both sides. In addition, stairways greater than 88 inches in width shall have a handrail at the center line of the stairs.

2. For steps, the railing shall be between 34 inches and 38 inches high as measured from the nose of the step tread to the top channel. For landings that are greater than 30 inches above adjacent ground, the railing shall be 36 inches high.

3. Non-continuous Handrail:
   a. At the top, handrail shall extend at least 12 inches beyond the top riser with the extension remaining parallel to the floor or ground surface.
   b. At the bottom, handrail shall extend 12 inches plus the width of one tread beyond the bottom riser. The handrail shall continue to slope for a distance of the width of one tread from the bottom riser while the remaining extension shall be horizontal.

4. If posts are to be set in concrete, they shall be set in a 1 1/2 inch diameter hole (2 1/2 inch for pipe rail), a minimum 6 inch depth, and the void filled with a commercial non-shrinking grout. An optional method of setting posts is to bolt posts to the tread with anchor bolts as specified herein and on the Standard Detail Plates.

END OF SECTION