SECTION 511 STEEL PILING

511.1 Description

(1) This section describes furnishing, driving, cutting off, splicing if necessary, and painting if required, steel foundation piling or steel trestle piling.

(2) This section also describes furnishing and attaching pile points to steel piling, and preboring piling into sound rock.

511.2 Materials

511.2.1 Steel HP Piling

(1) Conform to the requirements for structural steel 506.2.2.

(2) Unless the engineer directs otherwise, the contractor shall submit at, or before delivery of the steel HP piling the certified report of test or analysis as specified for structural steel mill inspection and testing in 506.3.21.

511.2.2 Steel Oil Field Pipe

(1) Conform to ASTM, A 252, grade 3 with a maximum tensile strength of 120 000 psi (413.7 MPa) or a maximum Brinell Hardness Number (BHN) of 240. Conducting the onsite Brinell Hardness Test is the contractor's responsibility. Perform 2 hardness tests on one end of each pipe length. Weld piling with a BHN in excess of 180 according to the welding requirements of 506.3.19.1 and 511.3.4.4.2, and a certified welder shall visually inspect these welds. If replacing HP piling, provide pipe with a cross section that equals or exceeds 97 percent of the area of the HP piling originally specified. The pipe shall have a minimum outside diameter of 7 3/4 inches (196 mm) and a minimum wall thickness of 3/8 inch (10 mm). Ensure that each pipe on each load delivered to the project conforms to the bill of lading and is marked to uniquely identify the load. Make the marking durable and legible.

(2) The contractor shall also furnish, at or before delivery, certification of the pipe's chemical composition to determine its carbon equivalency (CE). Ensure the CE does not exceed 0.55.

$$CE=C+1/6(Mn+Si+Cr+Mo+V)+1/15(Ni+Cu)$$

(3) Use pipe delivered in a magnetized condition for non-welded applications only.

511.2.3 Pile Points

(1) Furnish pile points from the department's approved products list and made from cast steel conforming to ASTM A27 Grade 65/35 or ASTM A148 Grade 90/60.

511.2.4 Pile Preboring

(1) Under the Piling Steel Preboring bid item, provide grade A, A-FA, A-S, A-IS or A-IP concrete conforming to section 501.

511.3 Construction

511.3.1 Ordering Piling

(1) Consider the estimated lengths of piling the plans show as approximate only and determined for design and estimating purposes from a few soil soundings taken at the site. It is the contractor's responsibility to furnish steel in sufficient lengths to obtain the required penetration and specified bearing for each pile.

511.3.2 Fabrication and Delivery

(1) Use the structural steel shapes the plans show to fabricate all steel foundation or trestle piling, except the contractor may furnish steel oil field pipe instead of the steel HP piling unless the contract states otherwise. Fabricate and deliver all steel piling as specified in section 506, except as specified below. Submit a certified report of test or analysis to the engineer at or before delivery of the piling.

(2) Paint that portion of the steel piling exposed in the completed work as specified for painting in 511.3.5.

(3) Except for piling made from cutoffs with the engineer's permission, furnish steel piling up to and including 20 feet (6 m) in length in one unwelded piece. Piling from 20 to 50 feet (6 m to 15 m) in length may have 2 field or shop welded splices; and the contractor may furnish piling over 50 feet (15 m) in length with 4 splices, unless the contract provides otherwise.

511.3.3 Driving Equipment

(1) Equipment for driving steel piling shall conform to 508.3.3 for equipment for driving timber piling. Cut the head of the pile squarely and provide a driving cap to hold the axis of the pile in line with the axis of the hammer.

511.3.4 Driving

511.3.4.1 General

(1) Drive steel piling as specified in 508.3.5 for timber piling, except as specified below.

511.3.4.2 Bearing Value

(1) Drive piles to a bearing value not less than that the plans show.

(2) Determine the bearing value for each individual pile as specified in section 508 for timber piling.

511.3.4.3 Penetration

(1) Drive steel piles to the minimum penetration specified in section 508 for timber piling.

511.3.4.4 Pile Splicing

511.3.4.4.1 General

(1) Make pile splices as specified shell lengths and splices in 510.3.2.

(2) The splice shall develop the full strength of the pile. If details for splices are incorporated in the plans, conform to them.

511.3.4.4.2 Oil Field Pipe

(1) Position backup rings flush with the joint and place as specified in paragraph 3.13 of AASHTO/AWS D1.5. The rings shall allow the joint to contract freely as the weld cools. Make tack welds the smallest size necessary to hold the pipe ends in alignment for welding.

(2) Preheat for a distance of 5 inches (125 mm) on both sides of the weld. Preheat steel pipe with a CE less than 0.35 to 100 F (38 C). Preheat steel pipe with a CE between 0.35 and 0.45 inclusive to 250 F (121 C) and preheat steel pipe with a CE between 0.45 and 0.55 inclusive to 400 F (204 C).

(3) Protect the pipe ends from high winds and precipitation during the welding process by housing or sheltering.

(4) The contractor may use engineer-approved threaded connections instead of welded connections.

511.3.4.5 Cutting Off Piles

(1) After driving all piles in a unit, cut the tops off the piles at the elevation the plans show and according to the plan details.

511.3.4.6 Pile Cutoffs

(1) The contractor may splice and extend delivered or driven lengths of steel piling with suitable cutoffs, if necessary.

(2) The engineer may allow the contractor to produce pile lengths by splicing together suitable cutoffs, except, do not use cutoffs less than 5 feet (1.5 m) in length to fabricate this piling.

(3) All pile cutoffs are the contractor’s property. The contractor is responsible for disposing of any cutoffs not used in the work.

511.3.4.7 Oil Field Pipe

(1) Remove soil, water, or other material within the pile to the bottom of the footing elevation. The contractor may install a suitable barrier at this elevation instead of filling any void with material acceptable to the engineer.

511.3.5 Painting

511.3.5.1 General

(1) Paint the exposed portions of the completed trestle or other exposed steel piling to conform to the 2-coat paint system or 3-coat paint system specified below. The paint shall extend from the top of the driven pile to a point not less than 4 feet (1.2 m) below streambed or ground line. Paint the piling before driving.

(2) Prepare the surface and apply the paint as specified in section 517, except blast clean the piling to conform to SSPC-SP 6.

(3) Handle pilings with padded slings, nonmetallic slings, or softeners to minimize paint damage. Repair all damaged paint exposed above water or above ground line.

511.3.5.2 Two-Coat Paint System

(1) This system consists of 2 coats of paint from a department-approved manufacturer with a dry film thickness of 8 mils (0.20 mm) minimum and 10 mils (0.25 mm) maximum. Ensure a minimum cure time of 7 days elapses before exposing to water.

511.3.5.3 Three-Coat Paint System

(1) This system consists of a department-approved organic zinc-rich primer and 2 coats of aluminum paint. Apply the 2 top coats as follows:

- Ensure that the aluminum paint for topcoats is made with aluminum pigment paste and varnish vehicle conforming to AASHTO M 69, type I, except use a non-leafing pigment paste for the first top coat.
- Tint the first topcoat by adding Paste in Oil, as contained in ASTM D 261, in the proportion of 3 ounces per gallon (23 g/L) of vehicle.
- Allow 2 days cure time between coats of paints.
- Do not apply aluminum paint to any portion of pile that will end up imbedded in fresh portland cement concrete.

511.3.6 Pile Points

(1) Fasten pile points to the piles using 5/16” (8 mm) minimum groove welds full length of flange for H-piles, and using 3/16” (5 mm) minimum groove welds around perimeter of pipe piles.

511.3.7 (Vacant)

511.3.8 Preboring

(1) Bore the holes from bottom of footing elevation to depth of 3 feet (1 m) or more into sound rock. Provide a bore hole diameter that equals or exceeds the following:

- For 10-inch (250 mm) HP piling, 14 inches (356 mm).
- For 12-inch (310 mm) HP piling, 18 inches (457 mm).
- For 14-inch (360 mm) HP piling, 20 inches (508 mm).
- For round piling, the piling diameter plus 6 inches (152 mm).

(2) Firmly seat the piling in the bottom of the bore hole, support the piling in position, and fill the area around the piling with concrete. Ensure that the bore hole is free of debris before placing concrete and, if necessary to prevent sloughing, case the hole. The contractor may fill the hole from the ground line to top of rock with concrete or sand.

511.4 Measurement

(1) The department will measure the Piling Steel Delivered and Driven HP bid items by the linear foot acceptably completed. The measured quantity equals the sum of the lengths of piling delivered, driven, and left in place below cutoff.

(2) The department will measure Pile Points as each individual unit acceptably completed.

(3) The department will measure Piling Steel Preboring by the linear foot, measured from the bottom of the footing to the bottom of the hole.

511.5 Payment

511.5.1 General

(1) The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
511.2100 - 2199	Piling Steel Delivered and Driven HP (inch) (lb)	LF
511.3000	Pile Points	EACH
511.6000	Piling Steel Preboring	LF

511.5.2 Piling Steel Delivered and Driven

(1) Payment for the Piling Steel Delivered and Driven HP bid items is full compensation for providing piling including fabricating, delivering, preparing, driving, splicing, and cutting off the piling; for painting, if required; for placing and positioning the piling in prebored rock, if required; for removing upheaved material; and for disposing of piling cutoffs not used.

(2) The department will pay an amount equivalent to the contract price for 9 feet of Piling Steel Delivered and Driven HP for field splices. The department will pay for one splice per pile under the Splices HP Piling administrative item. The department will only pay for splices meeting the following conditions:

1. The contractor can not get the plan bearing capacity in the length the plans show.
2. The contractor actually splices the pile.
3. The spliced pile is acceptably driven to the plan bearing capacity.

(3) The department will not pay separately or additionally for providing a piling fabricated from cutoffs, as allowed under 511.3.4.6.

511.5.3 Pile Points

(1) Payment for Pile Points is full compensation for providing and attaching the points.

511.5.4 (Vacant)

511.5.5 Piling Steel Preboring

(1) Payment for Piling Steel Preboring is full compensation for pre-boring the hole; for providing casing, if required; for furnishing and placing concrete; and for backfilling with sand or concrete.