

**9-10 PILING**

**9-10.1 Timber Piling**

Timber piling shall be untreated or treated with the preservatives specified in the Plans and completely described in Section 9-09.3.

Timber piles shall have the following limiting diameters:

<b>Length in Feet</b>	<b>Min. Butt Dia. 3-feet Above Butt in inches</b>	<b>Max. Butt Dia. 3-feet Above Butt in inches</b>	<b>Min. Tip Dia. in inches</b>
Under 40	12	20	7
40-54	12	20	7
55-74	13	20	7
Over 74	14	20	7

Timber piles shall be strapped with at least three straps: one approximately 18-inches from the butt, one approximately 24-inches from the butt, and one approximately 12-inches from the tip. Additional straps shall be provided at approximately 15-foot centers between the butt and tip. Strapping shall encircle the pile once and be tensioned as tightly as possible. Straps shall be 1¼-inches wide, 0.31-inch thick, cold rolled, fully heat treated, high tensile strapping, painted, and waxed, with an ultimate tensile strength of 5,100 pounds. The seal shall be 2¼-inches long, 20 gage, crimped with a notch type sealer to furnish a joint yielding 80 percent of the strap tensile strength. Treated timber piles shall be strapped after treatment.

**9-10.1(1) Untreated Piling**

Except where specifically provided otherwise, untreated timber piling shall be Douglas Fir, Western Red Cedar, or Larch. Piling for foundations shall be Douglas Fir. Piling shall be cut from sound, live trees and shall contain no unsound knots. Sound knots will be permitted, provided the diameter of the knot does not exceed 4-inches, or ⅓ of the small diameter of the pile at the point where they occur, whichever is smaller. Any defect or combination of defects which will impair the strength of the pile more than the maximum allowable knot will not be permitted.

Piling shall be cut above the butt swell and shall have a uniform taper from butt to tip. A line drawn from the center of the tip to the center of the butt shall not fall outside the center of the pile at any point more than one percent of the length of the pile. A spiral grain or twist in excess of ¼ turn in 10-feet of length will be cause for rejection.

Untreated timber trestle piling shall have an average of at least five annual rings per inch measured radially over a distance of 3-inches at the butt, beginning at a point 3½-inches from the heart. At least 9-inches of heartwood shall show at the butt.

Ring count requirements for untreated timber foundation piling and detour trestle piling will be waived.

**9-10.1(2) Creosote Treated Piling**

For creosote treated piling, Douglas Fir timber shall be used. All other requirements shall be the same as for untreated piling, except that the ring count requirement will be waived.

**9-10.1(3) Timber Composite Piling**

Timber composite piling shall consist of a pile made up of two timber sections. The lower section shall be untreated, and the upper section shall be creosote treated.

The treated and untreated sections of timber composite pile shall meet the respective requirements specified above for full length of treated and untreated timber piling.

#### **9-10.1(4) Peeling**

Untreated and creosote treated piles shall be peeled by removing all of the rough bark and at least 80 percent of the inner bark. No strip of inner bark remaining on the pile shall be over ¾-inch wide or over 8-inches long, and there shall be at least 1-inch of clean wood surface between any two such strips. Not less than 80 percent of the surface on any circumference shall be clean wood. All knots shall be trimmed close to the body of the pile.

### **9-10.2 Concrete Piling**

#### **9-10.2(1) Concrete**

Cement meeting the requirements of Section 9-01 shall be used in all precast concrete piles.

The concrete for precast-prestressed piles shall conform to the requirements of Section 9-19.1. The concrete for prestressed piles shall have a minimum compressive strength of 6,000 psi at the age of 28 days. The minimum compressive strength of concrete at the transfer of prestress shall be 3,300 psi.

The concrete for other precast piles shall be Class 4000. Mixing, transporting, and placing concrete shall be in accordance with the provisions of Section 6-02.3.

The Contractor shall mold and test a sufficient number of concrete test cylinders to determine the strength of the concrete as required by the Specifications. Under the surveillance of the Engineer, the test cylinders shall be molded, cured, and tested in accordance with the procedures established by the State Materials Laboratory.

In the event that a sufficient number of concrete test cylinders are not molded to satisfy all testing required on any one pile, cores measuring 4-inches in diameter by 5-inches in height shall be taken and tested by the Contractor. If the strength of the core meets the required compressive strength of the concrete, the pile may be accepted. The coring and testing of the core shall be done under the surveillance of the Engineer.

#### **9-10.2(2) Reinforcement**

Reinforcement shall meet the requirements of Section 9-07.

### **9-10.3 Cast-in-Place Concrete Piling**

Reinforcement for cast-in-place concrete piles shall conform to the requirements of AASHTO M 31 Grade 40 or Grade 60.

### **9-10.4 Steel Pile Tips and Shoes**

Steel pile tips and shoes shall be fabricated of cast steel conforming to ASTM A 148 Grade 60-90 [620-415] or ASTM A 27 Grade 65-35 [450-240] and be free from any obvious defects. Pile tips shall be accompanied by a mill test report stating the chemical and physical properties (tensile and yield) of the steel.

### **9-10.5 Steel Piling**

The material for steel piling and pile splices shall conform to ASTM A 36 or ASTM A 992, except the material for steel pipe piling and splices shall conform to the requirements of ASTM A 252, Grade 2. Steel soldier piles, and associated steel bars and plates, shall conform to ASTM A 36 or ASTM A 992, except as otherwise noted in the Plans. All steel piling may be accepted by the Engineer based on the Manufacturer's Certification of Compliance.