

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent and location of the “piling” work is indicated on the drawings. The work includes furnishing materials, labor and equipment for installing timber piles in accordance with the drawings and this specification. All piles are to be installed by driving with an impact hammer.

1.02 JOB CONDITIONS

- A. Existing Facilities: The Contractor shall be aware of the existing Terminal 7 structures and conditions. The Contractor shall drive piles at the designated locations and shall be prepared to encounter existing riprap and/or other subsurface obstructions.
- B. Subsurface Conditions: Subsurface conditions have not been explored for this Contract, and the Contractor shall make its own determinations and conclusions regarding the methods and procedures to be used in performing the work. Jetting will not be allowed for any pile driving. The use of a spud to displace riprap or other debris may be required at some locations.
- C. Equipment Restrictions: Piles may be driven from either a floating pile driver or a land-based pile driver. The Contractor shall determine the adequacy of the existing structures to support its equipment and shall take into account the age and conditions of the structures. The use of construction equipment on the structures shall be entirely at the Contractor's discretion and the Port shall not be liable for any loss or damage ensuing from such use. The Contractor shall coordinate and schedule, with the Port, access to the site in advance, and shall acknowledge that terminal and shipping operations take precedence over construction activities.
- D. Driving Restrictions: Comply with City of Tacoma noise ordinances. Pile driving shall also be performed in accordance with applicable provisions of environmental permits covering this work. Applicable permits are appended to these specifications.

1.03 QUALITY ASSURANCE

- A. Provide at least one qualified person who shall have a minimum of five (5) years' experience with marine conditions, all piling types, piling lengths, and installation methods to be used on the project, and who shall supervise and direct all work performed under this section.
- B. Provide at least one qualified person who shall have a minimum of five (5) years' of experience in marine piling inspection and who shall keep detailed driving records and logs of for each pile from the time the pile is picked until the installation is complete and accepted. A sample pile driving log is provided at the end of this section.
- C. Retain independent assistance, if directed by the Engineer, for observation of pile installation activities.
- D. Tolerance in Driving:
 - 1. Maximum permissible tolerance in driving shall be as follows for timber piles.
 - a. Plumb Piles: Deviation from vertical shall not be more than $\frac{1}{4}$ inch per foot of pile length except as noted on the drawings or as approved by the Engineer.
 - b. Pile Location: Top of pile shall be within 2 inches of the removed pile plan location.
 - 2. Manipulation of piles to force the piles into position under the existing pile caps or into the fender system will be allowed provided the forces induced for the manipulations do

not damage the integrity of the piles. Maximum lateral load to pull and position top of pile shall be 500 pounds. Piles that deviate more than the tolerance specified due to conditions beyond the Contractor's control may be accepted by the Engineer on a pile-by-pile basis. The intent is to drive the piles as close to the original driven position as possible.

- E. The Port reserves the right to inspect the above-water and underwater portions of all piling after installation, and the Contractor shall make available the site, or portions thereof, to meet the Port's inspection schedule. Any reports including underwater photographs or video prepared will be made available for the Contractor's review. All observed damage or defects shall be repaired at the Contractor's expense using damage-specific or defect-specific products specified by the Engineer.

1.04 SUBMITTALS

- A. The Contractor shall submit for approval, in accordance with Section 01 33 00, Submittals, the following:
 - 1. List of equipment and intended installation procedures to be used for all pile driving.
 - 2. Pile-driving logs within 24 hours from when the pile is driven (example included at the end of this section).
 - 3. Documentation demonstrating the qualifications and experience of the individuals supervising pile driving and individuals keeping driving logs, as described above.
 - 4. Pile surveys, as prescribed within this section.
 - 5. Pile inspection reports, as prescribed herein.
 - 6. Water Quality forms on a weekly basis during in-water work.

PART 2 – PRODUCTS

2.01 TIMBER PILES

- A. Furnished by the Owner, 90-foot length.

2.02 PILE RUB STRIP

- A. High density polyethylene (HDPE). Material furnished by the Owner.

PART 3 – EXECUTION

3.01 GENERAL

- A. Rub strips shall be installed after pile driving.
- B. Driving:
 - 1. Timber piles shall be fresh cut on the butt end just before placing in the leads for driving. Caps, collars, or bands shall be placed on the butt end of the pile when the pile is being driven in hard material to avoid crushing or brooming the head of the pile. When the area of the head of any timber pile is greater than that of the face of the hammer, the pile shall be snipped or chamfered to a size to fit the hammer. The heads of all treated piles shall be snipped or chamfered to at least the depth of the sapwood to avoid splitting of the sapwood from the body of the pile during driving.
 - 2. The piles shall be driven with a steam, air, or diesel hammer capable of delivering a minimum 15,000 foot-pounds of energy. The intent is to drive all piles to a minimum of 25 foot embed. Prior to cutting off any pile that fails to achieve the

designated tip elevation of the refusal criteria, the Contractor shall notify the Engineer for direction. Refusal is defined as two (2) consecutive feet of driving at 75 blows per foot at the minimum hammer energy of 15,000 foot-pounds. Any pile damaged in the driving, improperly driven, or driven at the wrong location shall be removed by the Contractor and another pile shall be driven in its place at no additional cost to the Port.

C. Cutoff:

1. Timber bearing piles shall be cut off level and true and fit tight beneath the wale to provide full bearing. Pile cut offs shall not be allowed to fall into the waterway. Saw tailings shall be captured so the tailings do not fall into the waterway.

D. Treatment: Pile heads, notching, and bolt holes for all timber piles, after being cut to the correct elevation, shall be given three brush coats of copper naphthenate.

E. Pile Installation Acceptance Criteria:

1. The Engineer shall reject a pile if any of the following conditions exist.
 - a. A pile damaged in handling or driving, indicated by break or cracks.
 - b. Driven location of a pile and plumbness deviating by more than the specified tolerance limits.
2. Rejected piles shall be fully removed and replaced with a new pile.

F. Daily Pile Driving Records: For each pile driven, submit a pile driving record form. Each initial driving record and re-strike record shall be submitted daily, and shall show the information below. However, report damaged piles to the Engineer immediately.

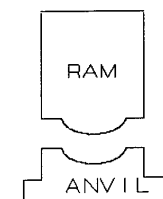
1. Date, time, and weather
2. Pile location, length, type and size of pile
3. Hammer used, rated hammer energy, pile cushion type and thickness
4. Blows per foot of penetration and blows per minute
5. Hammer stroke near the end of driving
6. Damage, obstructions, or any unusual occurrences during driving, and all other data on the sample pile driving form.

END OF SECTION

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HAMMER DATA SHEET

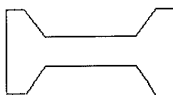
Contract No.:	Structure Name and/or No.:
Project:	
Pile Driving CONTRACTOR or Subcontractor:	
County:	Piles Driven By:



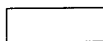
HAMMER



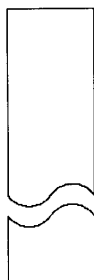
CAP
BLOCK



HELMET



CUSHION



PILE

Manufacturer:		Model:	
Type:		Serial No.	
Rated Energy:		@	Length of Stroke
Modifications: _____			
Material:			
Thickness:		Area:	
Modulus of Elasticity - E		(psi)	
Coefficient of Restitution - e			
ALL COMPONENTS		Weight:	
Cushion Material:			
Thickness:		Area:	
Modulus of Elasticity - E		(psi)	
Coefficient of Restitution - e			
Pile Type:		Weight/ft	
Length in Leads:			
Wall Thickness:		Taper:	
Design Pile Capacity:		(Tons)	
Description of Splice: _____			
Tip Treatment Description: _____			

NOTE: If mandrel is used to drive pile, attach separate manufacturer's detail sheet(s), including weight and dimensions.

Submitted By: _____ Date: _____

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PILE-DRIVING RECORD _____ PILE NO. _____

PAGE NO. ____ OF ____

JOB NO. _____ NAME _____
JOB LOCATION _____
PILE LOCATION _____
DRIVING CONTRACTOR _____

DATE _____
JOB ENGINEER _____
DATUM _____
SUPT _____

Pile: Type* _____
Length _____ Weight (lb) _____
Penetration: _____
Ground Elev. before Driving _____
Ground Elev. after Driving _____
Tip Elev. after Driving _____
Butt Elev. after Driving Group _____

Hammer: Make and Model _____
Stroke: Rated _____ Meas.** _____
Weight of Ram _____ lb _____
Strokes per Minute _____
Steam Pressure at Boiler _____
Driving Cap, Anvil, Helmet, etc. _____
Weight _____ lb Description _____

(Make sketch on back)

Time: Start Driving _____ Finish Driving _____ Driving Time _____ Minutes

ft	No. of Blows	ft	No. of Blows	ft	No. of Blows	ft	No. of Blows	ft	No. of Blows	ft	No. of Blows	ft	No. of Blows	ft	No. of Blows
0		0		0		0		0		0		0		0	
1		1		1		1		1		1		1		1	
2		2		2		2		2		2		2		2	
3		3		3		3		3		3		3		3	
4		4		4		4		4		4		4		4	
5		5		5		5		5		5		5		5	
6		6		6		6		6		6		6		6	
7		7		7		7		7		7		7		7	
8		8		8		8		8		8		8		8	
9		9		9		9		9		9		9		9	

DRIVING RESISTANCE LAST FOOT

1" _____ 2" _____ 3" _____ 4" _____ 5" _____ 6" _____ 7" _____ 8" _____ 9" _____ 10" _____ 11" _____ 12" _____

Remarks*** _____

* If wood, state kind, seasoning, and treatment. If concrete, state mix and age. If steel, state weight per foot.
** Note any falling off in rated speed and stroke during driving.
*** Jetting, cause and duration of delays in driving, boulders, bark, condition of cushions, types and thickness of cushions, plumbness, twisting, banding, damage, driving shoe, wetting of pile surface, etc.

USE BACK OF SHEET