

of the sheet piling from cutoff at the top to the tip of the sheet piling in the completed structure. No allowance will be made for waste.

410.04.05 Steel sheet piling will be measured and paid for at the Contract unit price per square foot as measured along the plane of surface for the pertinent Steel Sheet Piling item.

410.04.06 The following will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents:

- (a) When specified, tips for steel pipe piles.
- (b) Test pieces of sheet piling (timber or steel).
- (c) Dewatering, clean out, filler, reinforcement and concrete used in steel pipe piles.
- (d) Pile splices.
- (e) Augering, including sleeve and backfill when required.
- (f) Cleaning, painting, or coating of piling.
- (g) Piling or sheet piling for temporary structures, piles or sheet piling driven for the Contractor's convenience, or for any piles or sheet piling not specified in the Contract Documents.
- (h) Piling not approved by the Engineer, such as piles not properly driven, piles with questionable safe bearing values, piles damaged during driving, or piles driven below planned cutoff or the removal of any pile rejected by the Engineer as unsatisfactory.
- (i) Glass resin composite shield used on timber piles.

SECTION 411 — PILE LOAD TEST

411.01 DESCRIPTION. This work shall consist of applying loads to test piles when the Contract Documents include Load Tests. The load test setup, the measuring system, the loading device, the loading procedure, the frequency of measuring the movement of piles and the record keeping shall conform to D 1143 unless otherwise specified in the Contract Documents or directed by the Engineer.

411.02 MATERIALS. Not applicable.

411.03 CONSTRUCTION. At each load test location, the Engineer will provide driving criteria for the test pile. The pile shall then be driven and load tested to the test load specified in the Contract Documents or as directed by the Engineer. If the pile fails to achieve this capacity, an additional load test shall be performed on a second test pile. This pile shall be located adjacent to the initial test pile and driven according to revised driving criteria provided by the Engineer. The Engineer may elect to have the Contractor redrive piles that do not conform to the required penetration resistance.

The equipment and methodology used for driving the load test piles shall be the same as the equipment and methodology used for driving the permanent piles.

At each load test location, the Contractor shall construct a test enclosure to protect all of the equipment including dial gauges, load cells, loading apparatus and the personnel taking readings. Heat shall be provided, if necessary, so that a minimum temperature of 50 F is maintained within the enclosure. The test enclosure shall be adequately illuminated so that the readings can be taken inside the enclosure at all times of the day. The enclosure shall be ventilated to prevent fogging or frosting of gauges.

The Contractor shall submit drawings to the Engineer showing all details of the proposed load test setup. The submittal shall include the method of applying the load, the reaction frame and reaction pile configuration, if used, and the placement and support of measuring devices. The submittal shall be made at least seven days prior to the start of the first pile load test. The Contractor shall revise the load test setup if directed by the Engineer.

The reaction frame shall be designed by a professional engineer experienced in structural design and registered in the State of Maryland.

The load test setup shall be capable of supporting the test load for the duration of the test.

The clear distance from reaction piles to the test pile shall be at least 10 times the distance from the midpoint of web to end of flange for H piles or 10 times the radius of pile at the top for pipe piles or timber piles.

Where necessary, and if directed by the Engineer, the unsupported length of load test piles shall be braced to prevent buckling and without influencing the test results.

The primary instrument for measuring the movement shall be dial gauges. The dial gauges shall have an accuracy of 0.001 in. and shall have a minimum travel of 2 in. Three dial gauges spaced 120 degrees apart shall be used for measuring the movement of the top of the pile. A secondary system consisting of a scale, mirror and piano wire shall be used to measure the movement of the pile top.

Load apparatus shall conform to D 1143, Apparatus for Applying Loads. The loading apparatus shall have a capacity of 150 percent of the test load. The maximum operating load of all jacks shall be 85 percent of its total capacity. If more than one hydraulic jack is used, the jacks shall be of the same piston diameter, connected to a common manifold and pressure gauge, and operated by a single hydraulic pump.

Loads shall be applied uniformly without impact. If hydraulic jacks are used, they shall be equipped with automatic regulators so that constant pressure can be maintained for the long term test without frequent manual adjustment.

Unless weights of known magnitude are used to load the test piles, the primary method of measuring the test load shall be by a load cell with an accuracy tolerance within plus or minus 2 percent of the applied load. The load cell shall be calibrated prior to the test and a copy of the calibration report supplied to the Engineer. A pressure gauge shall be provided as a secondary system. The pressure gauge, hydraulic ram, and hydraulic pump shall be calibrated as a unit to an accuracy within 5 percent of the applied load. The use of a single high capacity jack is preferred to the use of multiple jacks. When a multiple jacking system is used, each jack shall be fitted with a pressure gauge in addition to the master gauge in order to detect malfunctions.

Load measuring devices shall be recalibrated if required by observed performance.

The load test pile shall be cut off in a manner that ensures a surface that is perpendicular to the longitudinal axis to allow for full bearing of the test pile. A steel plate of 1 in. minimum thickness shall be placed over the cutoff surface in a manner that facilitates axial loading and even bearing on the test pile.

The test procedure for all test piles driven to the embedded depths specified in the Contract Documents shall be the standard loading procedure conforming to D 1143 or as directed by the Engineer. Loading shall be continued to the specified test load or to failure, whichever occurs first.

The Contractor shall provide equipment to determine if reaction piles are moving. A scale attached to the reaction piles that can be monitored with a transit shall be used for this purpose.

If at any stage during the test, the Engineer detects malfunctioning of any apparatus furnished by the Contractor, or the load is being eccentrically applied, or the anchor piles are yielding, the Engineer will order the test abandoned and the Contractor shall replace it with another test at no additional cost to the Administration. The Contractor shall have all necessary personnel present at the site at all times during the performance of the test to maintain the required load.

After the pile test program is complete, anchor (reaction) piles shall be removed or cut off as specified in 410.03.10.

Steel pipe piles shall be load tested before filling.

411.04 MEASUREMENT AND PAYMENT. When the project includes an item for load test, it will be measured and paid for at the Contract unit price per each for the pertinent Load Test item. The payment will be full compensation for furnishing and installing all equipment, drawings, monitoring, recording, removal of all devices at the completion of the tests, and for all material, labor, equipment, tools and incidentals necessary to complete the work. In the event that the properly conducted load test fails to achieve the designated capacity, the additional tests will be measured and paid for at the Contract unit price per each under the Load Test item.

SECTION 412 — DRILLED SHAFTS (CAISSONS)

412.01 DESCRIPTION. This work shall consist of constructing drilled shafts (caissons) as specified in the Contract Documents, or as directed by the Engineer.

412.02 MATERIALS. Materials shall conform to 420.02 except as modified herein.

Concrete Mix No. 4	902.10
Reinforcement Steel	908
Steel Casings	A 252, Grade 2 or A 36

412.03 CONSTRUCTION. Construction shall conform to 402.03, 419.03, and 420.03, except as modified herein.