

S T A T E

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T E N N E S S E E

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January 1, 2021

SPECIAL PROVISION

REGARDING

DRILLED CAISSONS

Description

This work consists of drilling caissons for cylindrical foundations for supporting structures that primarily resist significant lateral loads concurrently with low-level vertical loads. This work shall provide drilled caissons in cylindrically excavated holes extending sufficiently into soil or sound rock to adequately support the structure terminating in soil or near surface rock, while constructed in the dry.

Materials

All materials shall be in accordance with the Plans and in accordance with Standard Specifications **604** and **907**.

Construction Requirements

A. Excavations

Perform the excavations required for the drilled caisson to the dimensions and elevations shown on the plans or otherwise required by the Engineer, including any miscellaneous grading or excavation to install the drilled caisson. The base of the caisson excavations shall be shaped to a level plane within a tolerance of 1 vertical to 12 horizontal.

The drilled caisson excavations shall be advanced with a drill rig of adequate capacity. The drill rig shall be capable of drilling through soil and non-soil including rock and boulders. Blasting will not be allowed to advance the excavation.

The drill rig shall be capable of drilling to sufficient depth to obtain the required rock socket shown in the plans. The “top of rock” is defined as the elevation at which natural material is penetrated with a rock auger at a hole advancement rate of less than 6 inches after 15 minutes of continuous drilling at full power. This does not include man-made materials, such as concrete, steel, timber, etc. Any man-made material that significantly limits excavation advancement will be classified as an “obstruction”. The presence of an obstruction must be verified by the Engineer using the aforementioned “top of rock” penetration resistance definition.

Relative to ensuring that the design intent is realized, the “top of the rock socket” will be defined as that elevation where the full diameter of the shaft penetrates rock. Therefore, the tip elevation will be determined by extending the caisson below the top of the rock socket to at least the minimum penetration into rock shown on the plans. Upon inspection of the socket

walls (before inner rock socket casing is placed) and/or below the excavation base by the Engineer, the caisson may need to be extended as directed by the Engineer.

B. Dry Construction

Precautions should be taken to drill and place concrete under relatively dry conditions. Dry construction shall consist of drilling the caisson excavation, removing accumulated seepage water and loose material from the excavation, and placing the reinforcing and concrete in a relatively dry excavation. Accumulation of loose soils, muck, etc. at the bottom of the excavation shall not be allowed. Dry construction will be allowed only if less than 3 inches of standing water is found at the bottom of the caisson and the seepage rate is less than 12 inches of water per hour. It may be necessary to utilize a temporary steel casing to support the walls of the caisson. If dry conditions cannot be achieved, the Contractor shall notify the Engineer before proceeding.

C. Casing

When applicable, select the casing used to stabilize the caisson during construction. A casing with sufficient strength to safely resist all imposed loads, including those from the soil and ground water, shall be used. Insure the stability of casing during all drilled caisson operations.

D. Drilled Caisson Alignment

Maximum permissible deviation from the actual center of the drilled caisson from design location for line and grade shall be 3 inches. The maximum permissible deviation from plumb shall not exceed 2% percent, which may consider equivalent to 2-1/2 inches for the first 10 feet and 2-1/2 inches for each additional 10 feet of depth.

E. Soil Stability or Caving

Areas of the rock socket containing voids shall be stabilized as part of the drilled hole preparation. If caving occurs during any drilled caisson procedure, the Engineer shall be informed immediately. If caving occurs during concrete placement, the drilled caisson shall be cleaned of all concrete immediately (before the concrete takes its set) and the integrity of the excavation reestablished.

F. Temporary Casing Extraction

During simultaneous concrete placing and casing removal operations, sufficient concrete should be maintained inside the casing to offset the hydrostatic head of the groundwater outside the casing and prevent the intrusion of soil and groundwater into the drilled caisson. Casing extraction must be done such that the concrete will fill the entire caisson area upon removal of the casing. Any portion of a temporary casing extending above ground shall be removed above the ground line after the concrete has cured. Casing left within the limits of the rock socket causing the total length of uncased rock socket to be less than the plans minimum shall be reason for the drilled caisson to be rejected.

G. Reinforcing Steel Cage

The reinforcing steel cage, consisting of the longitudinal bars, ties, spirals, cage stiffener bars, spacers, centering devices, and other necessary appurtenances, shall be completely assembled as a unit, and shall be placed immediately after the shaft excavation is inspected and accepted, and just prior to shaft concrete placement. All reinforcing steel in the shaft shall be tied at every intersection and supported such that the steel maintains at least 3 inches of cover during placement of concrete or casing removal. The reinforcing steel cage shall have sufficient rigidity to prevent racking or permanent deformations during delivery or installation.

H. Placement Of Concrete

The excavation shall be checked after the completion of drilling and immediately before concrete placement to determine the accumulation of sediment by the Engineer. Concrete shall be placed as soon as possible after all excavation of each drilled caisson has been completed. If the concrete is not placed the same day that excavation of the drilled caisson is completed, the drilled caisson shall be recleaned and inspected by the Engineer the same day the concrete is placed. Placement of concrete shall be continuous over the entire length of the caisson. Cold joints will not be allowed within a drilled caisson. The top of the concrete placement shall end at the elevation shown in these plans for each caisson. Concrete shall be placed for each shaft with the flow of concrete directed down the center of the shaft. Concrete placed by free fall shall fall directly to the base without contacting either the reinforcing cage or hole sidewall. Free fall placement of concrete shall be permitted if water can be removed from the caisson as required for Dry Construction.

I. Disposal

Dispose of all excavated materials removed, including soil, rock, rejected drilled caissons, water, concrete, drilling fluid, etc. in accordance with the contract documents, as directed by the Engineer and in compliance with federal and state regulatory requirements.

Method of Measurement

- A.** The Department will measure the accepted drilled caisson Drilled Caisson - Earth (Description) to the nearest 0.10 vertical foot of length along the axis of each caisson. For caissons without a rock socket, measurement will be from the Plans elevation for the top of caisson to the bottom of the caisson. For caissons with a rock socket, measurement will be from the Plans elevation for the top of caisson to the top of the rock socket as defined in section Drilled Caisson - Rock (Description).
- B.** The Department will measure the accepted rock sockets and drilling through rock as Drilled Caisson – Rock (Description) to the nearest 0.10 vertical foot of length along the axis of the caisson for the cumulative length of rock, as determined by the Engineer. The “top of rock” is defined as the elevation at which natural material is penetrated with a rock auger at a hole advancement rate of less than 6 inches after 15 minutes of continuous drilling at full power. Relative to ensuring that the design intent is realized, the “top of the rock socket” will be defined as that elevation where the full diameter of the caisson penetrates rock.

Basis of Payment

The Department will pay for accepted quantities, complete in place, at the contract prices as follows:

| Item No. | Description | Unit |
|-----------------|---------------------------------------|-------------|
| 204-02.1x | Drilled Caisson – Earth (Description) | Linear Feet |
| 204-02.2x | Drilled Caisson – Rock (Description) | Linear Feet |

Such payment will be full compensation for all work specified including labor, materials, equipment, tools, and incidentals to complete the work.

- A. Such payment for Drilled Caisson (Earth) will be considered full compensation for all temporary casing used or left in place, drilling, excavation, slurry, dewatering, cleaning, and incidental work, and materials required to complete the excavation. Payment for any drilled caisson excavation will be at the contract unit price per vertical foot for the diameter of the drilled caisson specified. No additional compensation will be made for concrete required to fill an oversized casing or for oversized excavation.

- B. Such payment for Drilled Caisson (Rock) will be considered full compensation for temporary casing used or left in place, drilling, excavation, slurry, cleaning, dewatering, and incidental work, and material required to complete the excavation. For payment purposes the length of any rock socket installed and accepted shall be paid for at the contract unit price per vertical foot for the diameter of the rock socket specified. If the method of construction requires that drilled caisson casing be seated into the sound rock such that the bottom of the casing is below the determined top of sound rock elevation, payment for excavation below the top of the sound rock layer (top of the rock caisson) will be included in the payment. If the Engineer orders additional rock caisson construction, payment for the additional length will be at the contract unit price per vertical foot of rock. Payment will be considered full compensation for the additional excavation into rock including all incidentals necessary to complete the work down to the elevation designated by the Engineer. Additional reinforcing steel and concrete shall be paid for at the contract unit bid price.

- C. Removal of obstruction(s) will be paid at two times the unit price bid for Item Drilled Caisson (Rock) for the caisson length from the first occurrence of the obstruction until such depth that the caisson is advanced to the point of removal of the obstruction and normal caisson excavation methods can resume.