

ITEM 7

EXCAVATION SUPPORT SYSTEMS

1.0 DESCRIPTION. The design, furnishing and construction of the excavation support system, and the adequacy thereof, under Item 7, shall be the responsibility of Contractor. The Contractor's shoring engineer shall be a professional structural engineer, legally authorized to practice in Ohio, experienced in the design of earth support systems, and required to visit the Site prior to development of any sheeting and shoring system designs in order to become familiar with existing Site conditions.

2.0 SUBMITTALS. The Contractor shall submit the following in accordance with requirements of this Contract (This information is considered “means and methods” of the Contractor and will not be examined in detail by the Stark County Metropolitan Sewer District.).

A. Reference Standards.

1. Structural Steel: ASTM A 36.
2. Steel Sheet Piles: ASTM A 328.
3. American Welding Society (AWS) D1.1 – Structural Welding Code, Steel.
4. American Institute of Steel Construction (AISC): Manual of Steel Construction.

B. Timber Lagging: Shall be of a structural grade providing a minimum allowable working stress of 7.6 MPa (1,100 psi) where a system of timber lagging is to be used to support earth excavation.

C. Shop Drawings.

1. Layout drawings for excavation support system and other data prepared by (Signed, dated and sealed), or under the supervision of, a qualified professional engineer licensed in the State of Ohio. System design and calculations must be acceptable to all authorities having jurisdiction. The following shall be included on the working drawings:
 - a. Details, arrangement, and method of assembly of the proposed system.
 - b. The method of bracing and preloading.
 - c. The full excavation depth.
 - d. Loads for various stages of bracing removal during concrete placement and backfilling.
 - e. The anticipated lateral earth pressure, hydrostatic pressure, utility, rail, traffic, and equipment loads.
 - f. The maximum design load to be carried by the various members of the support system and a tabulation of the required preloads.
 - g. The depth to which the support system will be installed.

- h. The proposed sequence of strut and shore removal as applicable and as related to concrete placement and backfilling operations.
 - i. Proposed monitoring plan.
- 2. Existing Utility Facilities shall be included and, after checking their locations by field investigations, the working drawings shall be revised to show the actual locations of facilities, location of excavation supports, interference with the proposed Work, and how the Contractor proposes to overcome these interferences.
- 3. The Contractor and his subcontracted shoring engineer shall furnish evidence of having successfully completed at least two projects that meet the following criteria.
 - a. Equal or larger total linear footage of sheeting or shoring for one project of similar scope and conditions.
 - b. Completed within the specified contract time.

D. Calculations.

- 1. Complete design calculations and the maximum theoretical deflections of the support members shall be included.

3.0 MATERIALS. Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new but should be in serviceable condition and comply with the following standards for support systems and materials.

A. Types of Shoring and Bracing.

- 1. If a Contractor purposes to use a sheeting, shoring and bracing system which deviates in any way from these Department of Labor and Industry requirements he shall submit to the Owner a copy of the written permission from the Department of Labor and Industry having jurisdiction before the system is employed.
- 2. Wood, steel, cast iron, or any other material used to support excavations in tunnel, casing pipe or specifically included in any other item shall not be included for payment under Item 7.

4.0 EXECUTION.

A. Sheeting & Shoring.

- 1. The excavation support system and ancillary components shall be designed to support lateral earth pressures, unrelieved hydrostatic pressures, utility loads, rail loads, traffic and construction loads, and building and other surcharge loads to allow the safe and expeditious construction of the permanent structures without movement or settlement of the ground, and to prevent damage to or movement of adjacent buildings, structures, utilities, and other improvements.

2. Wherever shoring is required, the excavation shall be constructed with vertical banks and shall remain within the construction limits of the contract.
3. Locate the shoring system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
4. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.
5. Sheet piling, sheet piling, bracing and shores shall be withdrawn and removed as the excavations are being backfilled, except where and to such an extent as the Engineer shall order, that the same be left in place, or where he shall permit the Contractor to leave the same in place, at the Contractor's own cost and request. The location of all shoring and sheet piling left in place shall be documented on drawings and given to Engineer.
6. No sheet piling left in place shall extend within three (3) feet of surface.
7. In withdrawing sheet piling and sheet piling, special care should be taken to ensure that all remaining voids or holes are filled with satisfactory material and thoroughly rammed with thin rammers provided especially for that purpose.

B. Bracing.

1. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
2. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressure. Remove sheet piling, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
3. Repair or replace, as acceptable to Engineer, adjacent work damage or displaced through installation or removal of shoring and bracing work.

C. Maintenance.

1. The minimum lateral design earth pressure in all cases shall be determined by the Contractor's Shoring Engineer. All of the other above loadings shall be determined by Contractor's shoring engineer and added to the minimum design criteria.
2. The design load shall be the maximum load the support member will encounter during construction and shall account for stresses caused by temperature variations.

D. Removal of Shoring and Bracing.

1. The design shall also account for staged removal of bracing to suit the sequence of laying pipe, installing structures and of backfill.
2. The system of sheet piling, shoring and bracing shall be designed and installed by the Contractor for the materials and depths encountered using as a minimum standard the requirements prescribed by the Department of Labor and Industry having jurisdiction over the safety standards of this type of work.

5.0 ELECTRICAL. This section is not applicable.

6.0 QUALITY ASSURANCE. All work shall conform with the following requirements.

A. Testing. This section is not applicable.

B. Observation. Any progress observations by SCMSD do not waive rights or remedies, nor divest the Contractor of any responsibility for contract compliance, liabilities or damages.

C. Warranty. This section is not applicable.

7.0 MEASUREMENT. This section is not applicable.

8.0 PAYMENT. The cost for all labor, equipment, tools, and all other items necessary and incidental to the excavation supports systems shall be included in other items.

END OF SECTION