

SECTION 31 50 00
EARTH RETENTION SYSTEMS (Issued AD-2)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Subsurface soils investigations have been made at project site:
 - 1. Soils information was obtained for use in preparing foundation design.
 - 2. Location of soils report is included in specifications.
 - 3. Examine site and soils report and determine character of materials to be encountered.
- B. Definitions:
 - 1. Geotech: Soils Engineer or Representative of Foundation Consultant employed by Contractor empowered to conduct inspections and make approvals.
 - 2. Temporary earth retention system: System required to function only during construction period, up until which time excavation can safely be backfilled and retention system is no longer required.
 - 3. Permanent earth retention system: System required to function throughout service life of structure.

1.2 QUALITY ASSURANCE

- A. Assume complete responsibility for design, installation, maintenance as well as damage resulting from installation or performance of the earth retention system.
- B. Carefully examine site and verify elevations of existing footings of adjacent buildings and invert elevations of underground utility lines.
- C. Standards:
 - 1. Post Tensioning Institute (PTI):
 - a. Guide specification for post tensioning materials.
 - b. Recommendations for Prestressed Rock and Soil Anchors.
 - 2. American Institute of Steel Construction (AISC):
 - a. Specifications for design, fabrication and erection of structural steel for buildings.
 - b. Code of standard practice for steel buildings.
 - 3. American Welding Society (AWS):
 - a. AWS D1.1, structural welding code - steel.
 - 4. American Society for Testing Materials Standards (ASTM): Standards indicated.
 - 5. Structural Steel Painting Council (SSPC): Standards indicated.
 - 6. American Wood Preservers Association (AWPA).
- D. Design criteria:
 - 1. Provide earth retention system which will safely withstand earth pressures and limit settlement of surrounding structures to maximum 1/4 IN vertically and laterally.
 - 2. Earth retention system shall utilize effectively prestressed tie backs or earth anchors to minimize lateral earth deflection.
 - 3. Earth pressures used for the design of the earth retention system shall be determined by recognized principles of soils mechanics and shall be acceptable to Contractor's Geotech.
 - 4. Design, installation and grouting of earth retention system to follow recommendations of Post Tensioning Institute's "Recommendations for Prestressed Rock and Soil Anchors".
 - 5. Consider long term effects, including creep and relaxation in anchor design such that lateral movement of finished wall is less than 1/4 IN during service life of structure.
 - 6. Do not use driven piles or sheet piling.

- E. Qualifications:
 1. Designer: Earth retention system must be designed by a Civil or Structural Engineer registered in the State of New York.
 2. Design Engineer must be knowledgeable in area of earth retention systems with minimum 5 years experience in design of systems such as that proposed.
 3. Contractor: Earth retention system must be installed by Contractor who specializes in installation of earth retention systems such as that proposed.
 4. Contractor: Minimum of 5 years' experience in area of earth retention system installation.
- F. Testing:
 1. Proof test tie-back anchors in accordance with Post Tensioning Institute's "Recommendations for Prestressed Rock and Soil Anchors" to verify their load carrying capabilities.
 2. Ten percent of permanent anchors shall be "performance tested" to at least 1.5 times design working load; and 10 percent of temporary anchors to at least 1.35 times design working load in accordance with referenced PTI standard.
- G. Monitoring:
 1. Contractor shall employ a qualified geotechnical consultant familiar with the soil conditions at the site who shall install 3-dimensional survey monitoring instrumentation as required to observe the movement of the earth retention system and adjacent structures.
 2. The geotechnical consultant shall report the measured movements of the earth retention system and adjacent structures to the Contractor and BNL on a weekly basis until such time that the earth retention system is no longer necessary as deemed acceptable by the Geotech.
 3. If movements are recorded that are larger than anticipated or projected, provide necessary support as to reduce the movements to the acceptable level .
- H. Inspection:
 1. Structural Engineer responsible for design shall observe work in progress to see that design is being followed and design criteria are being met.
 2. After construction of earth retention system is complete Structural Engineer responsible shall verify correctness of installation and inform Architect.

1.3 SUBMITTALS

- A. Project information:
 1. Earth retention system design, indicating approval of Office of State Architect. Allow 4 to 6 weeks for State Review. Architect review.
 2. Include following:
 - a. Description of system proposed including plans and details for stage of construction.
 - b. Anchor (tiebacks):
 - 1) Type.
 - 2) Corrosion protection.
 - 3) Stressing procedure.
 - 4) Grout and grouting method.
 - c. Crack survey of existing structures protected by earth retention system.
 - d. Tie-back proof test results.
 - e. Design calculations signed by a Structural or Civil Engineer licensed in State of New York.

1.4 JOB CONDITIONS

- A. Carefully maintain bench marks, monuments, and other reference points.
- B. Replace if disturbed or destroyed.
- C. Protect active utilities from damage.
- D. Provide protective barriers around excavation as required by governing agencies.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Anchor materials:
 - 1. Either single or multiple elements of wires conforming to ASTM-A421; or strands conforming to ASTM-A416; or steel bars conforming to ASTM-A722.
 - 2. Minimum protective coating (except over bond length): Double corrosion protection system consisting of a plastic sheathing and grease over tendon in addition to grouting.
 - 3. Take extra care to ensure complete and uninterrupted continuity of protective coating.
- B. Structural steel:
 - 1. New rolled shapes or plates of structural grade steel conforming to ASTM-A36 or ASTM-A992, Grade-50.
 - 2. Deformations, imperfections, camber and sweep of piles not more than allowed by ASTM-A6.
 - 3. Pile lengths necessary to reach required depths shall be determined by Contractor.
 - 4. Soldier pile: Coated with coal tar epoxy, with predrilled holes to prevent damage to corrosion protection system.
- C. Protective coatings:
 - 1. Corrosion protection material which is not detrimental to prestressing steel, with following properties:
 - a. Free from cracks and not brittle or fluid over entire anticipated range of temperatures.
 - b. Chemically stable for life of tendon.
 - c. Nonreactive with surrounding materials such as concrete, tendons or sheathing.
 - d. Corrosion inhibiting.
 - e. Impervious to moisture.
 - 2. Coal tar epoxy: Tnemec Tnemec-Tar 46-413, minimum 8 mils.
 - 3. Grease: Specially compounded for post tensioning.
- D. Timber lagging: Of sufficient size and strength to support loads imposed on it; pressure treated in accordance with AWWA standards to preserve capacity of element for service life of structure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Do not start work nor purchase materials required until description and calculations for proposed earth retention system and details have been examined for compliance with the specifications.

3.2 EXCAVATION

- A. Install earth retention system to dimensions and elevations indicated, allowing additional space as required for construction operations and inspection of foundations.
- B. Excavate and remove existing concrete encountered.
- C. Do not perform blasting.
- D. Remove old foundations, building construction, and other materials concealed beneath present grade, as required to execute work, and as indicated.
- E. Properly level off bottoms of excavations.
- F. Control grading around building.
- G. Pitch earth to prevent water from running into excavated areas or damaging structure.
- H. Provide pumping required to keep excavated spaces clear of water.

- I. When springs or running water are encountered, notify Architect and Engineer, provide free discharge of water by trenches or pumps, and drain to appropriate point of disposal as directed.
- J. Maintain earth retention system from time of installation until completion of backfilling around building.

END OF SECTION