ITEM 17203.1750nn M - TEMPORARY ANCHOR TIEBACK SYSTEM

DESCRIPTION

A. General

Design, furnish, install and test a temporary, prestressed cement-grouted anchor tieback system at the locations indicated on the plans, or where ordered by the Engineer, including de-stressing and releasing the tiebacks.

Submit the design and methods of construction, prepared and stamped by a Professional Engineer licensed to practice in New York State, to the Deputy Chief Engineer Technical Services (DCETS) for approval. The DCETS review will be based upon the most current version of the publication titled: Recommendations for Prestressed Rock and Soil Anchors, published by the Post Tensioning Institute, except as modified in this specification. Take this into account when preparing the submission. If methods differ from those described in this specification, document the effectiveness of the methods in the submittal. The DCETS will require 20 working days to review the submission after receipt of all pertinent information. Perform no further work prior to the DCETS's approval.

Submit proof: 1) of two projects on which the Contractor or subcontractor performing the work has installed anchor tiebacks in the past two years and 2) that the foreman for this work has at least one year of experience in the installation of anchor tiebacks.

B. Definitions

The following definitions apply:

Contractor - The contractor or subcontractor performing the work described in this specification.

Bond Length (Fixed Length). That portion of the prestressing tendon which is bonded to grout.

Stressing Length (Free Length). That portion of the prestressing tendon which is not bonded to grout. The stressing length is both greased and encased in a plastic sheathing tube.

Alignment Load. That load necessary to maintain position of the stressing and testing equipment. Do not allow the alignment load to exceed 0.05 P.

MATERIALS

Provide tension members consisting of clean, straight, rust-free:

04/16/85
Revised M 10/23/96
10/22/98
Revised 11/04/98
Revised 11/22/00
Revised 12/30/04

1. "Uncoated Seven-Wire Stress Relieved Strand for Prestressed Concrete" - ASTM Designation A416, or

2. Continuously threaded "Uncoated, High-Strength Steel Bar for Prestressing Concrete" - ASTM Designation A722, or

3. "Steel Strand, Seven-Wire, Uncoated, Compacted, Stress-Relieved for Prestressed Concrete" - ASTM Designation A779.

Provide tension members of such size that the design load does not exceed 60 percent of the guaranteed ultimate tensile strength of the tension member.

Provide couplers for tension members capable of developing 100 percent of the guaranteed ultimate tensile strength of the tension member.

Provide stressing anchorage capable of developing 95 percent of the guaranteed ultimate tensile strength of the anchor material when tested in an unbonded state. Provide bar tiebacks with spherical washers and spherical nuts at the anchorage.

Encase the entire free length of the tendon with a smooth plastic sheath having a minimum thickness of 0.5 mm. Completely cover the prestressing steel in the free length, with a corrosion inhibiting and lubricating grease compound that conforms to the following requirements:

SUBSTANCE	MAXIMUM ALLOWABLE QUANTITY - PPM	TEST METHOD
Chlorides	10	ASTM D512
Nitrates	10	ASTM D992
Sulfides	10	APHA - "Test Methods: Sulfides in Water"

Provide centralizers and spacers consisting of plastic, steel or any material not detrimental to the tendon, except wood.

Provide grout consisting of materials meeting the requirements of the following:

MATERIAL	SUBSECTION
Portland Cement, Type 1, 2 or 3	701-01
Grout Sand	703-04
Water	712-01

04/16/85
Revised M 10/23/96
10/22/98
Revised 11/04/98
Revised 11/22/00
Revised 12/30/04

Chemical additives to control bleeding or retard set, approved by the Engineer, may be used with the anchor grout. Do not use expansive additives. Mix additives, if used, in accordance with the manufacturer's recommendations. Do not use epoxy resin as a substitute for cement grout.

CONSTRUCTION DETAILS

Submit shop drawings conforming to the size and type requirements of Subparagraph 2A - Working Drawings, Size and Type as given in Subsection 718-01, Prestressed Concrete Units (Structural), under Drawings to the DCETS for written approval. Do not begin work prior to the receipt of the Engineer's approval.

Determine the anchor bond length necessary to develop adequate load capacity to satisfy anchor testing acceptance criteria for the design load shown on the plans. However, do not provide a bond length shorter than the minimum bond length, if such is shown on the plans. Do not extend the drilled anchor hole outside the right-of-way or easement limits shown on the plans. Determine tendon type, drilling method, grouting pressures, multiple grouting techniques, and bond length variations such as underreaming or belling. Cease operations if subsidence or physical damage to existing site conditions caused by such operations occurs and then repair to the satisfaction of the State or adjacent owners directly impacted. Immediately revise operations to prevent recurrence of such damage.

Drive or drill the holes for the anchors. Use core drilling, rotary drilling, auger drilling or percussion drilling. If the hole will not stand open, install casing as required to maintain a clean and open hole. Provide a hole diameter no less than 75 mm if using pressure grouting in the bond length and 100 mm if not using pressure grouting. (Pressure grouting is defined as grouting with a pressure greater than 415 kPa). Provide a drill bit with a diameter no less than the specified hole diameter minus 3 mm. Extend the hole a minimum of 0.6 m beyond the tendon length. Drill the holes to the inclination specified on the plans within a three degree tolerance. Prior to inserting the tendon, thoroughly clean holes in rock of all dust, rock chips, grease or other material which may affect bond.

Perform a water tightness test on all anchors bonded in rock if grout is injected at a pressure of 415 kPa or less.

Perform the water tightness test by filling the entire hole in the rock with water and subjecting it to a pressure of 35 kPa as measured at the top of the hole. If the stressing length portion of the hole is in soil or fractured rock, use a packer or casing to allow the bond length to be pressure-tested. If the leakage rate from the hole, over a ten minute period, exceeds 0.5 ml of water per millimeter of diameter per meter of length per minute, grout, redrill and retest the hole. Should the subsequent water tightness test fail, repeat the entire process until results are attained which are within leakage allowances. If artesian or flowing water is encountered in the drilled hole, maintain pressure on the grout until the grout has initially set.

04/16/85
Revised M 10/23/96
10/22/98
Revised 11/04/98
Revised 11/22/00
Revised 12/30/04

Provide centralizers at a maximum of 3 m center to center spacing throughout the bond length so as to provide that not less than 13 mm of grout cover along the bond length. Provide a centralizer at the bottom end of the tendon. Take into account sag of the tendon when selecting centralizer diameter and spacing.

Employ multi-element tendon spacers at 3 m intervals throughout the bond length to ensure grout cover on all elements. Combination centralizers and spacers will be permitted.

Degrease the bond length of the tendon prior to installation. Leave no residue on the tendon.

After a hole is drilled to the final depth and water tightness, if required, is attained, insert the tendon in the casing or hole. Do not subject anchor tendons to sharp bends. Do not damage the tendon's corrosion protection during handling or installation.

Provide grouting equipment capable of continuous mixing and producing grout free of lumps. Provide a grout pump equipped with a grout pressure gage capable of measuring 1050 kPa, or the highest working pressures attained, whichever is higher.

Perform the grouting operation after the tendon is inserted. In order to prevent air voids, fill the hole with grout progressively from bottom to top.

Fill the annular space between the anchor and the drilled hole with grout for its entire length. Grout the free length at low pressure. Leave sufficient clearance between the top of the free length grout column and the anchorage to ensure that load applied to the anchor during testing is not transferred to the anchorage via the grout column.

Extend a pipe or trumpet integral with the bearing plate from the anchor plate a sufficient distance to encapsulate the front portion of the sheath. Center the tieback in the trumpet so that there is no contact between the two. After installation and testing of each anchor, fill the trumpet with grout or grease and install the corrosion protection of the anchorage.

After the Engineer determines that the temporary tieback is no longer needed, de-stress and release the tieback. Leave the tendons and anchors in place, except that they may be cut to permit removal of sheeting or soldier beams.

TESTING

Incrementally load test each anchor. Performance test the first two anchors installed at each specified design load capacity and 5 percent of the remaining anchors (locations to be chosen by the Engineer). Proof test all anchors not performance tested.

Do not permit the maximum test load to exceed 80 percent of the guaranteed ultimate tensile strength of the tendon. Monitor the jack load with a load cell which has been calibrated by an

independent testing laboratory within 14 days prior to the start of testing. Provide the Engineer with the calibration curve before start of testing.

Hold each load increment, except the 1.33 P load, until the deflection stabilizes, but for a minimum of one minute. At each load increment, record the movement of the tendon to the nearest 0.025 mm with respect to an independent fixed reference point.

At the completion of the test, reduce the anchor load to 0.80 P and transfer the load to the permanent stressing anchorage.

A. Performance Tests

Conduct performance tests by incrementally loading and unloading the anchor in accordance with the following schedule:

Cycle	Load
1	AL 0.25 P
2	AL 0.25 P 0.50 P 0.25 P
3	AL 0.25 P 0.50 P 0.75 P 0.50 P 0.25 P
4	AL 0.25 P 0.50 P 0.75 P 1.00 P 0.75 P 0.50 P 0.25 P
5	AL 0.25 P

04/16/85
Revised M 10/23/96
10/22/98
Revised 11/04/98
Revised 11/22/00
Revised 12/30/04

0.50 P
0.75 P
1.00 P
1.25 P
1.33 P (creep test)
0.80 P (transfer load)

P = Design Load for the Anchor
AL = Alignment Load

The creep test consists of holding the 1.33 P load for 50 minutes. While the load is maintained constant, record anchor movement (total movement) referenced to an independent fixed reference point at 0, ½, 1, 2, 5, 10, 30 and 50 minutes.

The Engineer will review all performance tests to determine if the anchor is acceptable. An anchor will be accepted if the following three criteria are met:

1. The total elastic movement obtained at the design load exceeds 80 percent of the theoretical elastic elongation of the stressing length.

2. The creep movement does not exceed 2 mm during the time increment between 5 and 50 minutes regardless of tendon length and load. However, if the creep movement of a rock anchor is found to be 1 mm or less during the time increment between 1 and 10 minutes, the anchor will be accepted and the test may be terminated without taking the 30 and 50 minute readings.

B. Proof Tests

Perform the proof tests by incrementally loading and unloading the anchor in accordance with the following schedule:

Load
AL
0.25 P
0.50 P
0.75 P
1.00 P
1.25 P
1.33 P (creep test)
0.80 P (transfer load)

The creep test consists of holding the 1.33 P load for 5 minutes. With the load held constant, record anchor movement (total movement) at 0, ½, 2 and 5 minutes. If the

04/16/85
Revised M 10/23/96
10/22/98
Revised 11/04/98
Revised 11/22/00
Revised 12/30/04

movement between the ½ and the 5 minute readings is 2 mm or more, maintain the load for an additional 45 minutes and the movement measured. If the additional movement exceeds 2 mm, reject the anchor. Measure all movements in relation to an independent fixed reference point.

The Engineer will review all proof tests to determine if the anchor is acceptable. Acceptance criteria for an anchor which has been proof tested is the same as in the performance test except that the creep acceptable criterion is as given above.

Submit two copies of all test data to the Engineer.

For anchors that the Engineer finds unacceptable, submit a written proposal containing a suggested course of action. The action to be taken will be subject to written approval by the Engineer. If the total elastic movement is less than 80 percent of the theoretical elastic elongation of the stressing length, do not permit the anchor to carry any load. Anchors that meet criterion "1", but do not meet criteria "2", may be accepted by the Engineer for a reduced capacity, if the anchor is retested to determine the actual capacity which will meet the acceptance criteria, and a supplemental anchor is installed and tested in accordance with this specification at a location approved by the Engineer. Test any supplemental anchor to verify that the combined capacity of itself and the anchor it is supplementing equals or exceeds 1.33 times the original design load.

METHOD OF MEASUREMENT

The number of temporary anchor tieback system installed, successfully tested and accepted.

No payment will be made for anchors that do not meet the acceptance criteria but are accepted for a reduced capacity. Pay the bid price for each anchor tieback system upon installation and acceptance of the replacement or supplemental anchor necessitated by an anchor not being accepted for its design capacity. No payment will be made for any additional wall connections required for such replacement or supplemental anchors.

BASIS OF PAYMENT

Include in the unit price bid the cost of furnishing all labor, equipment, and material required to satisfactorily complete the work.

NOTE: nn denotes serialized pay item, see section 101-02 of Standard Specifications.
Serialized number identifies temporary anchor tieback system detailed on plans.

04/16/85
Revised M 10/23/96
10/22/98
Revised 11/04/98
Revised 11/22/00
Revised 12/30/04