

**ITEM 16586.20XXYY M - DRILLING AND GROUTING ANCHOR BOLTS AND REBARS IN CONCRETE**

**DESCRIPTION**

The work shall consist of drilling holes into existing concrete, at locations and depths shown on the plans, and grouting anchor bolts or rebars into them. Henceforth in this specification the term "anchor" shall mean either anchor bolt, or reinforcing bar. Drilling shall be done using a rotary-impact drill. If reinforcing steel is encountered it shall be cut with a core drill. The work shall also include providing load test equipment and load testing of anchors designated by the Engineer. The anchors will be paid for under another item.

**MATERIALS**

The Contractor shall use a grout which meets NYS Standard Specifications, Section 701-07 ANCHORING MATERIALS - CHEMICALLY CURING.

The Contractor is hereby notified that not all approved grouts have the same bond strength nor are they compatible with all concretes. Therefore, it is the Contractor's responsibility to assure the concrete-grout compatibility by pretesting a number of anchors to their test load before starting production grouting. The Contractor shall choose the number of anchors to be pretested to assure concrete-grout compatibility.

**CONSTRUCTION DETAILS**

Only a rotary impact drill is to be used to drill holes in concrete. If a rebar is encountered, it shall be cut with a core drill. After the rebar is cut, the remainder of the hole shall be drilled with a rotary impact drill.

Drilling shall not cause spalling, cracking or other damage to the concrete. Concrete spalled or otherwise damaged by the Contractor's operations shall be repaired in a manner satisfactory to the Engineer. Such repair shall be done at no additional cost to the State.

Drilling with a lubricant, including detergents, other than water shall not be permitted.

If approved by the Engineer, hole locations may be moved to avoid encountering reinforcing steel.

The Contractor may increase the embedment length beyond that required by the Contract Documents if approved by the Engineer. The increase shall be done at no additional cost to the State. The bottom of the hole shall be at least 40 mm from the nearest free surface of a structural element, unless otherwise shown in the contract documents.

Grout storage and handling, hole diameter, cleaning of the hole, and installation shall be in accordance with the grout manufacturer's instructions.

The anchor shall be inserted in the hole, at least, to the depth shown on the plans. After insertion of the anchor, all excess grout shall be struck-off flush with the concrete surface.

**Acceptance of Anchor Installations**

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A number of anchors in each lot shall be randomly chosen by the Engineer for load testing. The number to be load tested in each lot shall be in accordance with Table 1. A lot size is determined by the Contractor, but must meet the following criteria:

1. A lot size shall not exceed 600 anchors.
2. All anchors in a lot must be installed within a two-month period.
3. Any anchors installed beyond the two-month period set forth in 2. above shall be part of another lot.
4. A lot shall only include anchors grouted with a single product.
5. A lot shall only include anchors of the same type, diameter and embedment depth.

Testing of anchors in a lot shall not begin until all the anchors in the lot are installed.

Table 1 indicates for each lot size, the initial number of anchors required for testing (N1) and the number of anchors required for additional testing (N2).

Table 1

<u>LOT SIZE</u>	<u>N1</u>	<u>N2</u>
1-30	All the anchors in the lot	--
31-50	30	--
51-75	38	--
76-100	44	21
101-200	49	26
201-300	50	30
301-600	55	30

If all of the N1 anchors selected for testing pass the load test, the lot shall be accepted.

If the lot size is 75 or less and one of the N1 anchors fail the load test, all the remaining anchors in the lot shall be tested.

If the lot size is 76 or greater and an N1 anchor fails the load test, the Engineer shall immediately add the appropriate N2 number of anchors to the N1 anchors being tested. If no additional N1 and none of the N2 anchors fail the load test, the lot shall be accepted.

If any additional N1 or any of the N2 anchors fails a load test, all of the remaining anchors in the lot shall be tested.

Testing Equipment

The equipment shall consist of a load cell, jacking system, a frame to distribute the jack load, couplers to connect the jack to the anchors, and appropriate safety devices. Prior to starting the testing, the Contractor shall supply the Engineer with a certificate of calibration for the load cell performed within the previous six months by an independent testing agency.

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Supports for the frame used to distribute the jack load shall be located outside a circle centered at the anchor. The circle shall have a diameter equal to 50 millimeters plus twice the anchor embedment length, but need not exceed 600 millimeters. The frame and jack shall be positioned so that the load is applied along the axis of the anchor. Chains or cables shall be used to connect the various pieces of the tensioning system so that free flying projectiles will not be created by the failure of an anchor coupling or other portion of the testing system.

The test load for anchor bolts shall be 90% of the ASTM proof load, unless otherwise specified in the contract documents. When no proof load is given in the ASTM specifications for an anchor bolt steel, use the yield strength. The test load for rebars shall be 90% of the yield strength unless otherwise specified in the contract documents. Listed below are the test loads for the most commonly used anchor bolts and rebar steels, and anchor types.

**TEST LOADS**

ASTM A568M Property Class 8.8 ANCHOR BOLTS  
(Coarse-Threaded Full Length)

ASTM A616M (or A615M) GR420 REBARS

<u>Diameter</u> (mm)	<u>Test Load</u> (kN)	<u>Size</u>	<u>Test Load</u> (kN)
13	48.49	#4	48.04
16	76.95	#5	74.29
19	113.87	#6	105.87
22	157.02	#7	144.12
25	206.4	#8	189.94
29	225.97	#9	240.20
32	286.91	#10	305.15
		#11	374.54
		#14	540.46

Anchors shall be deemed to pass if the specified test load is attained without permanently displacing the anchors. NOTE: THIS LOAD TESTING IS DESIGNED TO BE NON-DESTRUCTIVE. LOADING SHALL BE STOPPED AS SOON AS THE TEST LOAD IS REACHED.

**Repairs**

Concrete spalled or otherwise damaged by the load testing shall be repaired in a manner satisfactory to the Engineer. Such repair shall be done at the Contractor's expense. All anchors which fail a load test, or are otherwise damaged, shall be replaced at the Contractor's expense. All such replaced anchors shall be load tested.

**METHOD OF MEASUREMENT**

Measurement will be taken as the number of anchors installed as indicated in the contract documents. No

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payment will be made for anchors which fail load tests.

**BASIS OF PAYMENT**

The price bid per each installed anchor shall include the cost of all labor, materials and equipment necessary to complete the work. The cost of the anchors will be paid for under a separate item.

**Note:** The manner in which the serialized portion of this specification is input as follows:

Third and Fourth digits to the right of the decimal place insert: "01" For anchor bolts  
"02" For rebars

Fifth and Sixth digits to the right of the decimal place insert:

Anchor Bolts: The diameter of the bolt to the nearest millimeter.  
Rebars: Insert the metric bar size for the rebar.