SCOPe:
This method covers the procedures that shall be used when testing materials for conformance with Specification 701-07, Anchoring Materials - Chemically Curing.

APPARATUS:

A compression machine meeting the requirements of ASTM C39

2. Rotary impact drill

3. Equipment for conducting pullout tests meeting the requirements of ASTM E488 for tensile testing except no displacement sensor is required

PART A PROCEDURE:

The Part A procedure must be performed by an independent lab hired by the manufacturer

Pullout Test Specimens: Each pullout test specimen shall be an unreinforced concrete cylinder with a diameter of 760 mm by 375 mm high as a minimum. A ring of number 10 (9.5 mm) rebar may be placed within 200 mm of the outside of the test specimen to hold the specimen together during testing.

An unreinforced concrete slab a minimum of 375 mm thick may also be used as a pullout test specimen

Concrete Strength: A concrete compressive strength greater than 28 MPa is recommended. At least three compressive test cylinders, 150 mm in diameter by 300 mm high, from each batch of concrete will be required to determine actual concrete strength. All compression tests shall be performed in accordance with ASTM C39. All compressive test cylinders shall be stored and cured under the same conditions as the pullout test specimens. The compressive test cylinders shall be broken at the time of the pullout tests. Cores, 100 mm diameter and 200 mm high, may be used as substitutes for the compressive test cylinders when a concrete slab is used.

Installation Requirements: A minimum of three anchors shall be installed in holes drilled using a rotary impact drill. The anchors shall be 24 mm diameter fully threaded steel rod having a minimum tensile strength of 825 MPa. The hole diameter and cleaning shall be as recommended by the manufacturer.
The holes shall be surface dry prior to installing the anchoring materials. The embedment depth shall be 250 mm.

**Cure:** Prior to pullout testing, the anchoring material shall be allowed to cure in the laboratory @ 23 ± 2°C for as long as recommended by the manufacturer or 24 hours, whichever time is less. For each test, record this time as the cure time of the anchoring materials. Care shall be taken to avoid disturbing the anchor bolt during this time.

Pullout Testing: Pullout tests shall be performed using a continuous rate of loading until failure in conformance with the tensile test requirements of ASTM E488. Supports for the pullout testing equipment must be outside the theoretical cone of failure. For a 250 mm embedment, this would require the supports be placed outside the circular region, 400 mm in diameter, centered around the anchor steel at the surface.

**PART A REPORT:**

Information submitted with the report to the Materials Bureau for review and acceptance shall contain the following:

1. Drilled hole diameters and hole depth.
2. Grade, diameter and thread size of steel anchors.
3. Anchoring material used and instructions on its mixing and application.
4. Anchoring material cure time prior to pullout testing.
5. All equipment and methods used to drill, clean and prepare the holes.
6. Compressive test cylinder or core compressive test strengths.
7. The pullout test loads at initial slip and at ultimate load.
8. Type of failure (cone, partial cone, anchor failure, debonding, etc.). Describe the extent of failure with actual measurements including cone base diameter and depth.

**PART B PROCEDURE:**

Part B procedure to be performed by the Materials Bureau.

Pullout Test Specimens: Each pullout test specimen shall be an unreinforced concrete cylinder with a diameter of 305 mm by 190 mm high as a minimum. The top of the cylinder shall have a raised concrete ring approximately 13 mm high and 35 mm wide around the circumference to act as a bearing surface during pullout testing.

Concrete Strength: A concrete compressive strength greater than 28 MPa is recommended. At least three compressive test cylinders, 150 mm in diameter by 300 mm high, from each batch of concrete will be required to determine actual concrete strength. All compression tests shall be performed in

Test results with embedment depths less than 250 mm will be acceptable provided they meet the minimum specified pullout strength requirements for a 250 mm embedment.
accompanying with ASTM C39. All compressive test cylinders shall be stored and cured under the same conditions as the pullout test specimens. One compressive test cylinder will be tested after seven days of cure. If the compressive strength of this cylinder does not exceed 21 MPa, then a second compressive test cylinder shall be tested after 14 days of cure and a determination of the continuation of testing shall be made. If either the 7 or the 14 day cure test exceeds 21 MPa, then a final compressive test cylinder shall be tested at the time of the pullout tests.

Installation Requirements: A manufacturer's representative shall be present to witness installation. Two test conditions are required and described below. Information on the hole diameters, material cure time and instructions for mixing and placing shall be supplied by the manufacturer or supplier when the material is submitted for testing. Anchor steel shall be 16 mm diameter fully threaded steel rod having a minimum tensile strength of 825 MPa.

1. Three “dry” installations in 100 mm deep holes drilled using a rotary impact drill are required. The hole diameter and cleaning shall be as recommended by the manufacturer. The holes shall be dry prior to installing the anchoring material.

2. Three “wet” installations in 100 mm deep holes drilled using a rotary impact drill are required. The hole diameter and cleaning shall be as recommended by the manufacturer. The holes shall have a wet surface prior to installing the anchors. To obtain the wet surface, fill the hole with water and let stand for four minutes. Turn the cylinder over for approximately two minutes to allow the excess water to drain from the hole. Turn all cylinders over to the upright position and immediately set the anchors.

Cure: Prior to pullout testing, the anchoring material shall be allowed to cure in the laboratory @ 23 ± 2°C for as long as recommended by the manufacturer or 24 hours, whichever time is less. For each test, record this time as the cure time of the anchoring materials. Care shall be taken to avoid disturbing the anchor bolt during this time.

Pullout Testing: Pullout tests shall be performed using a continuous rate of loading until failure in conformance with the tensile test requirements of ASTM E488.

PART B REPORT:

1. Drilled hole diameters and hole depth.
2. Grade, diameter and thread size of steel anchors.
3. Anchoring material used and instructions on its mixing and application.
4. Anchoring material cure time prior to pullout testing.
5. All equipment and methods used to drill, clean and prepare the holes.
7. The pullout test loads at initial slip and at ultimate load.
8. Type of failure (cone, partial cone, anchor failure, debonding, etc.). Describe the extent of failure with actual measurements including cone base diameter and depth.