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## Test Procedure for

# MAKING, CURING, AND TESTING COMPRESSION TEST SPECIMENS FOR PRECAST CONCRETE



## TxDOT Designation: Tex-704-I

**Effective Date: March 2008**

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### 1. SCOPE

- 1.1 This method outlines the procedure for making, curing, and testing concrete cylinders at plants that fabricate precast prestressed and nonstressed concrete products by the wet-cast method. Make, cure, and test concrete cylinders for the dry-cast method in accordance with the pertinent specification.
  - 1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
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### 2. DEFINITIONS

- 2.1 *Prestressed Concrete*—precast concrete subject to pretensioning, post-tensioning, or a combination of both.
  - 2.2 *Nonstressed Concrete*—precast concrete not subjected to prestressing.
  - 2.3 *Release of Tension Strength Cylinders*—cylinders used to determine when the concrete strength is adequate to apply the pretensioning force.
  - 2.4 *Partial Tensioning Strength Cylinders*—cylinders used to determine when the concrete strength is adequate to apply partial tensioning force, by either pretensioning or post-tensioning method, to remove the member from the casting bed.
  - 2.5 *Tensioning Strength Cylinders*—cylinders used to determine when the concrete strength is adequate to apply the final prestressing force by post-tensioning.
  - 2.6 *Design Strength Cylinders*—cylinders used to determine if design strength requirements have been achieved.
  - 2.7 *Curing Cylinders Identical to the Members*—curing cylinders within the curing enclosure of the members they represent without any additional covering, heat, or moisture not subjected to the members.
  - 2.8 *Curing Cylinders along with the Members* – placing cylinders cast within 4 hours of the members they represent directly above and in contact with those members or forms.
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### 3. APPARATUS

- 3.1 The following Test Methods list the apparatus required for making, curing, and testing concrete test cylinders:
- Tex-418-A
  - Tex-447-A
  - Tex-450-A.

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### 4. PROCEDURES

#### 4.1 *Cylinder Making:*

- 4.1.1 Sample the concrete in accordance with Tex-407-A; however, a composite sample is not required. Sample the concrete for design and release cylinders from separate loads in the first and last quarter of the casting. When necessary, take samples from other portions of the casting to test questionable concrete.
- 4.1.2 Mold the test cylinders in accordance with Tex-447-A. After molding, inscribe the cylinder identification into the top of the cylinders with minimal disturbance to the surface finish, or tag each cylinder using an approved tagging system. Cover the molds to prevent moisture loss in accordance with Tex-447-A.
- 4.1.2.1 *Prestressed Concrete*—Release of Tension Cylinders, Partial Tensioning Cylinders, Tensioning Cylinders, and Design Strength Cylinders:
- 4.1.2.1.1 Make a minimum of 6 companion cylinders for each strength test for each continuous concrete casting, separate casting line, concrete mix design, and curing condition. The cylinders may represent more than one casting line on the same date if the total volume of concrete does not exceed 100 yd.<sup>3</sup> (76 m<sup>3</sup>).
- 4.1.2.2 *Nonstressed Concrete*—Design Strength Cylinders:
- 4.1.2.2.1 Make 6 companion cylinders for each 100-yd.<sup>3</sup> (76-m<sup>3</sup>) production lot (or fraction thereof), concrete mix design, and curing condition for each casting day.

#### 4.2 *Cylinder Curing:*

##### 4.2.1 *Prestressed Concrete:*

- 4.2.1.1 Cure Release of Tension Cylinders, Partial Tensioning Cylinders, and Tensioning Cylinders in a manner identical to, and along with, (unless otherwise approved by the Engineer), the members they represent until the cylinders achieve the required strength.
- 4.2.1.2 As an option, cure Release of Tension Cylinders in accordance with Tex-715-I.
- 4.2.1.3 If post-tensioned members are partially tensioned and removed from the casting bed to a curing area, move the Tensioning Cylinders to that area and cure them in the same

manner. If all curing requirements of the members are met before final tensioning, stop curing Tensioning Cylinders at this point.

- 4.2.1.4 Cure Design Strength Cylinders in a manner identical to, and along with, (unless otherwise approved by the Engineer), the members they represent until release of tension or partial tensioning strength is achieved. At this time, visually inspect the cylinders for damage or molding imperfections. Place the acceptable cylinders in a curing tank and cure in accordance with Tex-447-A until the designated testing time.
- 4.2.2 *Nonstressed Concrete:*
  - 4.2.2.1 Cure Design Strength Cylinders in a manner identical to, and along with, (unless otherwise approved by the Engineer), the members they represent for approximately 24 hours, or until just before testing, if sooner than 24 hours. At this time, visually inspect the cylinders for damage or molding imperfections. Test, or place acceptable cylinders in a curing tank and cure in accordance with Tex-447-A until the designated testing time.
- 4.3 *Cylinder Testing:*
  - 4.3.1 Notify the Engineer before testing. Test all cylinders in accordance with Tex-418-A.
  - 4.3.2 *Prestressed Concrete:*
    - 4.3.2.1 Test Release of Tension Cylinders, Partial Tensioning Cylinders, and Tensioning Cylinders on the field laboratory's compression-testing machine in the presence of the Inspector. Each test consists of a set of 2 cylinders tested consecutively. Report the average strength of the set of 2 consecutively tested cylinders to the nearest 10 pounds as the official concrete strength. A test passes when the official concrete strength meets or exceeds the minimum required strength.
    - 4.3.2.2 Test Design Strength Cylinders on the field laboratory's compression-testing machine in the presence of the Inspector. If the anticipated strength exceeds the capacity of the field laboratory compression-testing machine, test the cylinders at an approved commercial laboratory. Each test consists of a set of 2 cylinders tested consecutively. Report the average strength of the set of 2 consecutively tested cylinders to the nearest 10 pounds as the official concrete strength. A test passes when the official concrete strength meets or exceeds design strength requirements.
      - 4.3.2.2.1 For prestressed concrete bridge deck panels, piling, and wall panels, test the first set at any age after achieving release of tension strength. For prestressed concrete bridge beams, test the first set at any age equal to or greater than 7 days.
      - 4.3.2.2.2 If the first set of cylinders fails to meet design strength requirements, test the second set at any age less than 28 days. If the second set of cylinders fails to meet design strength requirements, test the last set on the field laboratory's compression-testing machine or by an approved commercial lab at the age of 28 days.
      - 4.3.2.2.3 For high-strength concrete, if the first set of cylinders fails to meet design strength requirements, test the intermediate sets of cylinders at any age less than 56 days. If none of the intermediate sets meets design strength requirements, test the last set using the

field laboratory's compression-testing machine or by an approved commercial lab at the age of 56 days.

4.3.3 *Nonstressed Concrete:*

4.3.3.1 Test Design Strength Cylinders at any age on the field laboratory's compression-testing machine in the presence of the Inspector. An approved commercial laboratory may also test the cylinders.

4.3.3.2 Each test consists of a set of 2 cylinders tested consecutively. Report the average strength of the set of 2 consecutively tested cylinders to the nearest 10 pounds as the official concrete strength. A test passes when the official concrete strength meets or exceeds the minimum design strength requirements.

4.3.3.2.1 If cylinders fail to meet design strength requirements with the first two tests, test the last two cylinders on the field laboratory's compression-testing machine or by an approved commercial laboratory at the age of 28 days.

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**5. ARCHIVED VERSIONS**

5.1 Archived versions are available.