

State of Nevada  
Department of Transportation  
Materials Division

STANDARD METHOD OF TEST FOR MAKING AND CURING  
CONCRETE COMPRESSION TEST SPECIMENS  
IN THE FIELD

**Scope**

This method covers the procedures for making and curing concrete compression test cylinders in the field and is a modification of ASTM Designation C31.

**A. APPARATUS**

1. **Molds.** The molds shall be cylindrical, have nonabsorbent surfaces and be substantial enough to hold their shape during the molding of test specimens. The approved Standard is the 4" x 8" (100mm x 200mm) except when the nominal maximum size of the coarse aggregate exceeds 1 in. (25mm.) (note 1) then the 6" x 12" (150mm x 300mm) will be used.
2. **Tamping rods.** A round straight steel rod with the dimension conforming to those in Table 1, having the tamping end or both ends rounded to a hemispherical tip of the same diameter as the rod.
3. **Internal vibrators.** Internal vibrators may have rigid or flexible shafts preferable powered by electric motors. The vibrator frequency shall be at least 7000 vibrations per minute (150 Hz) while the vibrator is operating in the concrete. The diameter of the vibrator shall be no more than one-third the diameter of the cylinder mold and the combined length of the vibrator shaft and vibrating element shall exceed the depth of the section begin vibrated by at least 3 in. (75mm).
4. **Mallet.** A mallet with a rubber or rawhide head weighing  $1.25 \pm 0.50$ lb. ( $0.60 \pm 0.02$  kg.).
5. **Small Tools.** Tools and items such as shovels, pails, trowels, and scoops, shall be available for use.
6. **Sampling and mixing receptacle.** A suitable pan, wheelbarrow, or flat, clean nonabsorbent mixing board of sufficient capacity to allow easy mixing by shovel or trowel of the entire sample shall be provided.

**TABLE 1 Tamping Rod Requirements**

Dia. of cylinder in. (mm)	Rod Dimensions <sup>A</sup>	
	Dia. in. (mm)	Length of Rod in. (mm)
4 (100)	3/8 (10)	12 (300)
6 (150)	5/8 (16)	20 (500)

<sup>A</sup> Rod tolerances length  $\pm$  4 in. (100 mm) and diameter  $\pm$  1/16 in. (2mm)

Note 1: The nominal maximum size is the smallest sieve opening through which the entire amount of aggregate is permitted to pass.

**B. SAMPLING CONCRETE**

Samples of concrete for test specimens shall be taken in accordance with Nevada Test Method T425. The place of depositing the batch of concrete that was sampled shall be noted in the job records and the Transmittal for Concrete Samples.

**C. PROCEDURE**

- 1. Place of molding.** Specimens shall be molded as near as practicable to the place where they are to be stored during the first 24 hours. If it is not practicable to mold the specimens where they will be stored, they may be moved to the place of storage immediately after being struck off. (Note: All jarring, striking, tilting, or scarring of the surface, of the completed specimens, shall be avoided when moving them to the storage area.)
- 2. Placing the concrete.** The concrete shall be placed in the molds, using a scoop, in three layers of approximately equal volume. In placing each portion of concrete, the scoop or trowel shall be moved around the top edge of the mold as the concrete slides from it in order to ensure a symmetrical distribution of the concrete and minimize segregation of the coarse aggregate within the mold. the concrete may be further distributed by use of a tamping rod prior to the start of consolidation.
- 3. Consolidation.** Preparation of satisfactory specimens requires different methods of consolidation. The methods of consolidation are rodding and internal vibration. Base the selection of the method of consolidation on the slump, unless the method is stated in the specifications under which the work is being performed. Rod concretes with a slump greater than 3 in. (75mm). Rod or vibrate concretes with slump of 1 to 3 in. (25 to 75mm). Vibrate concretes with a slump of less than 1 in. (25mm).
- 4. Rodding.** Each layer shall be rodded 25 times. The strokes shall be distributed uniformly over the cross section of the mold. In rodding the first layer use sufficient force

to penetrate the entire depth without denting the bottom of the mold<sup>1</sup>. Each successive layer should be rodded enough to penetrate about 1 in. (25mm) into the underlying layer. After each layer is rodded, tap the outside of the mold lightly 10 to 15 times with the mallet, to close any holes left by rodding and to release any large air bubbles that may have been trapped.

- 5. Vibration.** Mold and vibrate in accordance with Table 2. Place all the concrete for each layer in the mold before starting vibration of that layer. Allow the vibrator to penetrate through the layer being vibrated, and into the layer below, approximately 1 in. (25mm). The vibrator shall not be allowed to rest on or touch the bottom or sides of the mold. Carefully withdraw the vibrator in such a manner that no air pockets are left in the specimen. After vibration of each layer tap the sides of the molds to ensure removal of large entrapped air bubbles at the surface of the mold. Avoid overfilling by more the 1/4 in. (6mm) when adding the final layer.

Note: The duration of vibration required will depend upon the work ability of the concrete and the effectiveness of the vibrator. Usually sufficient vibration has been applied as soon as the surface of the concrete has become relatively smooth. Continue vibration only long enough to achieve proper consolidation of the concrete. Over vibration may cause segregation.

**TABLE 2 Molding Requirements by Vibration**

Dia. of Cylinder in. (mm)	No. of Layers	No. of Vibrator Insertions per Layer	Approx. Depth of Layer
4 (100)	2	1	½ depth of specimen
6 (150)	2	2	½ depth of specimen

- 6. Striking off and covering.** After consolidation, the surface of the concrete shall be struck off, without undue manipulation, using the tamping rod where the consistency of the concrete permits, or with a wood float or trowel. All specimens shall be covered immediately with a lid provided with the mold. To prevent loss of moisture, seal the lid with duct tape or masking tape.

1 A Piece of ¾" (19mm) plywood cut to fit the bottom of the mold will help prevent puncturing of bottom of the mold.

D. CURING SPECIMENS

1. **Method 1.** Specimens for determining compliance with ultimate strength specifications. During the first 48 hours after molding, store all test specimens under conditions that maintain the temperature immediately adjacent to the specimens in the range of 60° to 80°F. (16° to 27°C) and prevent loss of moisture from the specimens. Storage temperatures may be regulated by means of ventilation or by evaporation of water from sand or burlap<sup>2</sup>, or by using heating devices such as stoves, electric light bulbs, or thermostatically controlled heating cables. A temperature record of the specimens may be established by means of maximum-minimum thermometers. Store specimens in tightly constructed, insulated, firmly braced wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or use other suitable methods, provided the foregoing requirements limiting specimen temperature and moisture loss are met. Remove specimens from storage and ship directly to the laboratory as soon as possible after field storage of 48 hours.
  
2. **Method 2.** Specimens for determining earliest date a structure may be put into service. After the initial 24-hour storage period, specimens shall be placed in or on the structure as near to the point of sampling as possible, and shall receive, insofar as practicable, the same protection from the elements as is given to the portion(s) of the structure which they represent. In simulating these conditions it should be kept in mind that the test specimens are relatively small and therefore more quickly affected by freezing or drying conditions than the much larger volume of concrete in the structure. The specimens also must be protected from injury while on the worksite. It must be kept in mind that these specimens are presumed to show the compressive strength of the portion(s) of the structure they represent at a given time and under field curing conditions. Therefore, such specimens should be kept in the field as long as possible, preferable right up to a day or two before being tested.

2 The temperature within damp sand and under wet burlap or similar materials will always be lower than the temperature in the surrounding atmosphere if evaporation takes place.