



Designation: D 4580 – 86 (Reapproved 1997)

# Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding<sup>1</sup>

This standard is issued under the fixed designation D 4580; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice covers procedures for surveying concrete bridge decks by sounding to determine delaminations in the concrete. It is not intended that the procedures described herein are to be used on bridge decks that have been overlaid with bituminous mixtures. The procedures may be used on bridge decks that have been overlaid with portland cement concrete mixtures; however, areas indicated to be delaminated may have a lack of bond between the overlay and the underlying bridge deck (Note 1).

NOTE 1—The influence of variable field conditions such as traffic noise, vibration, moisture content of the concrete, and the like, are not completely known and additional investigation may be needed. It is generally agreed that the practice should not be used on frozen concrete.

1.2 The following two procedures are covered in this practice:

1.2.1 *Procedure A, Electro-Mechanical Sounding Device*—This procedure uses an electric powered tapping device, sonic receiver, and recorder mounted on a cart. The cart is pushed across the bridge deck and delaminations are recorded on the recorder.

1.2.2 *Procedure B, Chain Drag*—This procedure consists of dragging a chain over the bridge deck surface. The detection of delaminations is accomplished by the operator noting dull or hollow sounds. Tapping the bridge deck surface with a steel rod or hammer may be substituted for the chain drag.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Significance and Use

2.1 This practice may be used in conjunction with other methods in determining the general condition of concrete bridge decks.

2.2 This practice may be used in determining specific areas of delamination requiring repair.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.32 on Bridges and Structures.

Current edition approved April 25, 1986. Published June 1986.

## PROCEDURE A—ELECTRO-MECHANICAL SOUNDING DEVICE

### 3. Summary of Procedure

3.1 Longitudinal lines at a predetermined spacing are established on the bridge deck.

3.2 After calibration, the sounding device is pushed along the established lines. Electrically powered tapping wheels emit vibrations into the deck that are sensed by sonic receivers. Areas of delamination are indicated by deflections on a strip chart recorder.

3.3 All portions on the strip chart indicating delaminations are plotted on a scaled map of the bridge deck. An outline is made showing the areas of delamination.

### 4. Apparatus

NOTE 2—The apparatus described here has been found suitable and is the most common type commercially available. Other apparatuses that do not exactly conform to these requirements such as sounding device, tapping rate, or sonic receivers may also be accepted.

4.1 *Electro-Mechanical Sounding Device*—A small, three-wheeled cart upon which is mounted a 12-V battery, two tapping wheels, two sonic receivers, a two-channel-strip recorder, and associated connectors and cables.

4.1.1 *Tapping Wheels*—Two rigid-steel-tapping wheels capable of tapping the bridge deck surface at the rate of 33 times/s. The tapping wheels shall be located approximately 6 in. (152 mm) apart.

4.1.2 *Sonic Receivers*—Two sonic receivers consisting of oil-filled soft tires, inside each of which a receiving transducer is mounted in nonrotating proximity to the concrete surface. The transducers shall be piezo-electric hydrophones that are coupled to the concrete surface through the soft tires and the oil within the wheels. Each receiving wheel shall be located approximately 3 in. (76 mm) outside of and parallel to its corresponding tapping wheel.

4.1.3 *Strip Chart Recorder*—A two-channel-strip chart recorder shall be capable of receiving the signals from the sonic receivers. The electronics unit shall accept only those portions of the signal that occur during the first 3 ms after the occurrence of a tap and further limit the recorder to respond only to those frequency components of the signal that lies in the range of 300 to 1200 Hz. The processed signals shall be