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AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Practice for Laboratory Testing of Bridge Decks[1]

This standard is issued under the fixed designation D 6275; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice establishes a standard for loading bridge deck test modules, in the laboratory, for static and fatigue investigation of anticipated performance of bridge decks in the field.

1.2 Testing of bridge decks is required for any substantive innovation in the structural system, the materials used, or both.

1.3 Testing of bridge decks also is required when the deck is composite with innovative floorsystem framing or with an innovative primary structural system proposed for use for the first time.

1.4 The specific objectives of the testing may be to study stress distribution in the deck, fatigue-prone details, wearing surface delamination potential, freeze-thaw damage resistance, or to provide experimental data for a life-cycle evaluation.

1.5 Testing of bridge decks should replicate the loading imposed by legal truck tires. Failure to do so in the past has produced possibly misleading information. Inconsistent test methodologies specially designed to justify a specific design cannot advance the knowledge of bridge deck behavior in an orderly and consistent manner.

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

2. Referenced Documents

2.1 *ASTM Standards:*

IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System[2]

2.2 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

AASHTO/LRFD Bridge Design Specifications, 1st Edition, 1994, and 1996 Interim Revisions[3]

AASHTO Standard Specification for Highway Bridges, 16th Edition, 1996[3]

3. Significance and Use

3.1 The next 25 or 30 years will require a massive increase in the number of bridge deck replacement projects. This need, as well as new bridge construction, will lead to the introduction of many new deck construction methods. Dependable information, based on uniform test procedures, will be important to users.

4. General Requirements

4.1 The test module shall replicate the construction of the bridge deck. No scaled reduction in size of materials or components shall be permitted. Wearing surfaces, if structurally significant in the performance of the actual deck, shall be installed on the test module. If the performance of the overlay is to be evaluated, it shall be installed on the test module. Any sacrificial portion of the wearing surface (perhaps the top 1.25 cm) should not be included in the test module.

4.1.1 If the deck is intended for use on a floorsystem comprised of longitudinal stringers or transverse floorbeams, or both, such members used for the test set-up shall be spaced at dimensions that are representative of maximum stringer/floorbeam spacing, unless the test is for a specific bridge.

4.1.2 Alternatively, if supporting members are not located at the maximum spacing for the deck configuration under test, loading shall be increased or decreased to achieve the same force effects as if the supporting members had been placed at the maximum spacing. Connection between the deck and the supports shall replicate the intended field connection. Tests shall be made with the deck test module supported in at least a two-span continuous configuration, since, in fact, decks usually are continuous over multiple supports, making it mandatory to test any deck (other than simple-span units) in negative bending moment, as well as positive moment.

4.2 The load shall be applied by means of hydraulic actuators, or other devices, which have been calibrated as to load actually applied for a range of hydraulic system pressure, and for the loading frequency to be used in the test. The use of load cells in the set-up, rather than direct calibration of actuators for load, is acceptable. Loading frequency should not exceed 300 cycles/min (5 HZ).

4.2.1 The location of the hydraulic actuators, or other devices, on the test module shall be selected so as to produce the maximum effect in the deck module being studied. A

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[1] This practice is under the jurisdiction of ASTM Committee D-04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.32 on Bridges and Structures.

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[2] *Annual Book of ASTM Standards*, Vol 14.02.

[3] Available from the American Association of State Highway Transportation Officials (AASHTO), 441 N. Capitol Street NW, Washington, DC 20001.

transversely stiffened frame, supporting a row of small hydraulic actuators, shall not be used, nor shall any other arrangement designed to impose either a line-load across the deck or directly over certain elements of the deck being tested. The only exception to this prohibition is when specific properties must be measured for modeling studies. Loads must be applied only by means of large hydraulic actuators, or other devices, loading steel plates on elastomeric pads, or a tire or air bag to replicate truck tire loading. The plates and the elastomeric pads shall be the same dimensions and orientation as the AASHTO definition of a truck tire "footprint" found in AASHTO Standard Specification for Highway Bridges, 16th edition.

4.2.2 For fatigue investigation, the load applied by each hydraulic actuator, or other device, shall be equal to the maximum truck wheel load for an HS-20 Standard Truck, plus the percentage for impact, in accordance with the 16th Edition of the AASHTO specification (9450 kg). The test set-up shall be the maximum spans recommended for the deck being tested, unless the test is for a specific bridge. The two span continuous module shall be loaded by two actuators operating simultaneously, spaced 1.83 m apart (truck wheel spacing in accordance with AASHTO), and located to produce the maximum positive or negative moment, whichever controls for the specific deck. The number of cycles applied in a fatigue investigation shall be determined from an evaluation of the controlling "fatigue category" (see AASHTO/LRFD Specification, Table 10.3.1a). If analysis or physical measurement of stress under the specified maximum wheel load does not reveal any locations, within the deck test module, where the stress exceeds that of the AASHTO fatigue category involved, then two million cycles of the maximum wheel load, varying the applied load from 2.0 to 20.8 kips for each cycle, will be sufficient to confirm an infinite fatigue life.

4.3 Support for the loading devices shall be massive, and designed to avoid deflection greater than L/1000 and shall not impose any moment at the actuator support.

4.4 For deck type previously tested to the above requirements, a program more limited in scope may be carried out to evaluate specific changes in construction details. If such detail changes could affect the fatigue performance of the deck, new fatigue testing must be conducted in accordance with 4.2.2.

5. Test Procedure

5.1 The load shall be applied to the top surface of the deck test module through a 50-mm thick steel plate having plan dimensions conforming to the AASHTO truck tire "footprint", or a tire or airbag to replicate truck tire loading.

5.2 There shall be a 12.7-mm thick elastomeric pad, between the bottom of the loading plates and the top surface of the deck test module, if the plate in 5.1 is used.

6. Test Reports

6.1 Reports shall include photographs of the test set-up, as well as detailed description of the preparation of the test module, the test set-up, the test objectives, and the source of all funding for the test.

6.2 The description of the test also shall include the test procedure, including a detailed description of the instrumentation and monitoring, as well as a report of the test results. All data shall be in SI units, in accordance with IEEE/ASTM SI 10.

6.2.1 The composition and physical properties of all materials used in the deck modules shall be included in the report.

6.2.2 The test procedure section of the test report shall describe all special aspects of the test, and a detailed justification for deviations from this standard, if any.

7. Keywords

7.1 bridge deck; bridge deck testing