



Designation: D6704 – 22

Standard Test Method for Determining the Workability of Asphalt Cold Mix Patching Material¹

This standard is issued under the fixed designation D6704; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This test method provides a procedure for determination of the workability of asphalt cold mix patching materials.

1.2 This test method is applicable to asphalt cold mix patching materials that will be stockpiled or packaged in containers, subjected to different climatic conditions, and later used for roadway patching operations.

1.3 The within-laboratory repeatability standard deviation has been determined to be 10 % based on one lab, three test replicates, and two different samples. Therefore, this test method should not be used for purchasing purposes.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* This procedure may involve hazardous materials, operations, and equipment.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.27 on Cold Mix Asphalts.

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2. Referenced Documents

2.1 ASTM Standards:²

C702/C702M Practice for Reducing Samples of Aggregate to Testing Size

D8 Terminology Relating to Materials for Roads and Pavements

D75/D75M Practice for Sampling Aggregates

D3665 Practice for Random Sampling of Construction Materials

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing

D5581 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 in. Diameter Specimen)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *workability*—the average maximum resistance to penetration by a designated penetrometer into a compacted asphalt cold mix that is confined in a designated box.

3.2 Definitions for other terms used in this test method may be found in Terminology D8 or a standard unabridged dictionary.

4. Summary of Test Method

4.1 This test method is used to determine the relative value for workability of an asphalt cold mix patching material to be used under different climatic conditions.

4.2 Cold patching samples are obtained from the asphalt cold mix stockpile or removed from its container, cooled to a specified temperature, and measured for workability.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

5. Significance and Use

5.1 This test method may be used to generate information concerning the potential characteristics of handling, placing, compaction, and performance of an asphalt cold mix.

5.2 Workability is one of the main factors that influences the suitability and ultimately the performance of asphalt cold mix suitability for use as a roadway patching material.

5.3 This test method is applicable to asphalt cold mixes manufactured with modified or unmodified emulsified asphalts, cutback asphalts, or combinations thereof.

NOTE 1—The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of Specification D3666 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification D3666 alone does not completely ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification D3666 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.

6. Interferences

6.1 Differences in the aggregate gradation, size, shape, and surface properties, and the residual asphalt binder can significantly affect the workability test method values.

6.2 Procedure variances can affect the values obtained. Careful adherence to this test method will decrease the likelihood of differences caused by departures from procedure parameters.

7. Apparatus

7.1 *Freezer*, capable of maintaining a temperature of -10 ± 1 °C.

7.2 *Balance*, conforming to the requirements of Guide D4753, Class GP5.

7.3 *Boxes*, three square workability boxes or other similar molds, constructed to measure 165 by 165 by 50 mm deep inside dimensions and sufficiently rigid for forming and measuring the asphalt cold mix specimens (Fig. 1).

7.4 *Compaction Hammer*, as specified in Test Method D5581 with a flat tamping foot (Fig. 2) of 150 by 150 by 6 mm

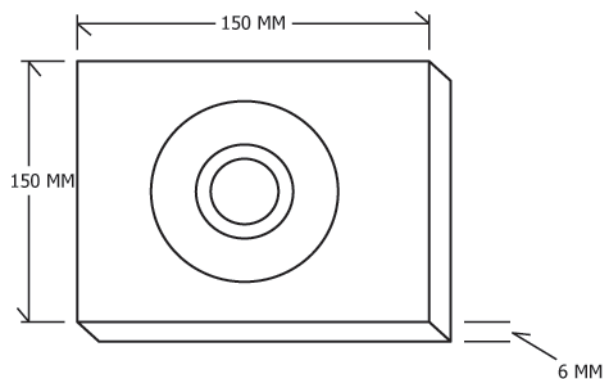


FIG. 2 Flat Tamping Foot

thick attached to the bottom of the hammer and a 4536 g sliding weight with a free fall of 457.2 mm.

7.5 *Compression Testing Machine*, as specified in Test Method D5581 and modified as necessary to provide at least 45 s of loading.

NOTE 2—Instead of the compression testing machine, any suitable load-measuring device may be used provided capacity and sensitivity meet the above requirements.

7.6 *Blade*, a flat steel penetration blade (Fig. 3) measuring 130 mm wide, 50 mm in height, and 3 mm thick attached to the adapter at the bottom of the proving ring.

7.7 *Utensils*, for handling and transferring mixture samples.

8. Hazards

8.1 Observe standard laboratory safety precautions when preparing and measuring cold mix asphalt specimens.

9. Sampling

9.1 Obtain field samples in accordance with Practice D3665.

9.2 *Alternate 1, Stockpile or Packaged Material:*

9.2.1 After stirring the stockpile, obtain three samples in accordance with Practice D75/D75M or obtain three samples from the container.

NOTE 3—Asphalt cold mixes that are in stockpile for some time may develop a crust on the surface of the pile. This crust should be removed to a depth of 100 mm, over an area of 1 m², to expose the unweathered mix.

9.2.2 Use standard quartering procedures as detailed in Practice C702/C702M to obtain a 2500 ± 100 g laboratory sample from each of the three field samples.

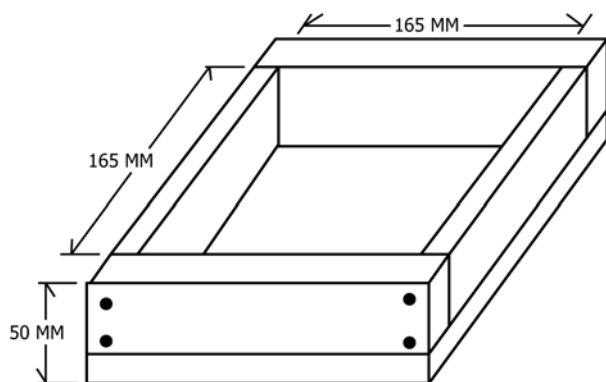


FIG. 1 Workability Box

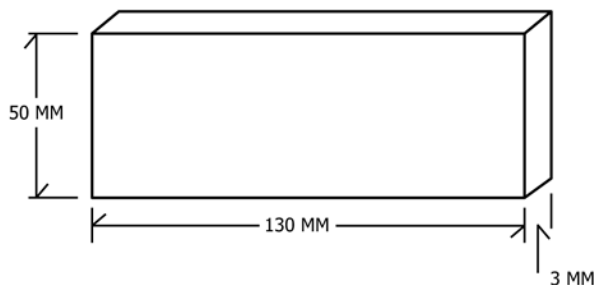


FIG. 3 Penetration Blade

9.3 *Alternate 2, Plant Mixed Material:*

9.3.1 Obtain three samples in accordance with Practice **D3665** of cold mix from the material proposed for use.

9.3.2 Use standard quartering procedures as detailed in Practice **C702/C702M** to obtain a 2500 ± 100 g laboratory sample from each of the three field samples.

10. Standardization

10.1 Verify calibration of the freezer.

11. Procedure

11.1 *Workability:*

11.1.1 Allow the material to stabilize at ambient laboratory temperature (25 ± 3 °C).

11.1.2 Weigh the material in three separate boxes the amount (about 2 kg) that will result in a compacted specimen height of 48 to 50 mm.

11.1.3 Spread the mix uniformly over the box and level the mix, avoiding any segregation. Discard any excess material.

11.1.4 Place the box with the material on any hard and level surface, and place the compaction hammer with the modified foot close to the center of the box and apply two blows with the hammer.

11.1.5 Place the compacted material and box in the freezer at -10 ± 1 °C for a minimum of 12 h but no longer than 24 h.

11.1.6 Attach the penetration blade (see 7.6) to the adapter at the bottom of the proving ring of the Marshall apparatus with the blade parallel to the front of the machine.

11.1.7 Adjust the dial indicator to zero.

11.1.8 Immediately transfer the box with the compacted material from the freezer to the loading jack. Place it under the blade and on the support stand, ensuring that it is level and firmly seated on the support stand.

NOTE 4—The blade should be centered on the middle of the sample.

11.1.9 Switch on the motor and bring the specimen close to the blade and continue the upward movement of the jack head

and start the timer when the dial indicator begins to move. Watch the dial carefully and record the highest load reading observed during 30 s of penetration.

NOTE 5—The rate of penetration used in this test method is the same as Test Method **D5581**, 50.8 mm/min.

11.1.10 Stop the motor, lower the jack head, and remove the specimen from the apparatus. The elapsed time for the test from removal of the test specimen from the freezer to the completion of the 30 s penetration shall not exceed 1 min.

11.1.11 Repeat the preceding procedure on the other two specimens.

12. Report

12.1 Report the average of the three readings.

13. Workability

13.1 The typical ranges of workability for asphalt cold mixes are shown in **Table 1**. The typical rates of workability shown in **Table 1** may be adjusted for variations in the temperature ranges required for use.

14. Precision and Bias

14.1 The within-laboratory repeatability standard deviation has been determined to be 10 % based on one lab, three test replicates, and two different samples. Therefore, this test method should not be used for purchasing purposes.

TABLE 1 Workability Temperature Ranges

Workability, N	Temperature Range, °C ^A
225 to 500	-22 to -1
501 to 1000	-12 to 10
1001 to 2000	-1 to 21
2001 to 4000	10 to 32
4001 to 8000	21 to 43

^A Experience has shown that cold mixes with workability in the ranges shown are suitable for use in the corresponding ambient temperature ranges.

BIBLIOGRAPHY

- (1) Ministry of Transportation of Ontario, "Ontario Laboratory Standard LS289."
- (2) Tam, K. K. and Lynch, D. F., "New Methods for Testing Workability & Cohesion of Cold Patching Materials," MTO EM85 Report, December 1987.
- (3) Tam, K. K. and Yacyshn, R., Proceedings of the Forty First Annual Conference of CTAA, Edmonton, Alberta 1996, p. 159.