
Standard Specification for Performance-Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test

AASHTO Designation: M 332-23¹

Technically Revised: 2023

Technical Subcommittee: 2b, Liquid Asphalt



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1. SCOPE

- 1.1. This specification covers asphalt binders graded by performance using the multiple stress creep recovery (MSCR) test. Grading designations are related to the LTPPBind calculated maximum pavement design temperature, minimum pavement design temperature, and traffic loading.
- 1.2. This specification incorporates T 350 for determining non-recoverable creep compliance, J_{nr} . “S,” “H,” “V,” or “E” designations must be specified for standard, heavy, very heavy, or extremely heavy traffic loading, respectively.
- Note 1**—For asphalt cements graded by viscosity at 60°C, see M 226.
- Note 2**—For performance-graded asphalt binder, see M 320.
- 1.3. To ensure that the asphalt binder exhibits elastic response, the specifying agency may require compliance with R 92.

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- < M 226, Viscosity-Graded Asphalt Binder
 - < M 320, Performance-Graded Asphalt Binder
 - < M 323, Superpave Volumetric Mix Design
 - < R 28, Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)
 - < R 66, Sampling Asphalt Materials
 - < R 92, Evaluating the Elastic Behavior of Asphalt Binders Using the Multiple Stress Creep Recovery (MSCR) Test
 - < T 44, Solubility of Bituminous Materials
 - < T 48, Flash Point of Asphalt Binder by Cleveland Open Cup
 - < T 240, Effect of Heat and Air on a Moving Film of Asphalt Binder (Rolling Thin-Film Oven Test)
 - < T 313, Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)
 - < T 314, Determining the Fracture Properties of Asphalt Binder in Direct Tension (DT)
 - < T 315, Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
 - < T 316, Viscosity Determination of Asphalt Binder Using Rotational Viscometer

< T 350, Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)

2.2. *ASTM Standard:*

< D8, Standard Terminology Relating to Materials for Roads and Pavements

2.3. *Other Reference:*

< LTPP Seasonal Asphalt Concrete Pavement Temperature Models, LTPPBind, Available online at <https://infopave.fhwa.dot.gov/Tools/LTPPBindOnline>

3. TERMINOLOGY

3.1. *Definitions:*

3.1.1. Definitions for many terms common to asphalt binder are found in ASTM D8.

3.1.2. *asphalt binder*—an asphalt-based cement that is produced from petroleum residue either with or without the addition of nonparticulate organic modifiers.

4. ORDERING INFORMATION

4.1. When ordering under this specification, include in the purchase order the performance grade (PG) of asphalt binder required including the designation for traffic loading (e.g., M 332, PG 64V-22).

4.1.1. If required to comply with the elastic response requirements in R 92, include reference to R 92 in the purchase order (e.g., M 332, PG 64V-22, R 92, Percent Recovery of X).

Note 3—The different generations of the LTPPBind program use different algorithms and weather databases for determining the PG high temperature for a location. The choice of which LTPPBind version to use is up to the specifier.

4.2. Select the environmentally appropriate high- and low-temperature grades and the appropriate “S,” “H,” “V,” or “E” grade for the expected traffic level and traffic load rate.

4.2.1. Standard Designation “S” in most typical situations will be for traffic levels fewer than 10 million Equivalent Single Axle Loads (ESALs) and more than the standard traffic speed (>70 km/h).

4.2.2. Heavy Designation “H” in most situations will be for traffic levels of 10 to 30 million ESALs or slow-moving traffic (20 to 70 km/h).

4.2.3. Very Heavy Designation “V” in most situations will be for traffic levels of greater than 30 million ESALs or standing traffic (<20 km/h).

4.2.4. Extremely Heavy Designation “E” in most situations will be for traffic levels of greater than 30 million ESALs and standing traffic (<20 km/h) such as toll plazas or port facilities.

Note 4—“Grade bumping” is accomplished by using “H,” “V,” or “E” designations and not by increasing the PG high-temperature grade as recommended in M 323.

4.2.5. The specification evaluates $J_{nr\text{diff}}$, the change in compliance from the 0.1-kPa stress level to the 3.2-kPa stress level and restricts the change to 0.75 or 75 percent. This is equivalent to 75 percent of one grade change. In cases where the $J_{nr3.2}$ value is less than 0.5, this requirement for $J_{nr\text{diff}}$ is dropped. When the $J_{nr3.2}$ value is below 0.5, the binder is extremely stiff and, from precision and bias studies, there is likely to be higher variability with $J_{nr3.2}$ values below 0.5. In these cases, the