Polymer-Modified Asphalt — Performance Grade by MSCR

PG 58 · 64 · 70 · 76 · 82 — S / H / V / E

In accordance with AASHTO M 332 and AASHTO T 350 (MSCR); complementary requirements of AASHTO M 320

1. Description

Modified asphalt is a conventional asphalt cement into which styrene-block elastomeric copolymers — linear or radial SBS, SB, SEBS, SIS — or EVA, ECR or VAE resins are incorporated. These modifiers increase adhesion at the aggregate–binder interface, raise resistance to permanent deformation and fatigue, reduce thermal cracking and lower the binder's temperature susceptibility.

AASHTO M 332 replaces the traffic "grade bumping" criterion of M 320 with the multiple stress creep recovery test (MSCR, AASHTO T 350). Traffic severity is no longer addressed by raising the test temperature, but by restricting the non-recoverable creep compliance Jnr at 3.2 kPa. The test is always performed at the climatic high temperature of the grade, on the RTFO-aged residue.

2. Applications

- Gap-graded, dense-graded, semi-dense and coarse mixes in high-traffic structural layers.
- Corridors with a high percentage of heavy vehicles, ramps, intersections and braking zones.
- Toll plazas, port terminals, weigh stations and container yards (standing traffic).
- Modified emulsions for high-demand bituminous surface treatments.
- Airport pavements and high-modulus porous mixes.

3. Specifications

AASHTO M 332 traffic designations

Designation	Traffic level (ESALs)	Traffic speed	Jnr at 3.2 kPa, max. (kPa^{-1})
S — standard	< 10×10^6	> 70 km/h	4.5
H — heavy	10 – 30×10^6	20 – 70 km/h	2.0
V — very heavy	> 30×10^6	< 20 km/h	1.0
E — extremely heavy	> 30×10^6 and standing traffic	< 20 km/h	0.5

The ESAL and speed criteria are alternatives ("or") for grades S, H and V; for grade E both are required ("and"). Warning: FHWA tech brief HIF-11-038 (2011), which predates the publication of M 332, gives different thresholds (S = 4.0 kPa^{-1} and different ESAL levels) and should not be used as a current reference.

Specification requirements

Property	Method	Requirement	Test temperature
Original binder			
Flash point, Cleveland open cup (°C), min.	T 48	230 °C	—
Rotational viscosity at 135 °C (Pa·s), max.	T 316	3.0 Pa·s	135 °C
DSR — G*/sin δ on original binder (kPa), min.	T 315	1.00 kPa	Grade high temperature
RTFO residue — AASHTO T 240			
Mass change after RTFO (%), max. (absolute value)	T 240	1.00 %	163 °C
DSR — G*/sin δ on RTFO residue (kPa), min.	T 315	2.20 kPa	Grade high temperature
MSCR — Jnr at 3.2 kPa (kPa^{-1}), max.	T 350	4.5 / 2.0 / 1.0 / 0.5 per S / H / V / E	Grade high temperature
MSCR — Jnr difference, Jnr(diff) (%), max.	T 350	75 %	Grade high temperature
RTFO + PAV residue — AASHTO R 28			
DSR — G*·sin δ on RTFO + PAV residue (kPa), max.	T 315	5,000 kPa	Grade intermediate temperature
BBR — creep stiffness S at 60 s (MPa), max.	T 313	300 MPa	Grade low temperature + 10 °C
BBR — m-value at 60 s, min.	T 313	0.300	Grade low temperature + 10 °C

In addition to the normative requirements, PRO-ROAD® formulates modified asphalt to meet any complementary parameters called for by

the project specification — elastic recovery by ductilometer (AASHTO T 301), storage stability, polymer content — and, where applicable, Federal Aviation Administration requirements for airport mixes. Please state the governing specification when requesting a quotation.

4. Storage and transport

Storage prior to application requires tanks with measuring and safety devices at easily accessible points. Where transfer pumps are used, rotary pumps are preferred to centrifugal pumps, and transfer from the tank truck to the storage tank must always be by direct piping; all piping used must be cleaned after each working day. Homogenisation of the modified binder is guaranteed by its design, so there is no maximum storage time; periodic recirculation is nevertheless recommended. In all other respects the storage and transport conditions for conventional asphalt cements apply.

5. Packaging and logistics

In bulk in heated tank trucks from 9 to 35 t · steel drums of 180–200 kg · Bitubags (thermally lined big bags) of 1,000–1,300 kg · 25 kg block packaging with anti-adhesive film for dry-container export. HS code: 2713.20 (petroleum bitumen).

6. Quality control

Every batch shipped is accompanied by a laboratory-issued quality certificate reporting the tests required by the applicable standard, with traceable batch identification. Additional testing or independent third-party inspection (SGS, Bureau Veritas, Intertek, Cotecna) at origin or destination can be arranged at the customer's request.

Consult the product Safety Data Sheet (SDS) before handling.