

**EXTRA
PERFORMANCE
FOR
ASPHALT**



Making progress, possible.

EXTRA PERFORMANCE FOR ASPHALT

1. Performance Graded Bitumen
2. Multigrade Bitumen
3. Multigrade Plus
4. High Modulus Binders for
EME2 Structural Asphalt

PERFORMANCE GRADED BITUMEN

Bitumen has traditionally been specified using empirical test methods, for example, by penetration.

These specifications do not reflect the real conditions that the bitumen will be used in. Specifically, they do not take into account:

- 1. The actual **climatic** conditions at site.
- 2. The **traffic** loading that the road will experience.

Traditional specifications do not reflect increasing road use and particularly, heavy traffic.

Heavy vehicles cause 3000 times more distress than passenger cars, evidenced by early damage or failures.

The Performance Grading system was first developed in the United States during the 1980's. Since then there have been 3 specification revisions, which have reflected practical experiences, successes and failures.

The current version, AASHTO M332, has added some additional tests that have now resulted in the elimination of rutting as the main cause of road failure.

The specification now has defined traffic classifications, which have been determined through more than 30 years of state wide experience.

Performance Graded Bitumen specifications take account of:

- 1. The actual climatic conditions at site, using historical climate data.
- 2. The traffic loading that the road will experience, using actual and future projections of road use.

Performance Graded Binders are tested and classified as suitable for :

Standard traffic levels "S"
Heavy traffic levels "H"
Very Heavy traffic levels "V"
Extreme traffic levels "E"

| Design traffic (million E80) | Traffic Speed (km/h) | | |
|---------------------------------|----------------------|---------|-----|
| | <20 | 20 - 80 | >80 |
| <0.3 | S | S | S |
| 0.3 - 3 | H | S | S |
| > 3 - 10 | V | H | S |
| > 10 - 30 | E | V | H |
| > 30 - 100 | E | E | E |
| > 100 | E | E | E |

Using data inputs allows a methodical way to select the right Bitumen for each individual project.

From careful crude selection and complex refining processes, EP Bitumen are able to provide the full range of Performance Graded Bitumen for any climatic or traffic condition.



MULTIGRADE BITUMEN

Multigrade from EP Bitumen is a high performance binder, which offers a value for money solution for multiple temperature and traffic requirements.

Using Multigrade in hotter climates increases pavement durability and sustainability whilst reducing maintenance and life cycle costs.

Designed as a traffic grade E for Extreme to carry +100 million ESAL's during a 20-year design life of the pavement, with a maximum daytime temperature of 64°C and a minimum night-time temperature of -16°C.

It also fulfils all the technical requirements for multiple temperature and traffic conditions:

Using Multigrade allows clients the flexibility to design a pavement that is suitable for extremely high traffic levels and slow moving traffic or implement an 'over design' for lower traffic levels, which will dramatically increase the lifespan of the pavement. Compared to a conventional binder. EP Bitumen's Multigrade is proven to:

1. Prevent rutting in early life and at high temperatures.
2. Resist ageing and fatigue.
3. Retain relaxation ability to prevent age-related distresses such as block cracking.

| Performance Temperatures | | | |
|-----------------------------------|----------|----------|----------|
| Traffic Design (E80s) | PG 64-16 | PG 70-16 | PG 76-16 |
| "S" Standard 0.3-3m | ✓ | ✓ | ✓ |
| "H" Heavy 3-10m | ✓ | ✓ | |
| "V" Very Heavy 10-30m | ✓ | ✓ | |
| "E" Extreme 30m+ / slow moving | ✓ | | |

Multigrade Bitumen vs conventional binder in surface course asphalt mix. Using wheel tracking device at 60 °C and 20,000 cycles, AC-10 surface course made with Multigrade Bitumen shows 50% less rutting than a 60/70 penetration grade.



MULTIGRADE PLUS

Multigrade Plus is the ultimate value engineering solution from EP Bitumen. A modified binder suitable for the most demanding pavement conditions whilst offering initial and life cycle cost savings compared to polymer modified alternatives.

The unique processing route of Multigrade Plus produces a binder that is designed to be less temperature susceptible meaning that it retains stiffness and excellent resistance to rutting at high temperatures whilst withstanding thermal cracking as the temperature decreases.

Multigrade Plus is the best value solution for applications where a binder with improved temperature susceptibility is required and where resistance to both fatigue and rutting is essential.

Endorsed by the C8 committee as an alternative to the use of low and medium polymer modified binders.

| Performance Temperatures | | | | |
|-----------------------------------|----------|----------|----------|----------|
| Traffic Design (E80s) | PG 64-22 | PG 70-22 | PG 76-22 | PG 82-22 |
| "S" Standard 0.3-3m | ✓ | ✓ | ✓ | ✓ |
| "H" Heavy 3-10m | ✓ | ✓ | ✓ | |
| "V" Very Heavy 10-30m | ✓ | ✓ | | |
| "E" Extreme 30m+ / slow moving | ✓ | | | |

As a modified binder, Multigrade Plus, can be used for surface course asphalt that needs to be durable and long lasting in hotter climates with heavy traffic loads.

The Useful Temperature Index (difference between maximum and minimum performance temperatures) is over 100°C, making it particularly suitable for climates with large thermal variances between day and night.

Under South African Bureau of Standards (SATS 3208) Multigrade Plus is a single product solution to a range of traffic designs, satisfying the following performance grading shown above:

HIGH MODULUS BINDERS FOR EME2 STRUCTURAL ASPHALT

Focusing on heavily trafficked roads, cost reduction and the environment.

The importance of the base

The road base is the main structural element of the pavement. The base must resist deformation and cracking caused by fatigue through repeated loading. It must also be capable of withstanding stresses induced by temperature through the structure, whilst protecting underlying layers from damage caused by water ingress.

Whilst surface courses can be maintained or resurfaced, failure of the road base can only be remedied by full depth replacement.

Many countries are now constructing base courses with a design life in excess of 50 years, so that only the surface course is either maintained or replaced. This approach saves time and money with reduced inconvenience to the road user.

High Modulus Binders use EME2 asphalt mixtures at a high binder content to increase stiffness, fatigue and rut resistant properties. In addition EME2 asphalt is considered to be impermeable, so that the sub-base is protected.

These savings reduce both costs and construction times.

The environmental impact of road construction on people and places is reduced.

The development of EME2 Asphalt globally has been limited by the availability of High Modulus Binders.

Thanks to the BitBox® packaging system, EP Bitumen can be made available, anywhere, alongside a complete range of High Modulus Binders.

EME2 asphalt, which uses high quality bitumen grades from EP Bitumen, produces a high modulus asphalt used in Base Courses.

These extra performance grades of bitumen are used in the asphalt mix at a high binder content resulting in:

1. The possibility to design.
2. Base course asphalt layers up to 40% thinner than conventional asphalt.
3. The production of asphalt mixes with increased stiffness, and increased fatigue and rutting resistance.

Thinner layers that require less of everything:

1. Aggregates and Quarrying.
2. Truck movements, from the quarry to the asphalt plant to the site.
3. Fuel.
4. Energy used in asphalt production.



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