



TECHNICAL BULLETIN #51

SAMIfalt Chemically Modified Polymer Binders for use in Asphalt Concrete Mixes

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Description

SAMIfalt binders are used as an alternative to C170 or C320 bitumen in the manufacture of asphaltic concrete. SAMI Pty Limited manufactures this range of binders in a purpose built manufacturing plant that includes facilities for thermodynamic, mechanical treatment and chemical modification. The binder is supplied to the asphalt producer for the manufacture of asphaltic concrete which is required to have increased performance levels to that of asphalt incorporating standard grade bitumens.

Features

SAMIfalt offers the engineer the advantage of an A.C. mix with vastly improved mechanical and other properties in terms of service and performance over conventional A.C. mixes. These include improvements in:

- resistance to permanent deformation and creep deformation (shoving and rutting);
- fatigue behaviour (relationship between tensile strain and number of load applications to failure) ie. improved crack resistance;
- tensile strength and elastic modulus;
- resistance to crack propagation (reflective cracking);
- temperature susceptibility (improved performance in higher and lower temperature regions/extremes);
- stripping resistance.

Benefits

The benefits of SAMIfalt translate into extended pavement life or the normal (conventional) pavement life with a reduced thickness. Applications where the benefits of SAMIfalt would be most noticeable are:

- heavily trafficked and stressed pavements on main roads
- approaches to intersections on main roads
- overlays over existing concrete pavements
- where road geometry limits the thickness of the asphalt overlay
- pavements that experience large temperature extremes, day/night or seasonal

Uses

SAMIfalt AB6 meets AustRoads A10E specification and is most frequently used in heavy-duty dense graded pavement applications which carry high axles loadings such as motorways, and main arterial routes. AB6 can be also be used when the design thickness needs to be reduced.

SAMIfalt 60 (or AB5) meets AustRoads A15E specification and is best suited for use on medium – heavy-duty pavements such as urban arterial roads.

Both SAMIfalt AB6 and SAMIfalt 60 provide excellent rutting and fatigue resistance properties and offer very good resistance to reflective cracking.

SAMIfalt AB4 meets AustRoads A20E specification and is primarily used in open graded friction courses to improve fatigue performance and to retard ageing and stripping of the binder in these mixes. AB4 is also used in less stressed areas where conventional asphalt is not quite performing to expectations and some improvement in fatigue life and/or rut resistance is sought.

SAMIfalt D meets AustRoads A30P specification and is used where a heavy-duty dense grade asphalt pavement is required where rutting is the primary mode of failure, such as motorways or main arterial routes.

SAMIfalt AB2 meets AustRoads A35P specification is also used for resistance to rutting but on medium – heavy-duty pavements such as urban arterials.

SAMIfalt D and SAMIfalt AB2 both provide excellent rutting resistance properties but do not offer as good fatigue properties as SAMIfalt AB6 and SAMIfalt 60.

Mix Design

Gradings currently used for conventional dense graded A.C. mixes are generally acceptable with a SAMIfalt binder content between 4.8% and 5.8%. Conventional Marshall testing can be carried out to assess the properties of SAMIfalt modified mixes.

Due to the difference visco-elastic behaviour of SAMIfalt binders, the binder content may be increased by approximately 0.3% over and above that established for use with conventional C170 in a given mix design.

The increased binder content will reduce the void content, improve the workability and ease of compaction of the mix on the site and further enhance the fatigue life and crack resistance of the SAMIfalt mix.

It is recommended that in doing a Marshall mix design, where fatigue performance is the key objective, successive mixes with increasing binder content be prepared until the stability is greater than that for the acceptable conventional mix and the Marshall voids are greater than 2.5 percent.

Manufacture

Although SAMIfalt binders do not require any other additional additives or bitumen to be added by the user, the addition of adhesion agent may be included.

A separate storage facility at the point of manufacture of the mix will be required to maintain and circulate the binder at a temperature of 165°C – 185°C. This can usually be achieved by connecting the bulk tanker into the plant and recirculating the binder through the tanker and plant simultaneously. Precautions should be taken to ensure that all pumps and lines connecting the bulk tanker into the manufacturing plant are properly pre-heated so as to prevent a cold slug of modified binder blocking lines and delaying the work.

Storage

Recommended storage times are as follows:

Asphalt Binder	Mixing Temperature	Holding Time at Mixing Temperature	Medium-Term Storage Temperature	Medium-Term Storage Time
SAMIfalt AB6	165 – 175°C	4 days	120 – 140°C	14 days
SAMIfalt 60	165 – 175°C	4 days	120 – 140°C	14 days
SAMIfalt AB4	160 – 175°C	4 days	120 – 140°C	14 days
SAMIfalt D	160 – 175°C	30 days	120 – 140°C	30 days
SAMIfalt AB2	165 – 175°C	30 days	120 – 160°C	30 days

IMPORTANT - See following notes on storage, next page:-

Storage Notes

All polymer modified binders must be stirred prior to use and regularly circulated during storage due to possible polymer segregation. For storage of binders for periods longer than those listed above please contact SAMI Pty Ltd.

Longer storage times apply to lower storage temperatures.

Temperatures

The mixing temperature and the holding time at mixing temperature on the above table, refer to the binder prior to its introduction to the mixing process. Adjustments to these temperatures may be required to allow for prevailing conditions such as pavement surface temperature, wind speed, asphalt mix type and haulage distance.

Precautions should be taken to ensure that flow meters or other batching systems are properly calibrated to take account of the different viscosity/temperature relationship of SAMIfalt compared to conventional bitumen.

The temperature of the mix at the point of delivery to the paver should not exceed 170°C.

Laying

Conventional laying techniques, limitations and conditions apply, except as follows:

- the minimum mix temperature in the paver should be 145°C with compaction commencing at this temperature. SAMIfalt material cools at a slower rate than conventional asphalt.

Rolling

Use two steel rollers with a minimum capacity of 7 tonnes and vibratory capacity. The first pass should be vibratory.

No pneumatic or rubber tyre rollers should be used until the mix cools down sufficiently, so that no "pick up" occurs.

All compaction should be completed at temperatures greater than 140°C.

The pushing back of excess material from the side of the paver on longitudinal joints should be minimised, as it leaves an untidy finish and does not compact properly. Handwork should be kept to an absolute minimum.

Binder Sampling

Binder samples should be heated to between 165 - 185°C, held at this temperature for one hour and thoroughly stirred before immediately casting into test moulds. Casting test moulds at lower temperatures will result in unrepresentative test results which may be as much as 50% below those achieved by the above procedure.

NOTE: *Whilst every care is taken in the preparation of this data, no responsibility is accepted for the interpretation of the information contained herein, nor is any warranty expressed or implied for the suitability of the material for a particular application.*