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## TECHNICAL BULLETIN #30

### SEALOFLEX

### An Asphalt Concrete Mix Incorporating a Chemically Modified Polymer Binder

#### Description

SEALOFLEX<sup>®</sup> binder completely replaces the C170 or C320 bitumen currently used in the manufacture of asphaltic concrete. SAMI Pty Limited blends the SEALOFLEX<sup>®</sup> binder in a purpose made manufacturing plant that includes facilities for thermodynamic, mechanical treatment and chemical modification. The binder is supplied to the asphalt manufacturer at the plant for the manufacture of SEALOFLEX<sup>®</sup>.

#### Features

SEALOFLEX<sup>®</sup> now 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 SEALOFLEX<sup>®</sup> translate into extended pavement life or the normal (conventional) pavement life with a reduced thickness. The application where the benefits of SEALOFLEX<sup>®</sup> 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

#### Typical Binder Properties

	Soft Pt. °C	T. Rec @ 25°C %	Pen @ 25°C (100g 5 mins) mm	B/field Vis. @ 135°C PaS	Flow @ 0°C mm
Sealoflex <sup>®</sup> 2	95	66	56	3.0	0
Sealoflex <sup>®</sup> U	60	25	46	1.2	-

#### Uses

SEALOFLEX<sup>®</sup> 2 is most frequently used in order to achieve an increased life and/or reduced design thickness.

SEALOFLEX<sup>®</sup> U is primarily 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 being sought. SEALOFLEX<sup>®</sup> U may also be used in open graded friction courses to improve fatigue performance and to retard ageing and stripping of the binder in these mixes.

**Mix Design**

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

Due to the difference visco-elastic behaviour of the SEALOFLEX® binder, 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 SEALOFLEX® 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.

**Lab Mixes**

Ensure that the SEALOFLEX® binder temperature is in the range of 185°C and 195°C and that the aggregate samples are 160-170°C. It is recommended to stir the sample before using it. Do not use repeatedly reheated binder samples.

Lab. mixing sequence:

- dry mixing of aggregate;
- introduction of SEALOFLEX® binder
- Mix until thoroughly wet, usually 3 to 4 minutes. It is recommended that the mixing method allows the temperature of the mix to be maintained.
- Marshall compaction, 2 x 50 blows at a temperature range of 155°C to 165°C. Reheating and/or longer oven storage of the samples will affect the mix properties.

**Manufacture**

SAMI Pty Limited will supply the complete SEALOFLEX® binder, no other additives, bitumen etc., will be required by the user.

A separate storage facility at the point of manufacture of the mix will be required to maintain and circulate the SEALOFLEX® binder at a temperature of 180°C. This can usually be achieved by connecting the bulk tanker into the plant and recirculating the SEALOFLEX® 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:

Storage Time	185°C	130°C	Ambient
Storage without oil heating and circulation	Max 24 hours (after 24 hours lower temp. to 130°C)	Max 1 week (after 1 week lower temp. to ambient temp)	Unlimited
Storage with oil heating and circulation	Max 48 hours (after 48 hours lower temp. to 130°C)	Max 4 weeks (after 4 weeks lower temp to ambient temp)	Unlimited

**Temperatures**

Mineral aggregate should be 170°C  
 SEALOFLEX® 2 and U binder should be 185°C  
 Mixing sequence as per conventional batch plants  
 Complete cycle mixing time - 60 seconds.

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 SEALOFLEX® compared to conventional bitumen.

Problems have occurred in early trials with contractors losing mix as a result of a lack of binder content where the above precautions have not been taken. The density of SEALOFLEX<sup>®</sup> 2 is approximately 0.942kg/litre at 180°C compared to a typical 0.948 kg/litre for conventional C170 bitumen at the same temperature.

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. SEALOFLEX<sup>®</sup> 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. Hand work should be kept to an absolute minimum.

### **Binder Sampling**

Binder samples should be heated to 185°C, held for one hour at 185°C, 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.

### **General**

This bulletin should be read in conjunction with our Technical Bulletin #40 which gives the temperature details on other SAMI Polymer Modified Bitumen Binders for Asphalt Modification.

*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.*