



## TECHNICAL BULLETIN #37

## SAMI Bitumen Technologies

# POLYSEAL

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## A Tough Spray Sealing Binder

### Description

PolySeal is a polymer modified bitumen used as the binder in spray sealing applications where a tough seal is required. PolySeal is a composite product manufactured by blending bitumen, with various polyethylene and elastomeric polymers and derives unique properties resulting in performance benefits contributed by each polymeric additive. In addition to the "toughness" imparted by the polyethylene, the elastomers increase the binder's elasticity and promotes superior adhesion with the aggregate. The combination of great toughness and excellent adhesion make the polyethylene composite PolySeal, a superior sealing binder which does not significantly compromise intrinsic elastic properties or temperature susceptibility.

### Features

PolySeal is a binder which exhibits superior aggregate retention and is tough, yet elastomeric, providing a very "easy to use" substitute to crumb rubber and in some situations SBS binders. Features of PolySeal are:

- Greater toughness
- High softening point
- Superior aggregate retention
- Crack retardation
- Flexibility to meet numerous performance specifications
- Unequaled storage stability and handling characteristics
- Compatibility with a broad range of bitumens
- Excellent cost-performance ratio
- Less prone to fuming as no extender oils are added
- Early sweeping capability – 1 hour
- Sprayed at a lower temperature than crumb rubber and SBS binders
- No transportation limitations

### Applications

Used for most sprayseal applications including a SAM where minor cracking is to be covered.

- For quick aggregate adhesion
- Situations where minimal loose aggregate is paramount
- High stress sites or alignments
- Intersections

### Technical Data

The combination of toughness (polyethylene) and elasticity (thermoplastic polymers) means that PolySeal retains aggregate more effectively, while retarding crack reflection. The higher softening point reduces the risk of bleeding.

#### Typical Range of PolySeal Properties

Property		Value
Penetration @ 25°C	p.u	40 - 80
Torsional Recovery @ 25°C	%	16 - 35
Softening Point	°C	49 - 56
Viscosity @ 135°C	Pa.s	0.81 - 1.10
@ 180°C	Pa.s	0.17 - 0.25
Elastic Recovery @ 60°C	%	20 - 30
@ 45°C	%	15 - 25
Consistency @ 60°C	Pa.s	360 - 800
@ 45°C	Pa.s	3000 - 5000

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Tests have been carried out with various binders meeting the AUSTRROADS and the New South Wales RTA specifications. The results are as follows:

### Comparison of Typical Binder Properties

Test Method	Test Property	15% Crumb (S15R)	20% Crumb (S20R)	3% SBS (S10E)	5% SBS (S20E)	PolySeal (S35E)	PBD (S35E)
MBT 22	Torsional Recovery (25°C, %)	30	35	25	60	29	20
MBT 31	Softening Point (°C)	57.5	61.5	57.0	80.0	52.0	51.0
MBT 11	Viscosity (165°C, Pa.S)	1.10	1.90	0.28	0.43	0.27	0.23
MBT 21	Elastic Recovery (60°C, %)	25	34	38	99		
MBT 21	Elastic Recovery (45°C, %)			25		24	22
MBT 21	Consistency (60°C, Pa.s)	1440	1920	622	10,205	500	
MBT 21	Consistency (45°C, Pa.S)			2727		3760	3699
MBT 21	Stiffness (15°C, Kpa)	92	168	73	57	155	154
MBT 24	Toughness (4°C, Nm)	2.6	3.3	1.9	1.7	3.8	3.8
RTA T238	Adhesion (% Stripping)	< 5	< 5	< 5	5	< 5	< 5

### Results from Comparisons

- The toughness at 4°C of PolySeal was the highest against other binders at various displacement levels. The test at low temperature indicates the lack of temperature susceptibility.
- The peak force required to stretch the sample is the highest for the PolySeal binder.
- The plot of force against displacement clearly indicates the superior toughness of Polyseal over the other binders.

The combination of great toughness and excellent adhesion make the PolySeal a superior sealing binder without significantly compromising the intrinsic elastic properties and temperature susceptibility.

### Manufacture and Delivery

PolySeal is manufactured and supplied from our production facilities at Sydney, Brisbane and Perth. Transportation of the product to sites a long distance from the manufacturing plant is simple and easy as the PolySeal has an extremely long storage life at temperature without degradation.

### Use and Handling

#### Design

The AustRoads Technical Report AP-T68/06 titled "Update of AustRoads Sprayed Seal Design Guide Method" (Table 4.1), suggests a Polymer Factor (PF) factor of 1.3 be used in the design of a seal using S35E product. The New South Wales Roads and Traffic Authority seal design guide suggests a factor of 1.15. SAMI suggests that a figure of 1.15 is appropriate for 7mm aggregate seals and 1.3-1.4 for 14mm aggregate seals, however this factor may need to be increased where traffic volumes are low.

#### Storage/Heating

Never heat PolySeal above 200°C. PolySeal may be stored for up to 7 days at 175 – 185°C. For periods exceeding 7 days the temperature must be reduced to 120-160°C and can be kept at this temperature for up to 30 days without deterioration of binder properties. When re-heating PolySeal heat at a maximum of 10°C per hour.

#### Preparation

Pre-coated aggregate is recommended as well as the use of anti-stripping agent. Wet aggregate must not be used. PolySeal must not be sprayed over a primer seal for at least 48 hours after the application of the primer, and it is completely dry. Polyseal should also not be sprayed over a primerbinder for at least 14 days after the application of the primerbinder.

### Application

PolySeal can be sprayed using conventional spray nozzles to a road surface temperature applicable to C170 bitumen seals, generally at least 15°C and rising. Up to 3% cutter may be added to PolySeal when the pavement temperature is below 25°C at the time of spraying, or where the site experiences frosty winter conditions. This allows the extension of the sealing season for PMB's particularly in southern Australia.

PolySeal should be sprayed at temperatures between 170°C and 185°C. If streaking occurs during spraying, add cutter.

PolySeal exhibits the phenomenon of a transition after spraying. Initially PolySeal appears similar to C170 bitumen that allows adequate time to incorporate pre-coated aggregate. A transition then occurs about one hour later where the binder exhibits all the characteristics of a PMB including superior aggregate adhesion after which the surface can be immediately power broomed.

Because PolySeal exhibits superior adhesion and toughness the binder is less prone to stripping in the event of immediate heavy rain. After the transition stage has occurred and the aggregate embedded, stone loss due to wet weather is unlikely to result. This compares favourably to a highly SBS modified binder which is prone to stone loss due to water ingress long after completion.

Spraying when rain is imminent is not recommended as best practice should apply. However, a spray seal binder with the adhesion and tenacity to perform under unexpected adverse conditions provides the contractor with significant additional comfort, the ultimate in "user friendliness".

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