STONE MASTIC ASPHALT IN WESTERN AUSTRALIA

WARRIP
WESTERN AUSTRALIAN ROAD RESEARCH & INNOVATION PROGRAM

Identifying opportunities for improvement through consultation, testing and comparison with national and international practice.

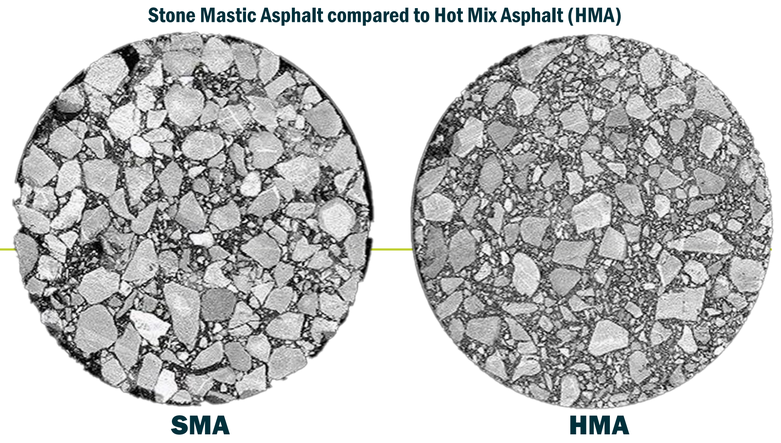
Stone Mastic Asphalt (SMA) is a gap graded asphalt mix developed in Germany that provides a deformation resistant, durable surface material suitable for heavily trafficked roads, intersections or other high-stress areas. The expected service life of a SMA wearing course is between 10 and 20 years.

Main Roads developed Specification 502 Stone Mastic Asphalt (2016) to manufacture and place SMA on the road network. This study reviewed these current practices and identified opportunities to improve this specification based on national and international practices.

SMA comprises of a high proportion of coarse aggregate, filler binder and fibre.

The stone skeleton is formed from the interlocking of coarse aggregate which provides deformation resistance. The hot mix is filled with a mastic of bitumen and fillers and fibres added to provide adequate stability to the binder and prevent drainage to binder during transport and placing.

Stone Mastic Asphalt compared to Hot Mix Asphalt (HMA)



SMA HMA

Source: Sirjannano.com

Key differences in SMA practices (Australia, Germany)

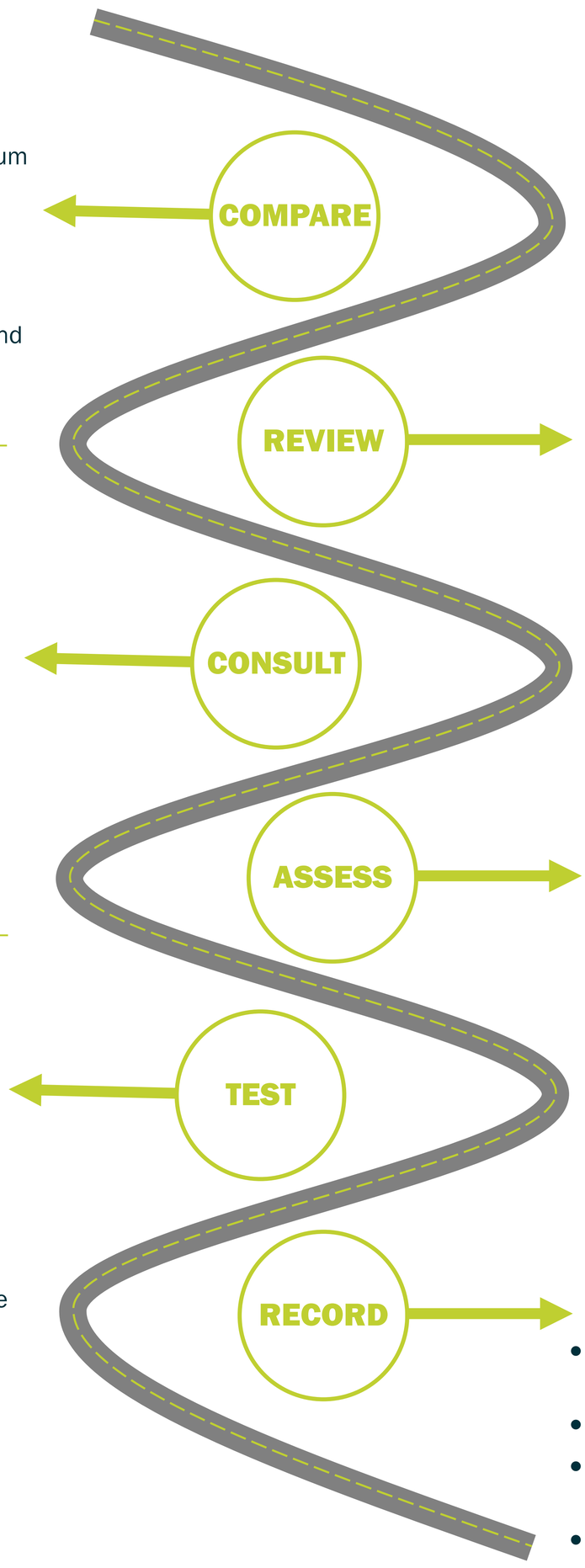
- Varied requirements for the types of binders used, aggregate grading, volumetric requirements and minimum field density specified.
- Main Roads grading is coarser than the German requirements.
- German practice targets a lower aid void content than Main Roads, likely to result in a higher binder content and denser field mixes.

Industry key areas of concern regarding the supply of SMA in WA

- Filler specifications including difficulties adding the required amounts when using older asphalt plants.
- Challenging aggregate grading requirements.
- Availability of suitable quantities of baghouse dust.
- Methods to determine bulk density.
- Consistent production and placement of SMA in accordance with Specification 502.

Determine volumetric and filler properties of four ‘typical’ 10mm SMA mixes (with hydrated lime)

- Filler was defined as material passing the 0.125mm sieve (like German).
- Dry compacted filler voids varied from 40-48% with hydrated lime and 36-37% without.
- Lime addition significantly increased the stiffness of the mastic when using the delta ring and ball softening point test.
- Methylene blue values of the filler combinations were well below the maximum limits specified by RMS and TMR.
- No significant difference in air voids determined by WA 733.1-2012 and AS2891.9.2-2005.



SMA Performance from local asphalt suppliers in WA:

- Most mixes were produced in accordance with the IPWEA specification which allows for the use of C320 binders, whereas an A20E Polymer Modified Bitumen is specified by Main Roads.
- Average gradings of 10mm SMA mixes were coarser for materials smaller than 4mm.
- Several mixes exceeded the maximum allowable grading limit specified by Main Roads.
- Average laboratory air void content was closer to the upper specification limit due to lower binder contents and coarser gradings.

SMA Performance in WA:

- SMA trial sections vary in age from 2 to 17 years. Visual observations indicate most section are performing satisfactorily.
- Most prominent defects include flushing, bleeding and minor loss of mastic on the surface.

Tonkin Hwy northbound, 1 km from Gosnells Road East

Recommended amendments to Main Roads Specification 502:

- Introduce a requirement for minimum air voids to dry the compacted filler.
- Introduce an alternative filler specification.
- Collect fixed binder fraction data on SMA mixes to evaluate if this property correlates with workability.
- Adopt the Australian Standard bulk density test method AS2891.9.2:2014.

How do these recommendations help ?

Ensuring continuous improvements and refinements to Main Roads specifications will ensure best practice is applied to provide better performance outcomes that benefit industry and road users alike.