

WarmPave

WARM MIX ASPHALT



Building more sustainable roads

Paving the way towards a more sustainable future

New developments in asphalt production technology have led to a reduction in the amount of energy used and green house gases emitted as compared to hot mix asphalt. As an industry leader in the manufacture and application of construction materials, Boral is committed to providing sustainable asphalt technologies and superior pavement performance for a better future.

A Better Planet with WarmPave Asphalt

WarmPave is specially designed around the latest innovations in asphalt performance and application with sustainability practices and technologies to reduce carbon emissions and lower embodied energy of asphalt roads.

This is primarily achieved by reducing the temperature of the asphalt in manufacturing and application, using a proven warm mix technology and optimising the use of reclaimed asphalt pavement (RAP) in the mix.

WarmPave Innovation

WarmPave technology is an innovation that allows asphalt to be produced and placed at lower temperatures compared to traditional 'hot mix'. This process reduces energy consumption and carbon emissions resulting from asphalt production and application, and also allows greater quantities of recycled asphalt to be used in the mix than ever before.

Consistent with international developments in warm mix technology, WarmPave is the result of many years of research and reflects a commitment to biosphere friendly technologies sought throughout the world by road authorities and communities in their efforts to preserve and sustain the environment for future generations.

Boral has adopted both additive and foam methods of producing WarmPave asphalt. Experience with the rheological modifier or organic additive called Sasobit dates back to 2006 while foaming systems have been installed in both double drum and batch plants. In fact Boral is the first to install a WarmPave foaming unit to a batch plant in Australia.

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Recycled Asphalt (RAP) and Reduced Waste

WarmPave asphalt uses reclaimed asphalt pavement (RAP) in the mix, avoiding waste asphalt going to landfill. Although recycling aged asphalt (removed from existing roads during reconstruction and maintenance) is not new, the advent of warm mix technology allows RAP to be more effectively used to manufacture a product with sustainable qualities that performs comparably with hot mix asphalt.



Processed reclaimed asphalt pavement (RAP).

Preserving Resources

Using larger quantities of RAP in the production of WarmPave proportionately reduces the demand for virgin materials (bitumen and aggregates) in the asphalt mix and preserves these valuable resources for future use. The aggregates in recycled asphalt are generally of the same high quality as virgin aggregates specified for new asphalt and can be directly substituted to achieve similar asphalt performance.

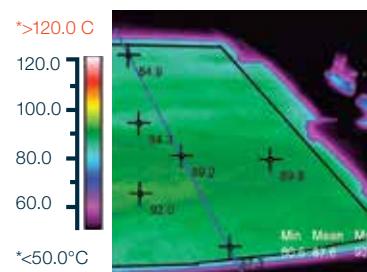
When RAP is added, the bitumen coating on the RAP aggregate is usually reactivated by the heat from the virgin aggregates during mixing. This means that the amount of new bitumen can also be reduced – so preserving another valuable natural resource.



WarmPave asphalt with 15% RAP being paved on the Superway project in South Australia.

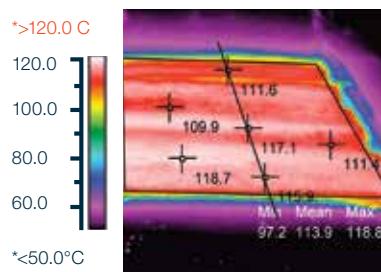
Temperature Profile

When thermographic images that capture the heat distribution using infrared cameras were taken of the completed mat immediately behind the paver in recent works, they clearly demonstrated that a more uniform temperature distribution was achieved on the surface of the newly placed mat with WarmPave.



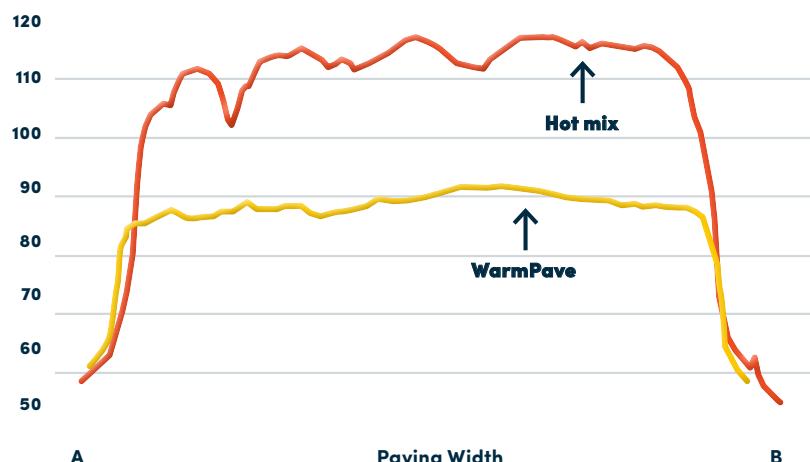
WarmPave Time: 14:03:10

Temperature Profile. Extract from Boral field test, Granville, NSW 2010

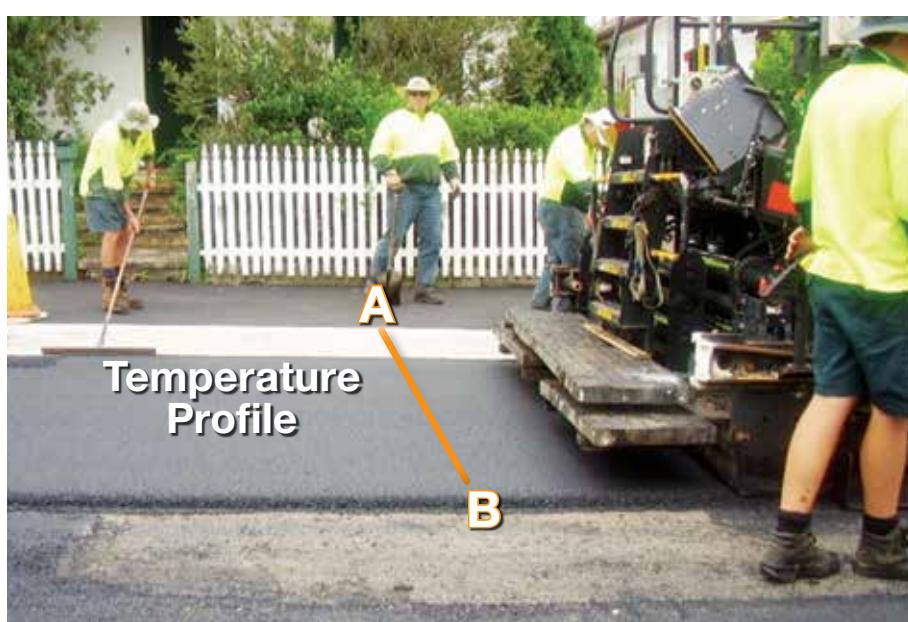


Hot Mix Time: 12:07:34

Temperature Profile (°C)



Temperature Profile. Extract from Boral field test, Granville, NSW 2010



Temperature Profile. Extract from Boral field test, Granville, NSW 2010

Work benefits with WarmPave Asphalt

As well as environmental benefits, WarmPave asphalt has additional advantages such as reduced handling temperatures and greater workability. This enables the asphalt to be handled and placed with even greater safety and ease. Reductions in smoke, fumes and odours also results in cleaner air around road works to the significant benefit of both workers and the communities in which asphalt roads are being paved.

WarmPave asphalt combining recycled asphalt (RAP) and warm mix asphalt technology provides high value benefits compared to hot mix asphalt.



WarmPave asphalt being discharged into the tipper from the pug mill after mixing. Note the absence of any fumes.

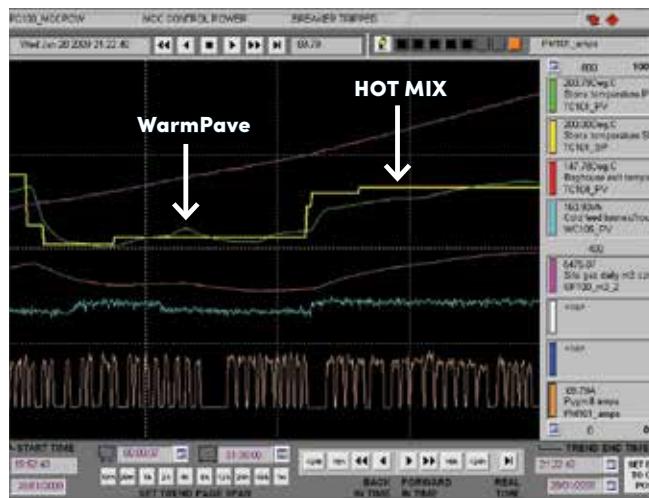
Benefits of WarmPave are¹:

- Reduces emissions ($\text{CO}_2 \sim 10\% - 15\%$, $\text{CO} \sim 10\% - 25\%$, $\text{NO} \sim 15\% - 20\%$)
- Can reduce energy and fuel consumption by up to 30%
- Reduces production and placement temperatures by up to 25°C compared to HMA
- Increases the ability to use recycled asphalt
- Can reduce the consumption of non renewable materials
- Reduces smoke, fumes and odours thereby reducing the impact on neighbours living in vicinity of asphalt plants

- Enables easier compaction that can lead to improved density control and increased service life
- Allows multiple layers of asphalt to be placed more quickly
- Offers a wider compaction window allowing more time required to achieve specified density
- Increases the opportunity for improved compaction of joints
- Allows asphalt applications previously not possible such as hand work
- Improves working conditions for laying crew that results when temperature and emissions are reduced

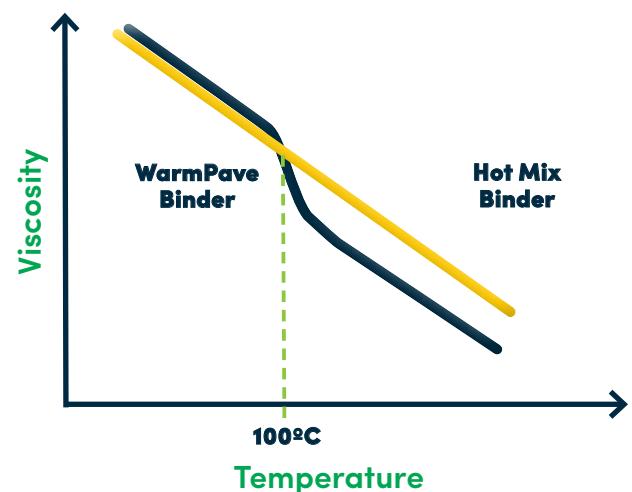
- Leads to higher production rates by virtue of lower production temperature
- Extends the paving season in colder climates due to a wider band of compaction temperatures.
- Allows newly placed asphalt roads to be opened to traffic sooner due to lower compaction temperature.
- Lower mixing temperatures reduce the binder ageing thus contributes to longer pavement and service life.
- Field observations supports rutting resistance and crack inhibition is equivalent to hot mix asphalt.
- Laboratory tests indicate that required key asphalt performance properties are met.

Fuel usage comparison



Drop in fuel usage during WarmPave asphalt production.
Boral Deer Park Plant Trial, January 2009

Binder viscosity comparison



Change in binder viscosity at paving and mixing temperature using an organic additive. Extract, NCAT, USA Presentation 2006

WarmPave

Applications

WarmPave asphalt can directly replace hot mix asphalt in many applications and is ideal for use on municipal roads, parking areas, side walks and driveways where community concerns for the environment are most prevalent. It can be produced in all structural forms of hot mix asphalt including dense graded, stone mastic, open graded or Novachip.

Results of performance testing WarmPave against hot mix asphalt reveal that (shown previous page) the viscosity of the binder in WarmPave is lower and so very likely less aged. Furthermore, there is little difference in resilient modulus (see graph) and supports adding recycled asphalt to achieve additional stiffness.

Special Applications

WarmPave asphalt can be customised to meet specific client requirements for grading and binder content for special applications. Boral Asphalt technologists can assist with the modification of WarmPave so customers may meet community needs for sustainable technologies and the specific demands of road performance.

Availability

WarmPave is widely available from Boral Asphalt locations around Australia. Unlike hot mix, WarmPave asphalt can be transported much longer distances due to its ability to be placed at lower temperatures. Contact your local Boral Asphalt office to find out more.

Achieving Carbon Neutral

Warm mix asphalt can reduce green house gases by up to 15% compared to hot mix, so helping the journey to net zero carbon.

There are many examples of where Boral has placed WarmPave including:

| Road Projects | Jurisdiction | Location | State |
|------------------------------|---|---------------------|-------|
| Great Eastern Highway | Main Roads Western Australia | Sawyers Valley | WA |
| Franki Avenue | Hunters Hill Council | Woolwich | NSW |
| Queens Street | City Of Parramatta | Granville | NSW |
| Deer Park Bypass | VicRoads | Deer Park | VIC |
| Norris Road | Shire Of Yarra Ranges | Lilydale | VIC |
| Gallipoli Grove | DTEI & City Of Port Adelaide Enfield | South Road Superway | SA |
| Carina Hockey Pitch | McIlwain Civil | Carina Hockey Pitch | QLD |

Reference (1) Warm-Mix Asphalt: European Practice, FHWA, 2008

www.boral.com.au/asphalt

CONTACT US

Visit www.boral.com.au/asphalt for more information about Boral's range of asphalt products. For orders and enquiries please call our office:

1300 132 964

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