Health & Safety
2012 Study Tour Key Topics

1. Long life pavements
   - Experience, design systems, use, durability & performance

2. High performance asphalt & binders
   - High modulus asphalt (EME, HiMA), modifiers

3. Sustainability
   - RAP/WMA, bitumen substitutes, carbon calculators & energy analysis
     climate change impacts, societal concerns

4. Health & Safety
   - Construction of road works, health considerations for bitumen
     and asphalt products

5. Procurement Systems
   - Proprietary products (Avis Technique, HAPAS, etc.), “green” procurement,
     REACH, responsible sourcing, PPP and contract models
Overview of reasons

• Australia has high expectations & legal requirements for a healthy & safe operating environment – key operating focus
• Europe is considered to aware and sensitive to this requirement
• Recent changes to the European operating environment (REACH, IARC, austerity) may have impacted and lessons learnt could be shared

• Specific issues and implications for Australia
  o Improving road work site safety
    – full closure / contraflow / automatic aids / speed
  o Increased environmental awareness & society friendly treatments
    – new developments | emerging concerns
    – impact of REACH on products and operations
    – IARC classification of bitumen
OBSERVATIONS

• IARC monograph on occupational exposure
• REACH (Registration, Evaluation, Authorisation & Restriction of Chemicals)
• Risk management & good communications
• UK road worker annual fatality highest / person
• Contra-flow and lane shifting works
# Topic 4: Health & Safety

HEALTH: Using Bitumen Safely

- Risks and hazards
- Fume and emission
- Communication

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Exposure</th>
<th>Risk at high exposure Potential health impact</th>
<th>Risk Management Measures</th>
<th>Risk after measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat / high temperatures</td>
<td>Dermal Contact</td>
<td>Skin damage ... death</td>
<td>PPE, Equipment, Procedures</td>
<td>Low</td>
</tr>
<tr>
<td>H2S in fumes</td>
<td>Inhalation</td>
<td>Acute toxicity ... death</td>
<td>Procedures, Equipment</td>
<td>Very Low</td>
</tr>
<tr>
<td>Cancer (due to PAH in fumes)</td>
<td>Inhalation, Dermal Contact</td>
<td>Chronic toxicity ... death</td>
<td>Lower emissions, temperature, fume extraction equipment, etc</td>
<td>Very Low</td>
</tr>
<tr>
<td>Fumes (respiratory tract irritation)</td>
<td>Inhalation</td>
<td>Respiratory irritation Breathing difficulties</td>
<td>Lower emissions, temperature, fume extractions, etc</td>
<td>Very Low</td>
</tr>
</tbody>
</table>
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HEALTH: Using Bitumen Safely

- Risks and hazards
- Fume and emission
- Communication

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**Emission**
- Aerosols and vapours from hot bitumen
- Fume condensates
- Organic vapour
- PAH (in fumes)

**Exposure (Techniques)**
- Systems
- Equipment
- Work duration
- Hygiene
- Quantity
- Procedures

**Exposure (Measures)**
- Temperature control
- Innovative technologies
- Engineering controls
- Additives

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*Source: A Case-Control Study of Lung Cancer Nested in a Cohort of European Asphalt Workers Final Report*
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HEALTH: Using Bitumen Safely

- Risks and hazards
- Fume and emission
- Communication

- Guides on the safe loading
- Transportation
- Safe handling, burns card
- Maximum safe working temperatures
- Environmental information
Classifications

- **Group 1:** *Carcinogenic to humans* 109
- **Group 2A:** *Probably carcinogenic to humans* 65
- **Group 2B:** *Possibly carcinogenic to humans* 275
- **Group 3:** *Not classifiable as to its carcinogenicity to humans* 503
- **Group 4:** *Probably not carcinogenic to humans* 1
IARC monographs identify cancer hazards even if the risks are very low at current exposure levels.

### IARC Monograph Classifications

<table>
<thead>
<tr>
<th>Evidence in experimental animals</th>
<th>Evidence in humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficient</td>
<td>Group 1</td>
</tr>
<tr>
<td>Limited</td>
<td>Group 1</td>
</tr>
<tr>
<td>Inadequate</td>
<td>Group 2B</td>
</tr>
<tr>
<td>Absence</td>
<td>Group 2B</td>
</tr>
<tr>
<td></td>
<td>(Group 2A)</td>
</tr>
<tr>
<td></td>
<td>Group 3</td>
</tr>
<tr>
<td></td>
<td>Group 3</td>
</tr>
<tr>
<td></td>
<td>Group 4</td>
</tr>
</tbody>
</table>

- Group 1: confirmed
- 2A: probably
- 2B: possibly
- 3: not classifiable
- 4: probably not
The IARC monograph 103 is not yet in its final form but the release through the Lancet indicates that:

• occupational exposures to oxidized bitumens and their emissions during roofing operations are “probably carcinogenic to humans” (Group 2A)

• occupational exposures to hard bitumens and their emissions during mastic asphalt work are “possibly carcinogenic to humans” (Group 2B)

• occupational exposures to straight-run bitumens and their emissions during road paving are “possibly carcinogenic to humans” (Group 2B)

This is the identification of a cancer HAZARD even if risks are very low at current exposure levels, it is also about the occupational exposure and not the substance itself.
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HEALTH: REACH – EU Regulations

- **REACH** (Registration, Evaluation, Authorisation and Restriction of Chemicals)

**REACH Regulation requirements**

1. **Ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals**

2. **Industry responsible for assessing and managing the risks posed by chemicals and providing appropriate safety information to downstream users.**
The aim of REACH is to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances.

The benefits of the REACH system will come gradually, as more and more substances are phased into REACH.
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REACH

• Applies to all chemicals manufactured or imported into EU
• Bitumen is classified as a chemical
• If the chemical is classified as hazardous requires a Chemical Safety Assessment (CSA)
• Major review by oil companies classifies bitumen as not hazardous
• But bitumen suppliers have voluntarily produced a Safety Data Sheet
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REACH

• Safety Data Sheet
  o Safe handling - eg temperature, H₂S
  o Related health issues – eg irritation of respiratory tract

• Also REACH requires a Derived No Effect Level (DNEL) if more than 10 tonne/year
  o DNEL for bitumen is 2.9mg/ m³ based on an 8 hour exposure
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HEALTH: Using Bitumen Safely

“When used correctly, working with bitumen and asphalt is and remains safe” – Carl Robertus - Eurobitume

Conclusions

Health
• Bitumen is not classified as hazardous to health or to the environment
• Hazards of working with bitumen are now defined
• Risks are very low and can be reduced further through exposure reduction
• Temperature control and reduction are key

Safety
• Bitumen is usually handled and applied hot
• Workers can be adequately protected by
  – following good practices and
  – using the right equipment (PPE)

Environment
• Bitumen is Green
• 100% recyclable
• known eco footprint
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HEALTH: awareness in pavement materials selection

- Warm Mix Asphalt
- Sanitary aspects of old asphalt pavements
- Fume generator – scientific study

*Emission potential is calculated as the area under the TOC(e) curve w.r.t. Time*
### Topic 4: Health & Safety

**SAFETY: Road Worker Safety**

**UK “Aiming at Zero at the Highways Agency” program**

<table>
<thead>
<tr>
<th>Category of people</th>
<th>Number of people</th>
<th>Average fatalities per year</th>
<th>Fatality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road workers</td>
<td>2,000</td>
<td>2</td>
<td>1 in 1,000</td>
</tr>
<tr>
<td>Road construction</td>
<td>15,000</td>
<td>1</td>
<td>1 in 15,000</td>
</tr>
<tr>
<td>Road users (all roads)</td>
<td>30,000,000</td>
<td>1,850</td>
<td>1 in 16,000</td>
</tr>
<tr>
<td>Road users (HA roads)</td>
<td>8,000,000</td>
<td>248</td>
<td>1 in 32,000</td>
</tr>
</tbody>
</table>

![Image of construction site]

![Image of road workers]

![Image of emergency response vehicle]
SAFETY: Road Worker Safety

UK “Aiming at Zero at the Highways Agency” program

Themes

1. Continual review of working practices to reduce risks to road workers
2. Reducing speed and improving compliance through road works
3. Improving driver behaviour through road works
4. Improving communication of road worker safety initiatives
Topic 4: Health & Safety

SAFETY: Road Worker Safety

Themes 2:
1. Investigate different speed restriction method on vehicles through road works
2. Improve compliance with speed restriction at road works
3. Investigate RedX (ganty signs) and hard shoulder non-compliance issues.
SAFETY: Road Worker Safety

Theme 3:
Respect our roadworkers campaign included press, television, YouTube

Roadworks are a place of work, and the people there deserve just as much respect as you would expect at work. On busy roads, day and night, in all weathers, they risk their lives improving our highways. Keeping them open. When you see roadworks, reduce your speed, drive with more care and keep them safe.
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SAFETY: Road User Safety

- Ultra thin asphalt surfaces for noise reduction and skid resistance
- Road work zone separation
SAFETY: Road User Safety

• Noise a health hazard – small aggregates help friction

Noise data: + 300 files

- LOW noise
- Intermediates
- NOISY

78dBa
75dBa

7,50 m
1,20 m

Revêtement à tester
SAFETY: Road User Safety

- Not all drivers are created equal / Speed vs ?

7.12 Road fatalities (per 100,000 population) in EU-27 and selected countries - 2009

Source: IRTAD

* Provisional data for 2009
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SAFETY: Road User Safety

• Ultra thin asphalt surfaces for noise reduction and skid resistance
• Road work zone separation

*United Kingdom* – roadway cleared to allow works - temporary barrier system protects work zone
Impact on the road user in minimal
Netherlands - full traffic diversion to allow for construction

Netherlands - construction adjacent to traffic lanes
Germany - lane closure for maintenance - traffic lanes shifted
Germany - contra flow single lane - two lanes provided for rehabilitation
Topic 4: Health & Safety

SAFETY: Road User Safety

- Ultra thin asphalt surfaces for noise reduction and skid resistance
- Road work zone separation

The advantages of full separation allows for higher quality outcomes, reduced risk to contractor & road user, and if planned properly reduces costs and speeds delivery.
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Questions – ANSWERED IN THE REPORT

• Health
  o Impacts of IARC classification of bitumen on industry?
  o Has REACH impacted on the supply and use of products?
  o Drive for healthier products? What products?
  o Noise – measured, surfacing options, maintenance?

• Safety
  o Statistics – injuries & fatalities? How measured & collected?
  o What are the greatest road worker risks?
  o What training is available?
  o What techniques / methods for safer maintenance?
  o Communicating road worker safety needs to the public – how?
  o Urban & multi accessed sites – any special safety approaches?
  o Are higher safety road surfacing products preferred?
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RECOMMENDATIONS

1. Review the Australian risk management guides on the use of bitumen
2. Communicate the hazard and exposure methodology in the safe use of bitumen
3. Promote the reduction of temperature in the use of bituminous products
4. Promote the use of lane shifting and contra-flow to improve quality, increase safety and reduce costs.
AAPA Health and Safety Conference

• Recent Conference focussed on three themes
  o Develop and maintain a safety aware culture
  o Identify and respond to risks within worksite
  o Identify and respond to the risks at the traffic/worksite interface

• 28 deaths since 2000 – 11 at the boundary and 15 in the worksite (2 being investigated)
  o Report incidents – “Mate, that was bloody close”

• Next Asphalt Review will have a summary