ENCOURAGE MIXES THAT HAVE HIGHER ASPHALT CEMENT(AC) CONTENT

OAPC TOP 10 LIST #2

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ORBA

Presentation Outline

- Asphalt Pavement Durability – What Does it Mean?
- Addressing Durability in Asphalt Pavements
- Asphalt Cement (AC) Content Impacts on Mixes
- Industry's Shortcomings
- Enhancing Asphalt Mix Durability
- Strategies for Improved Durability
- Summary & Conclusions
- Reminder – Top 10 List/Factsheet(s)
- Q&A

Asphalt Pavement Durability – What Does it Mean?

- For Asphalt Pavements, "**DURABILITY**" Simply Refers to the Ability to Resist Deterioration as it Ages.
  - The primary distresses associated with durability issues include:
    - Surface Initiated Cracks; and
    - Raveling.

Addressing Durability in Asphalt Pavements

- Key Practices in Addressing Asphalt Pavement Durability/Performance Problems Include Use of:
  - Asphalt binder specifications that limit changes in binder properties under simulated aging;
  - Aggregate specifications that limit the amount of clay and other deleterious materials to guard against breakdown of aggregates during production, under traffic and environmental effects during the service life of the pavement;
  - Limits on volumetric properties to provide a sufficient volume of asphalt binder in the mixture to properly coat the aggregates and to minimize aging during production and the service life of the mixture;

Addressing Durability in Asphalt Pavements

- Key Practices in Addressing Asphalt Pavement Durability/Performance Problems Include Use of:
  - Testing and requirements to ensure that the mixture is not sensitive to moisture; and
  - In-place compaction requirements to minimize permeability which minimizes water infiltration and slows the rate of age hardening in the mixture.

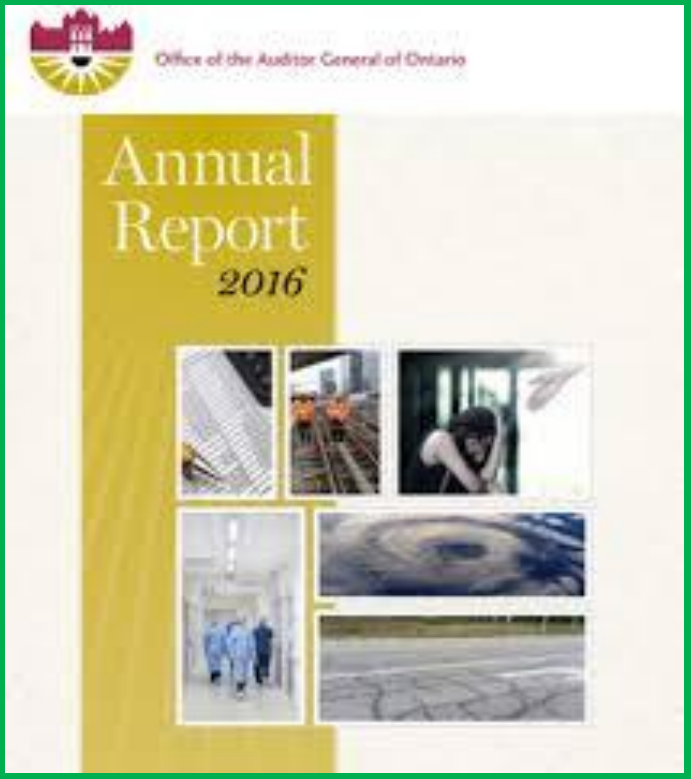
Asphalt Cement (AC) Content Impacts on Mixes

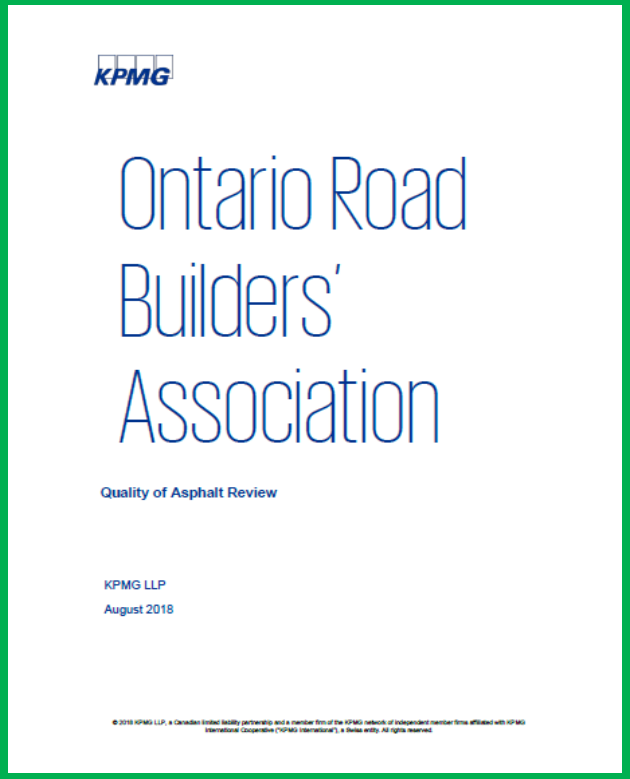
- Sufficient AC Ensures Durable Pavement
  - Low AC content results in fatigue cracking, dryness or raveling, and brown dull pavement appearance, and excess AC content leads to bleeding, fat spots and low skid resistance.
  - For virgin mixes, low AC contents are typically caused by one of the following:
    - *Asphalt absorption problems;*
    - *Increase in dust content, thus decreasing VMA;*
    - *The loss of VMA during production and thus decreasing the AC content to meet the air voids requirement; and*
    - *Production automation problems: pumps, weigh bridge, asphalt meter, aggregate moisture, etc.*

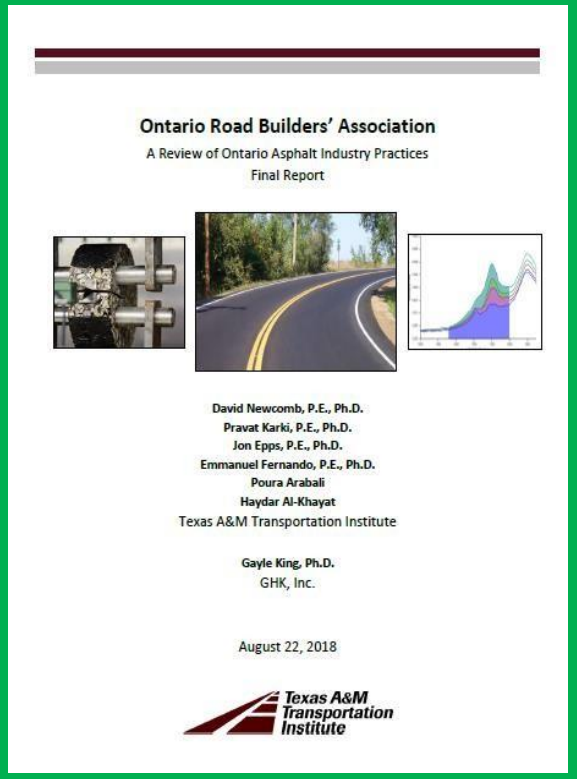
Asphalt Cement (AC) Content Impacts on Mixes

- Sufficient AC Ensures Durable Pavement
  - In recycled mixes, low AC contents can be caused by above-mentioned problems, but can also be related to:
    - *Increased total dust percentages due to RAP fines, thus decreasing VMA;*
    - *Improper RAP proportions due to inaccurate RAP moisture content; and*
    - *High moisture contents in RAP, hampering the softening of the RAP binder required to blend with virgin binder, thus coating "black rocks" and reducing the total binder content for the recycled mix*

Industry's Shortcomings – Quality of Asphalt Reports





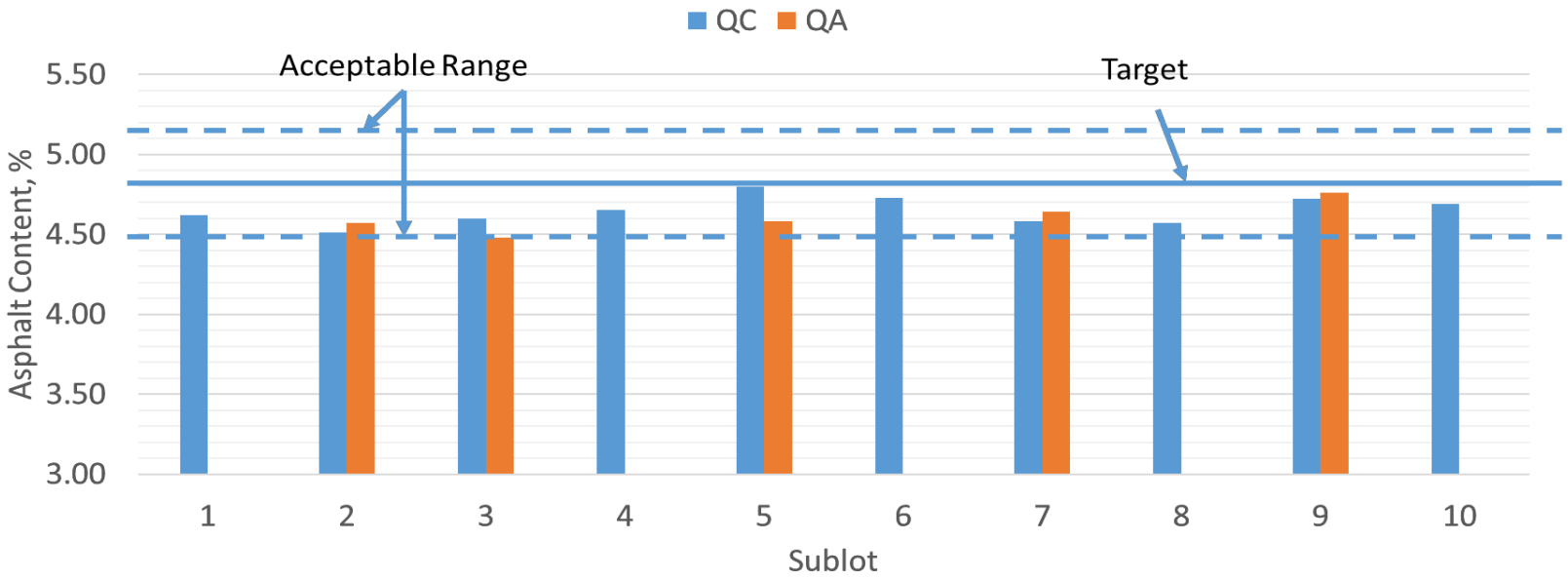


"PERFORMANCE PROBLEMS IN ASPHALT PAVEMENTS RARELY HAVE THEIR ROOTS IN A SINGLE CAUSE"

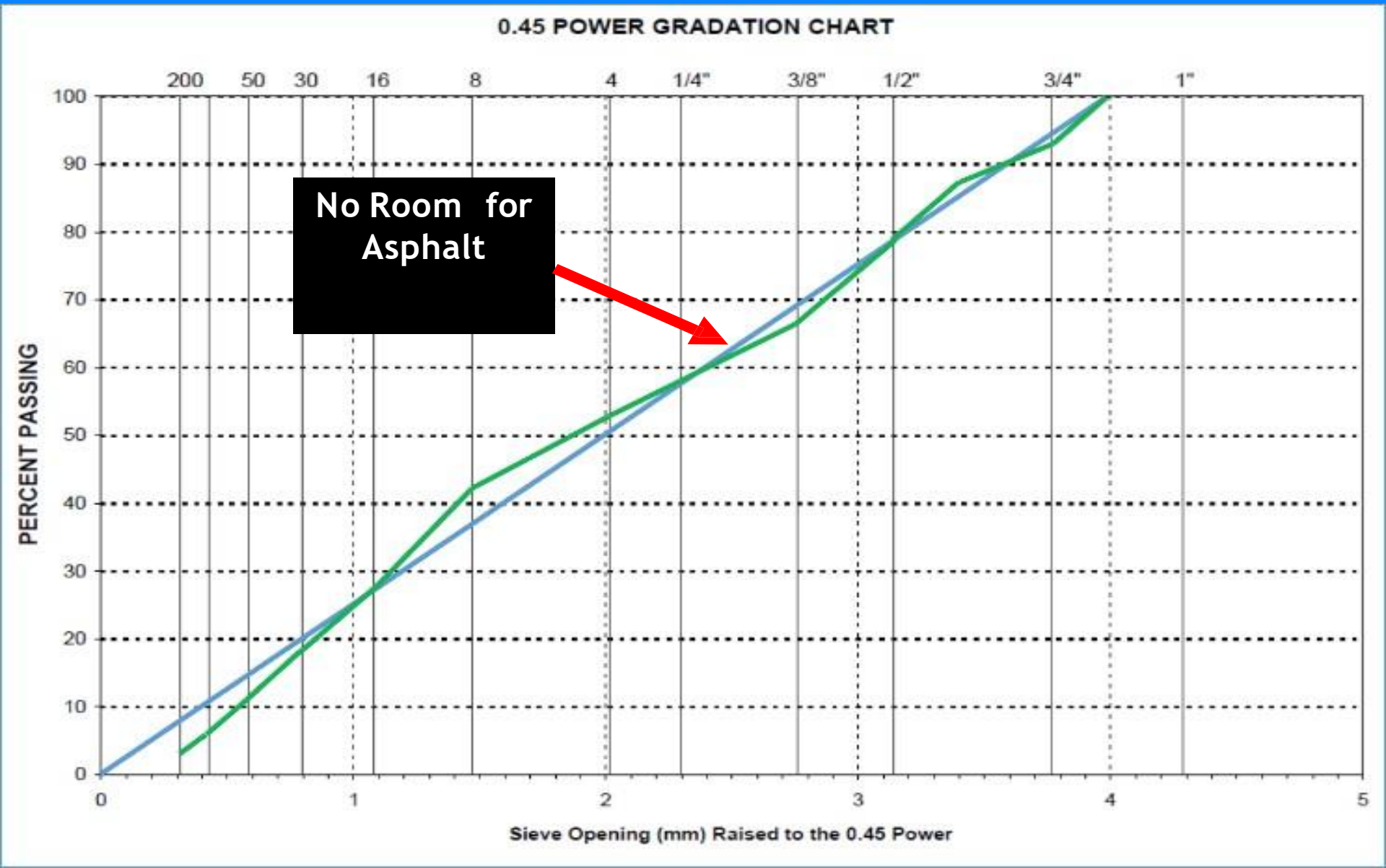
Industry's Shortcomings – Mix Problems

- ❑ Lack of Asphalt
- ❑ Lack of Room for Asphalt
- ❑ Coarse Gradations

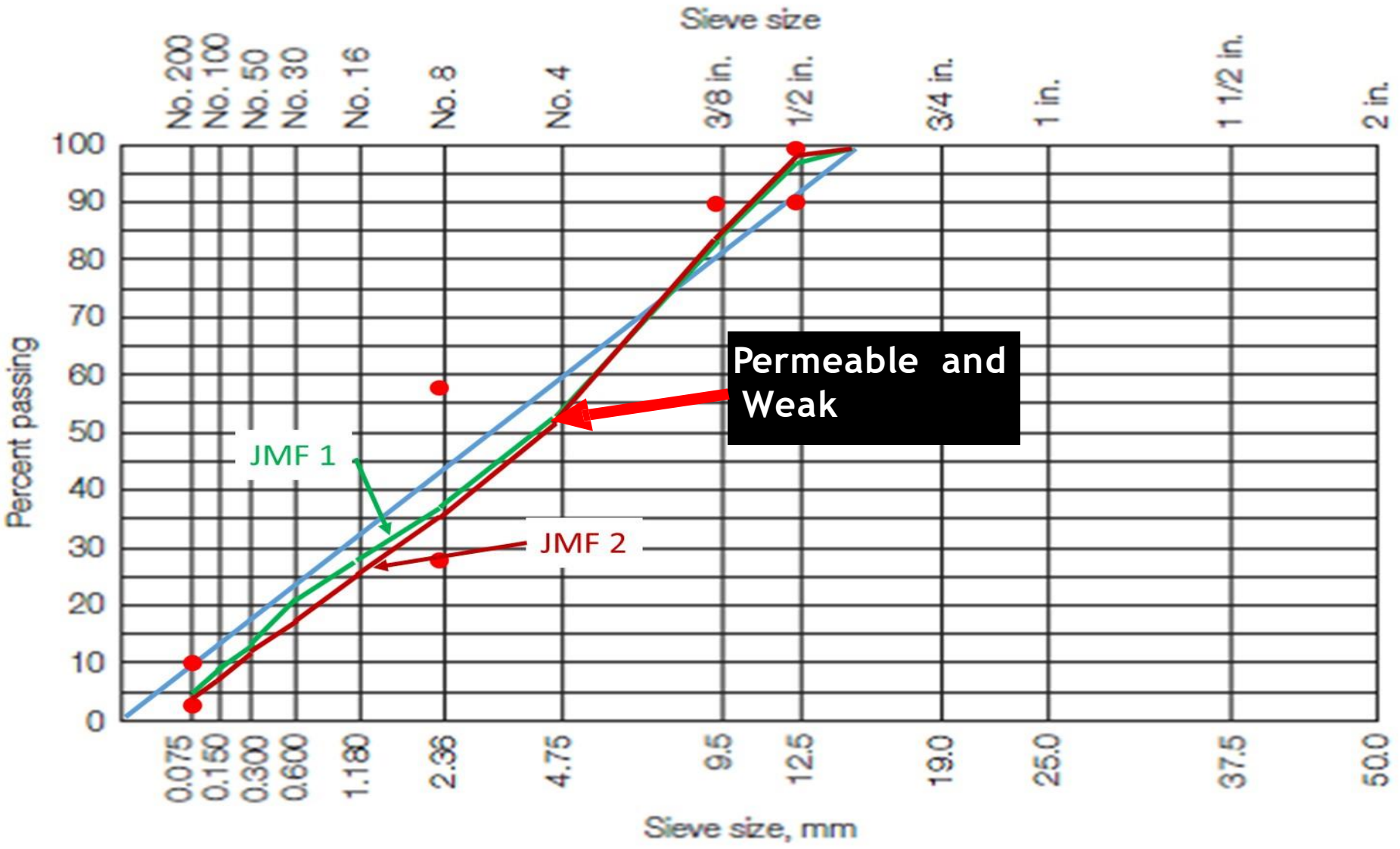
Typical M N
5.0-5.5 for 12.5mm
5.5-6.0 for 9.5mm



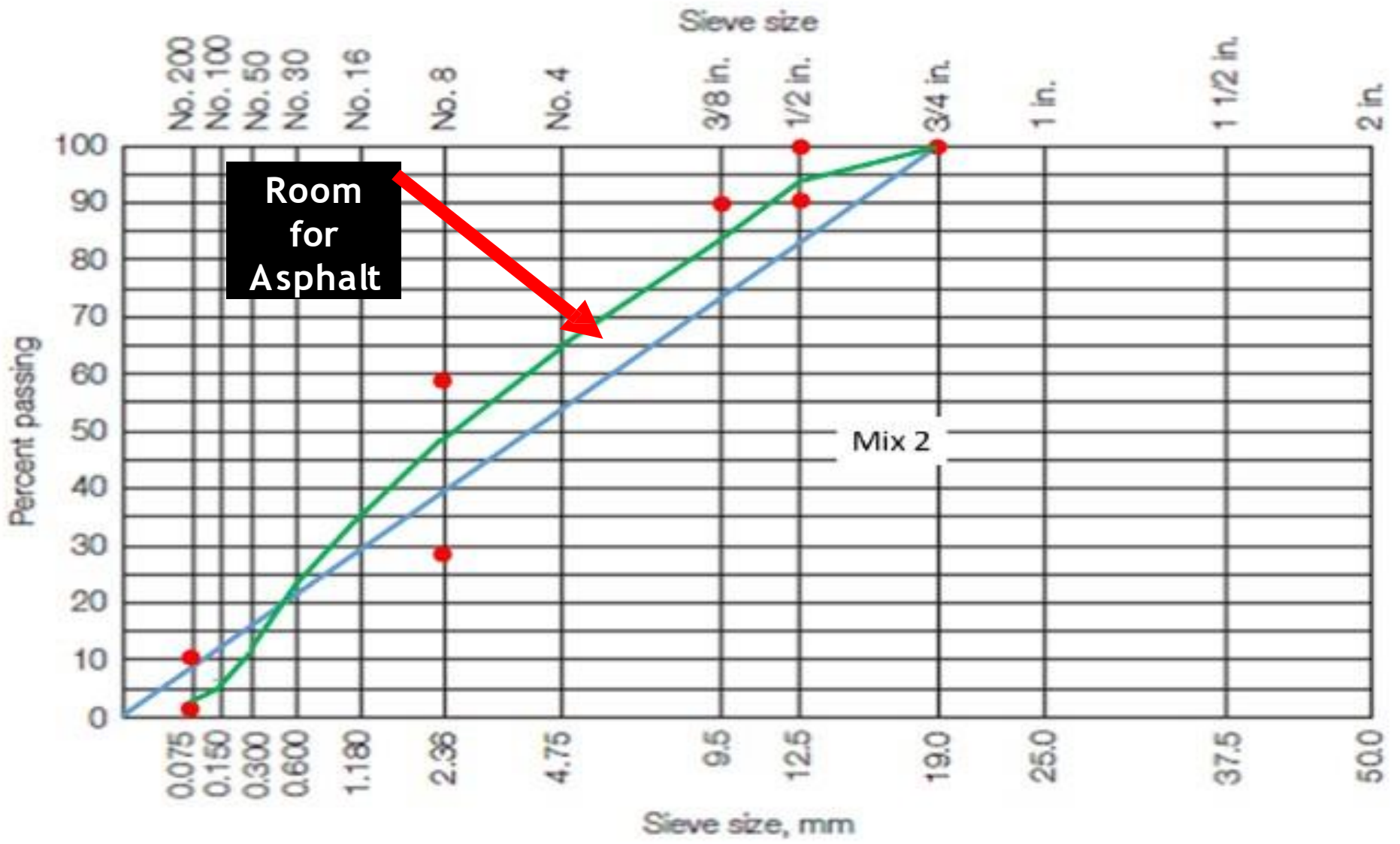
Industry's Shortcomings – Dense Gradation



Industry's Shortcomings – Coarse Gradation



Industry's Shortcomings – Good Gradation!



Enhancing Asphalt Mix Durability

- To Enhance Durability vis-à-vis Performance, General Practice Recommends:
  - Designing the mix using a dense gradation of sound, tough, moisture-resistant aggregates;
  - Maximizing the asphalt film thickness on the aggregate; and
  - Compacting the mixture to be impervious

Strategies for Improved Durability

- Some Suggested Options to Address the Issues with Designing Asphalt Mixtures for Improved Durability Include:
  - Specifying a higher minimum AC content;
  - Lowering the laboratory compaction effort (number of gyrations);
  - Lowering the air void content of the mix to allow more asphalt;
  - Introducing cracking testing on the asphalt mixes prior to finalizing a mix design; and
  - Implementing the Superpave 5 Volumetric Mix Design Method.

Summary & Conclusions

- Increasing the AC content in asphalt concrete mixtures should be a high priority for improving pavement performance in Ontario. This can be encouraged by the suggested options discussed in the presentation.

- Regardless of the method adopted, differences between the desired properties of the Job-Mix Formula (JMF) and the properties of the plant-produced asphalt mix **MUST** be checked and verified for compliance, and necessary adjustments should be made to minimize any variations and mitigate against consequent negative effects on the in-service pavement performance.

Reminder – Top 10 List/Factsheets

- Technical Articles and/or Factsheet(s) Available in Asphaltopics Magazine – see www.onasphalt.org
- Item(s) #1, 2, 5, 6, 7, 8 & 9 - Complete
- Look out for Item(s) #3, 4 & 10 – This Fall.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謝謝
ngiyabonga
شكراً جزيلاً
teşekkür ederim
спасибо
dank je
thank you
gracias
tapadh leat
bedankt
mauruuru
mochchakkeram
dziękuję
go raibh maith agat
obrigado
sukriya
kop khun krap
arigato
dakujem
grazie
merci
감사합니다


WHAT?
WHEN?
WHERE?
HOW?
WHO?
WHY?