Back to Basics

Workshop

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Jointly sponsored By VAA, VTRC and VDOT

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The Basics and BMD

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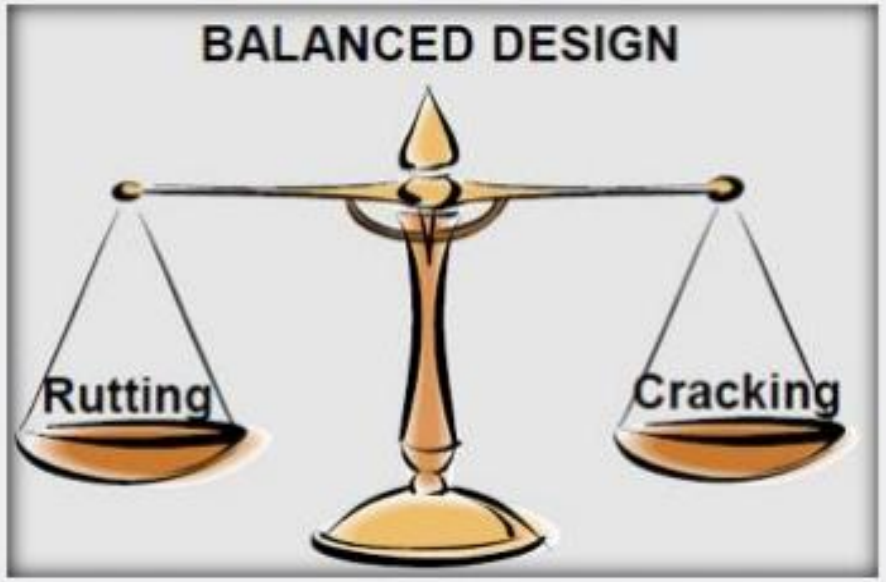
Balanced Mix Design

- Balance of properties and performance
  - Volumetrics
  - Cracking
  - Rutting
  - Mass loss
  - Moisture sensitivity



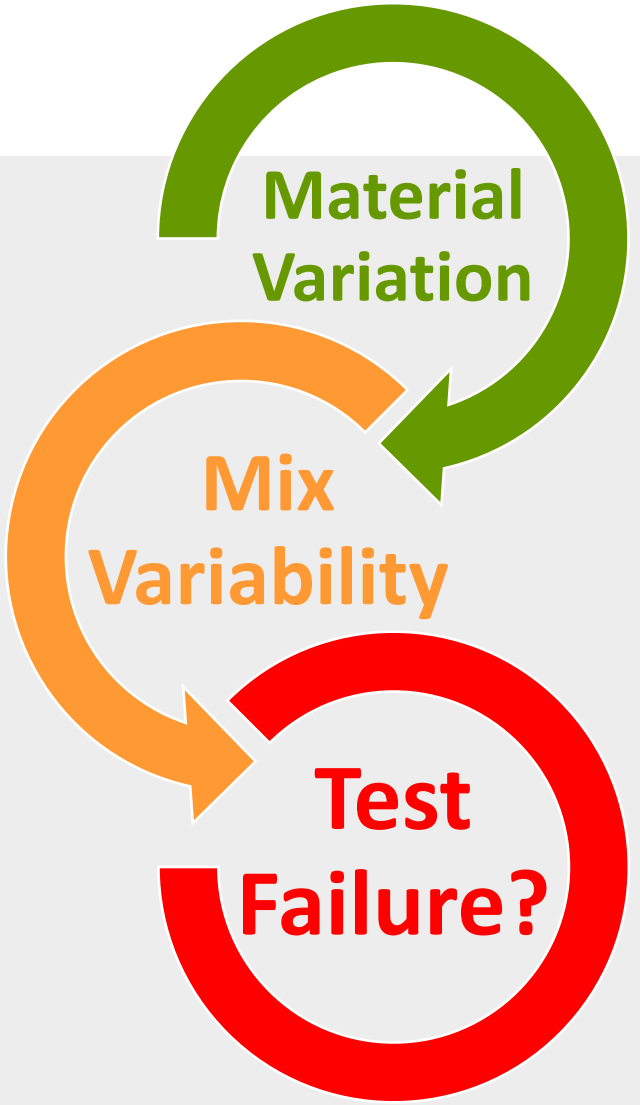
Why is BMD needed?

- To improve performance to achieve longer lasting pavement
- Limitations of volumetric design
  - No direct indication of performance
  - Cannot capture impact of binder grade and/or additives
  - Cannot capture impact of RAP, RAS, or recycling agents
  - Requires assumptions when calculating volumetric parameters in mixtures with recycled materials
  - Inconsistency in Gsb (not checked often) and accuracy in measuring it

BMD Testing

- Any factors that contribute to mix variability are magnified in BMD testing

- Consistency is key!
  - Source material consistency
  - Stockpile management
  - RAP processing and management
  - Proper sampling techniques
  - Good specimen fabrication practices



Testing BMD Mixes

- Important details to consider
  - Sampling
  - Specimen preparation
  - Test variability
  - Differences between design and production

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The Basics

- Use good sampling practice
  - Non-representative sample will NOT give representative results
  - High standard deviation and COV
  - Results from other samples will not compare
- Do not let mix segregate when splitting, weighing out, and loading molds
  - BMD tests have different degrees of sensitivity to changes in gradation

The Basics

- Determining sample mass for 7 ± 0.5% AV
  - Several methods – use what works for your mixes consistently
    - Use gyro pills
      - Convert from gyro height/voids to performance test height/voids
      - Correct for surface air voids
    - Use trial APA and IDT-CT specimens
      - Single point trial
      - NCAT spreadsheet
  - Must use current sample Rice value for accuracy

The Basics

- Oven calibration and hot/cold spots
  - Avoid opening oven door where possible
  - Monitor specimen temperatures throughout oven
  - Cold spots → less aged mix, softer mix response
  - Hot spots → more aged mix, stiffer mix response
  - Keep ovens calibrated and verify calibration

The Basics

- Be consistent in fabrication methods/process
  - Different methods = different test results
  - Routine training to stay aware and consistent
  - No shortcuts
  - Check test results between technicians to see consistency

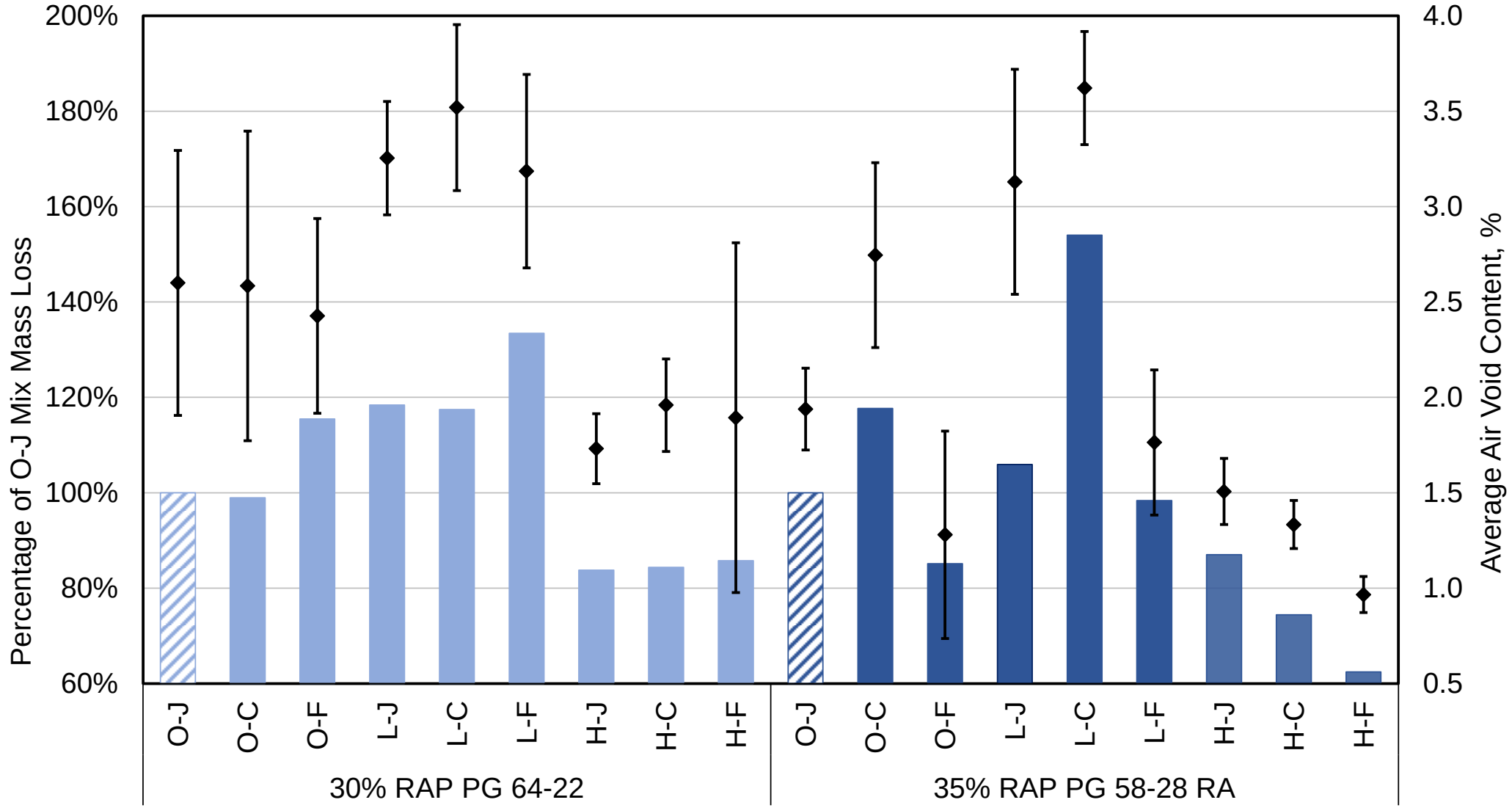
- Specimen fabrication process is a significant source of test variability

The Basics

- Specimen handling
  - Avoid damaging test specimens during storage or transport
    - Be aware that specimens can deform or be damaged
    - Keep at room temperature or below for storage
    - Do not allow specimens to get hot inside vehicle or sit in direct sun
    - Provide solid support under specimens
    - Lay on flat face to avoid deformation
    - Do not stack specimens

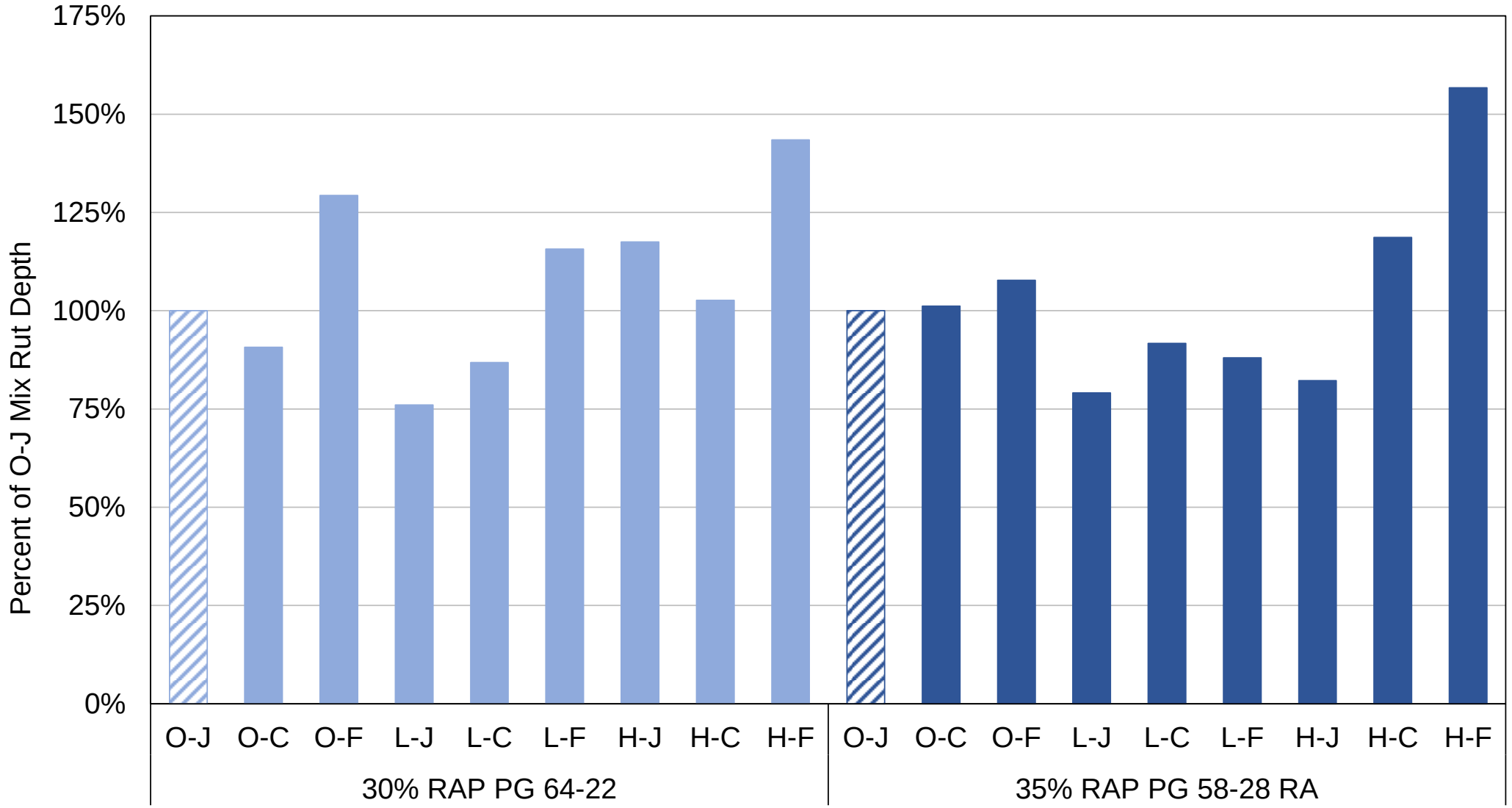
Mass Loss – Impact of Factors

Binder Content:
O = optimum
L – low
H – high
Gradations:
J = JMF
C = coarse
F = fine



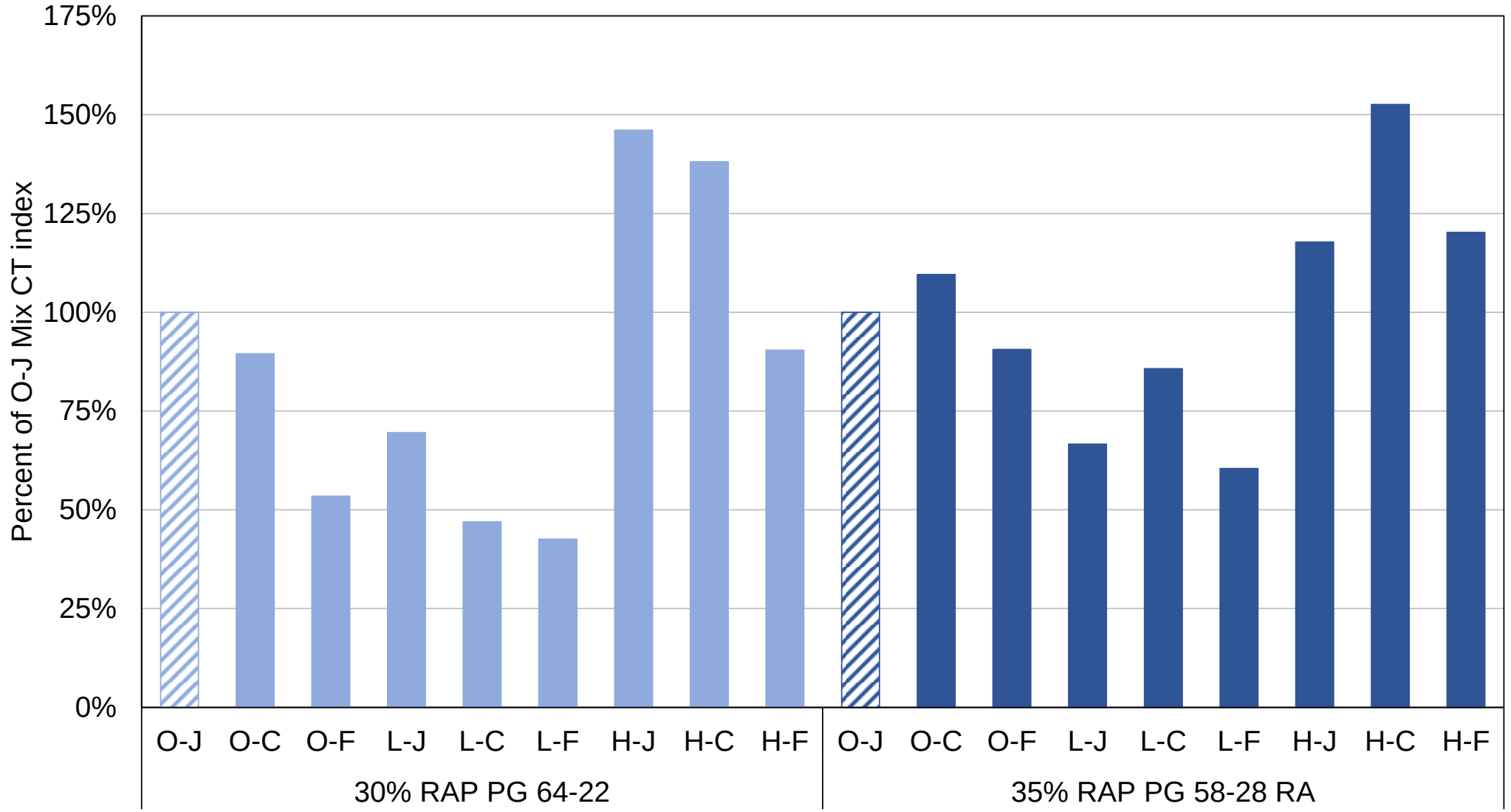
Rut Depth – Impact of Factors

Binder Content:
O = optimum
L – low
H – high
Gradations:
J = JMF
C = coarse
F = fine



CTindex – Impact of Factors

Binder Content:
O = optimum
L – low
H – high
Gradations:
J = JMF
C = coarse
F = fine



Things to Consider

- Variability is additive!

- Design, produce, and test with variability in mind
  - Better practices and consistency → lower variability
  - Training and experience → lower variability
  - Consistent materials → lower variability

- Understand acceptable levels of variability
  - Single operator variability
  - Between lab variability
  - Production variability

Things to Consider

- Control variability as much as possible – THE BASICS
  - Know your materials
  - Use correct procedures and methods
  - Be consistent - use same practice and methods every time
  - Training - there's always room to improve
  - Testing, testing, testing…
    - Experience matters
    - More data provides more information

Discussion and Questions

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