# IDOT
# HMA Update
## 2014

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**Illinois Department of Transportation**

**Illinois Asphalt Paving Association**

Design
Materials
Construction
Acceptance
Training
Research
Challenges

# Reduction in Number of Mixes Designs

# Reduction in Number of Designs

- Eliminate
  - N105 Binder and Surface - IN PROGRESS
  - IL-12.5 Surface Mixes – IN PROGRESS
  - N30 "All Other Mixes" (i.e. 2% Voided BAM for stabilized sub-base and shoulders)
  - IL-19.0 Coarse Graded Mixes
- ABR & Percent of RAP / FRAP / RAS
  - Developed Committee to Address

# HMA Fine Graded 19.0 Mix

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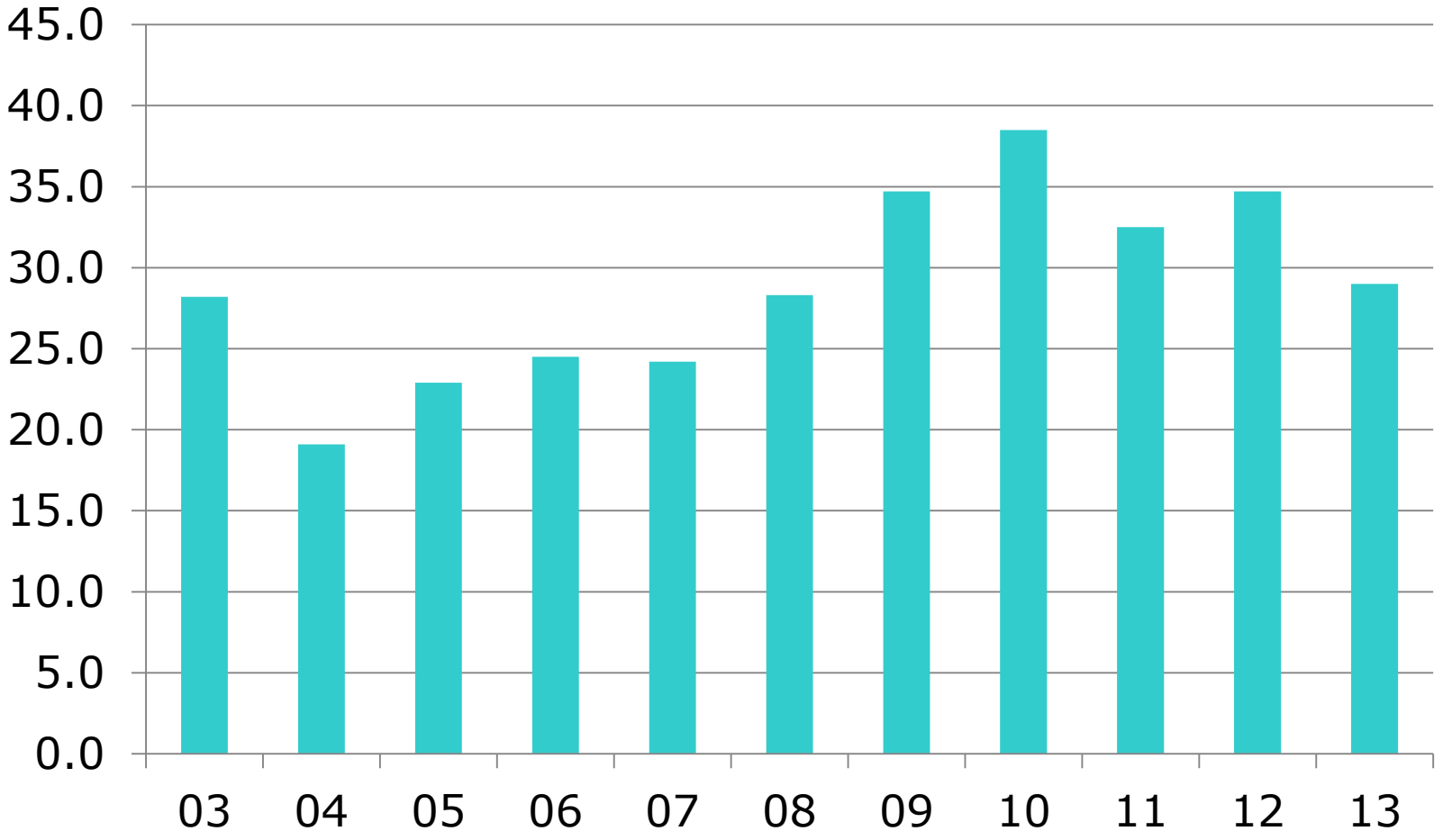
- Agreed at Joint HMA TWG to Abandon Coarse Graded IL-19.0 & go with Fine Graded IL-19.0
- BMPR Revised BDE Special *Mixture Design Composition and Volumetric Requirements*
  - Redefines our current IL-19.0 to be less coarse
  - Eliminates reference to N105 & 12.5 **Surface** Mix
  - Target November 2014 Letting as BDE
  - BMPR Special until then

# New ABR spec

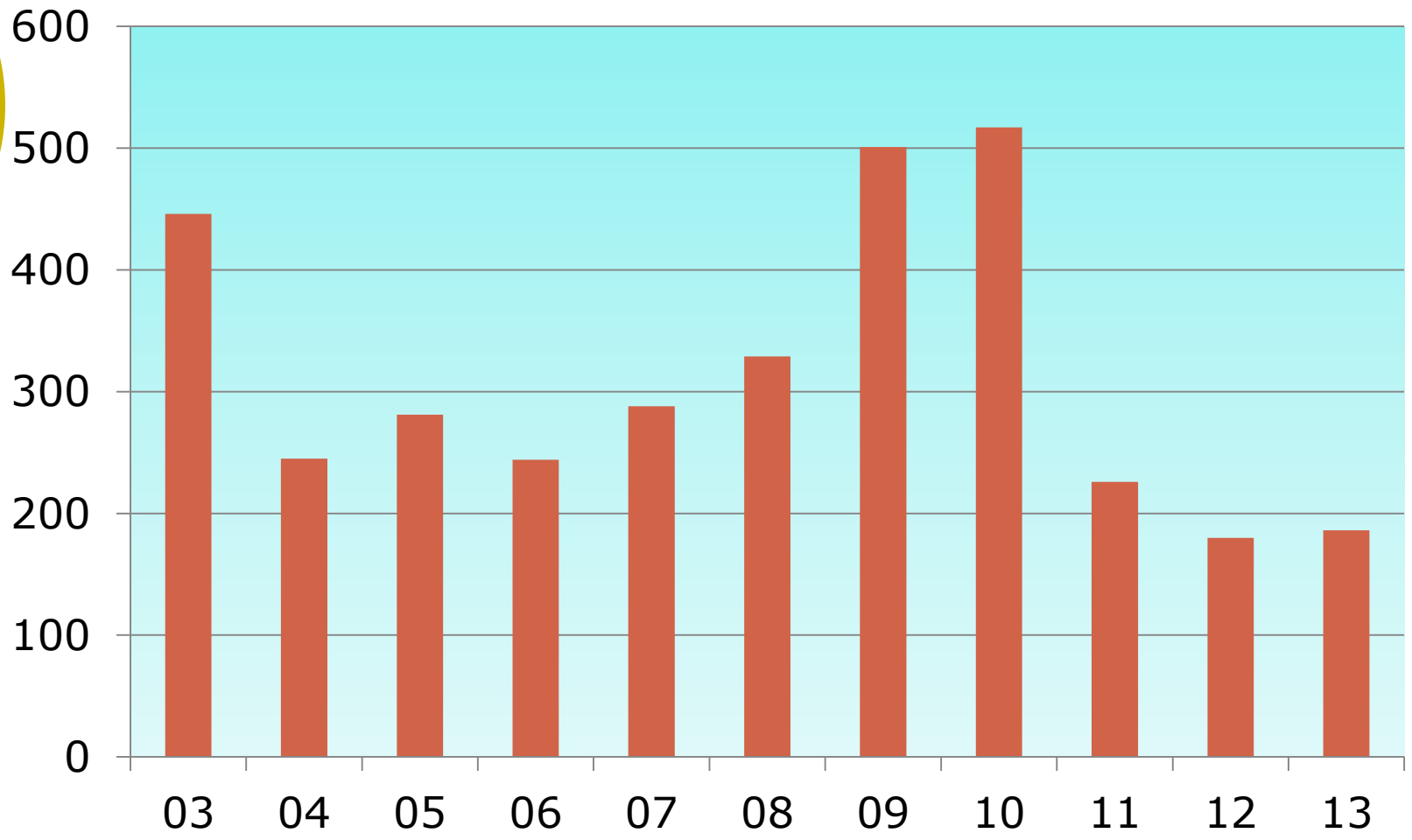
- The focus is on Asphalt Binder Replacement and not on how much RAP/FRAP or RAS is incorporated.

# PG Liquid Binder Usage

# % Polymer Usage



# PG Binder Used (in thousand tons)



# Liquid AC Sampling at HMA Plants

# 2013 District PG INV Field Samples

| District | Sample Total | Off Test | % Off Test |
|---|---|---|---|
| 1 | 419 | 17 | 4.1 |
| 2 | 72 | 3 | 4.2 |
| 3 | 52 | 0 | 0 |
| 4 | 81 | 1 | 1.2 |
| 5 | 98 | 0 | 0 |
| 6 | 100 | 2 | 2.0 |
| 7 | 145 | 1 | 0.7 |
| 8 | 164 | 0 | 0 |
| 9 | 110 | 1 | 0.9 |
| **TOTAL** | **1241** | **25** | **2.0 %** |

# Potential PG Binder Changes

- Softer grades of PG binder
  - PG40-40, PG52-34
- Reintroduction of Recycled Engine Oil Bottoms (ReOB) to binder
  - Cost/Benefit, method of measurement
- Classification of binder using MSCR in lieu of PG testing
  - Grade to high temperature of location
  - Mix performance unknown
- Asphalt Binder Replacement (ABR) rejuvenators

# Agg Issues

- Fine graded mixes creating too many fines.

# Contractor Labs

- Round robin testing of Gmm, Gmb, Voids, unconditioned and conditioned tensile strengths with Z-score.
- AMRL may begin round robin testing of Hamburg Wheel in 2016.

# Longitudinal Joint Issues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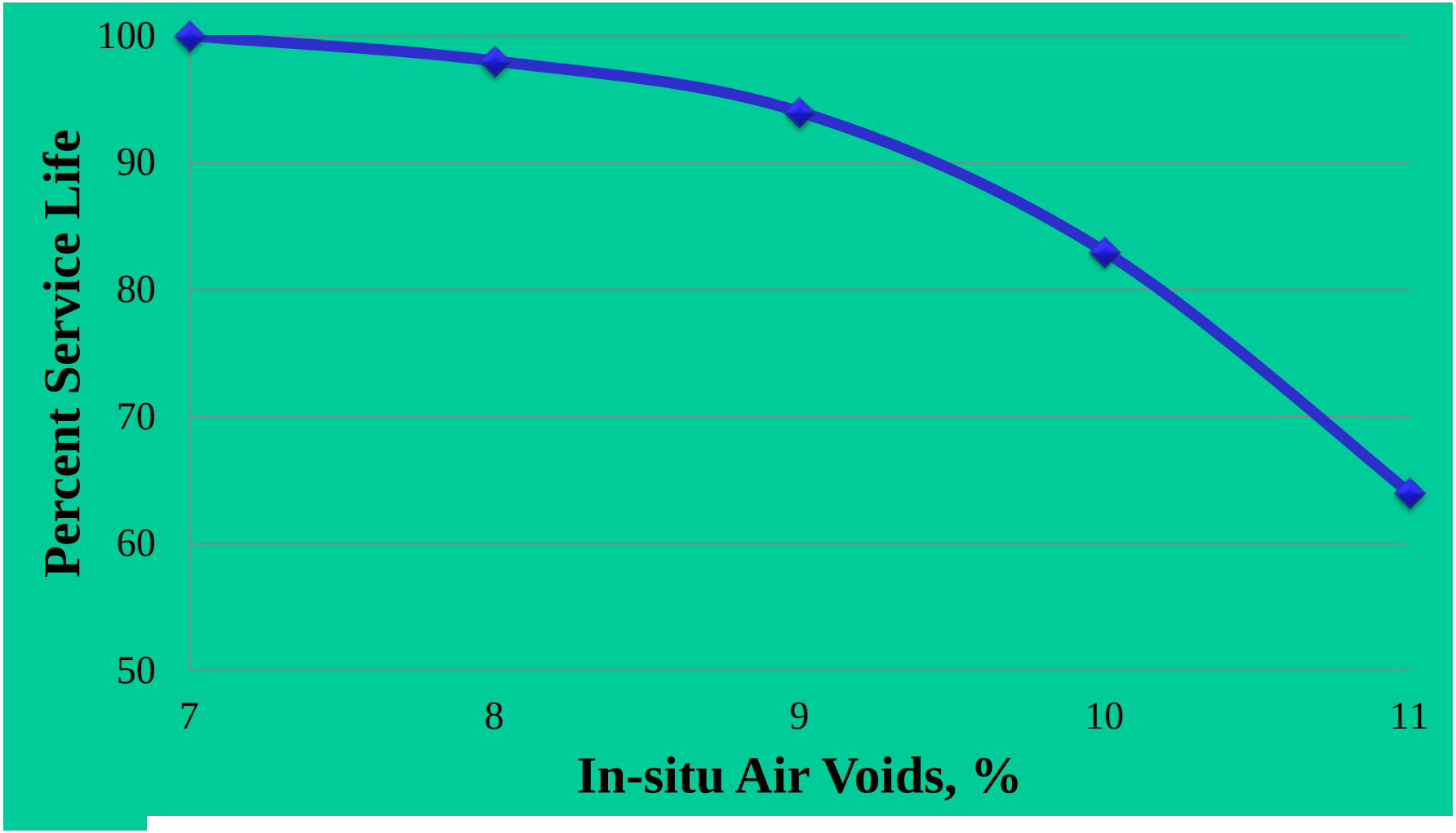
# Failing PFP Edge Densities

- Rapid Penetrating Emulsion
  - Used on D1, D2 & D6 PFP projects
  - Guide will be developed for RPE
  - Proposed use of RPE would be as follows:

# Effect of In-Place Voids on Life

## Washington State DOT Study



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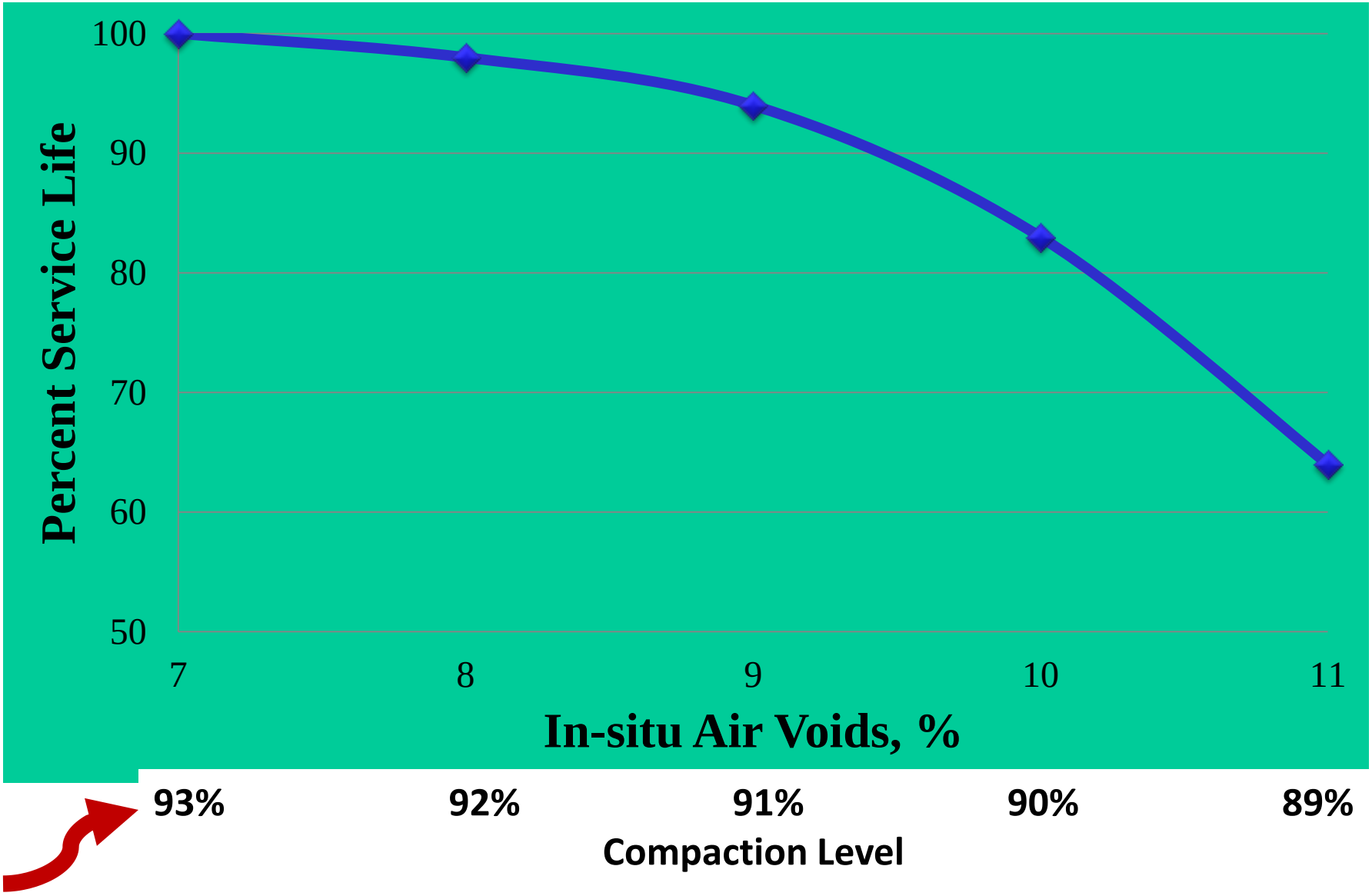

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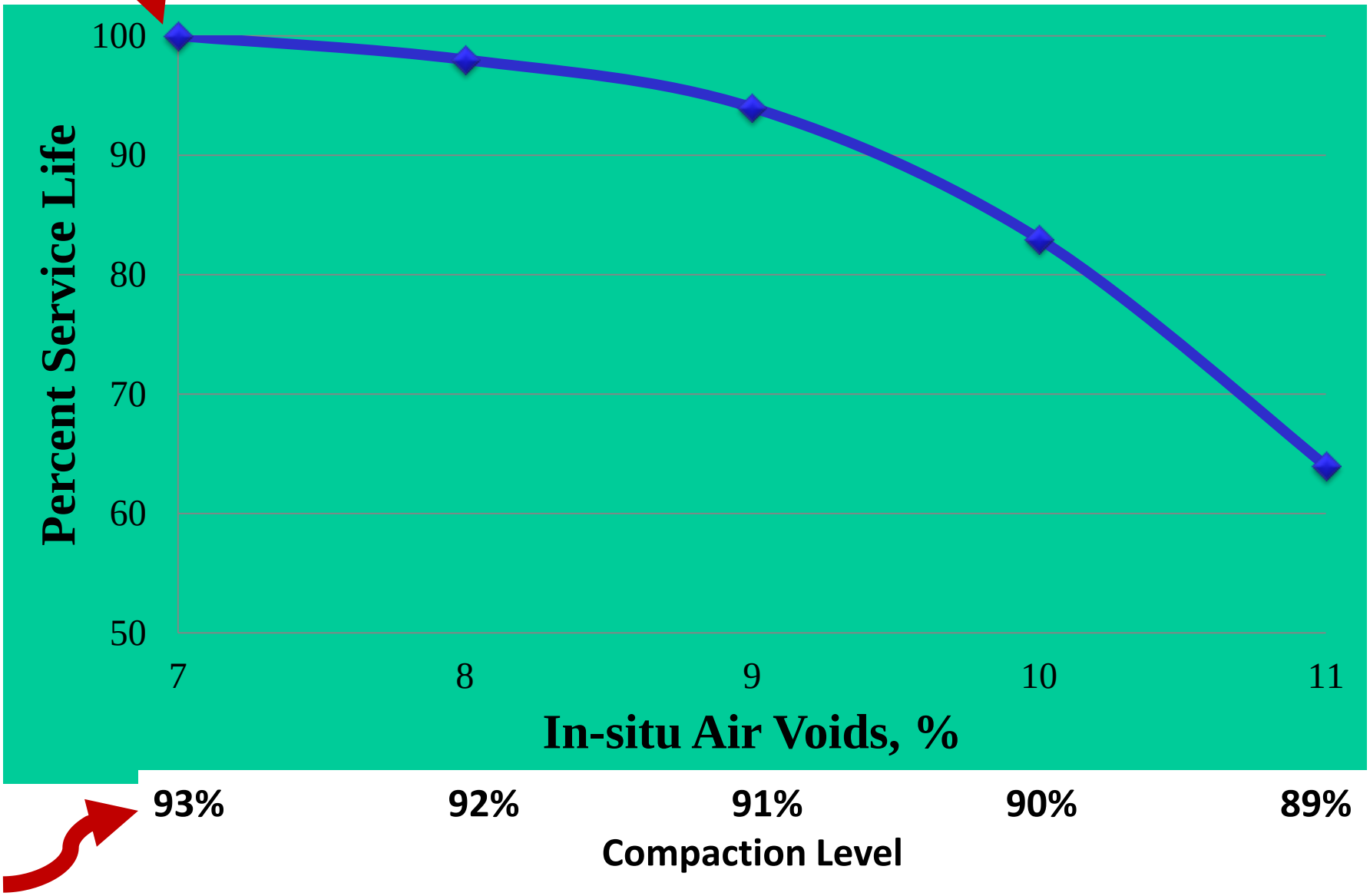

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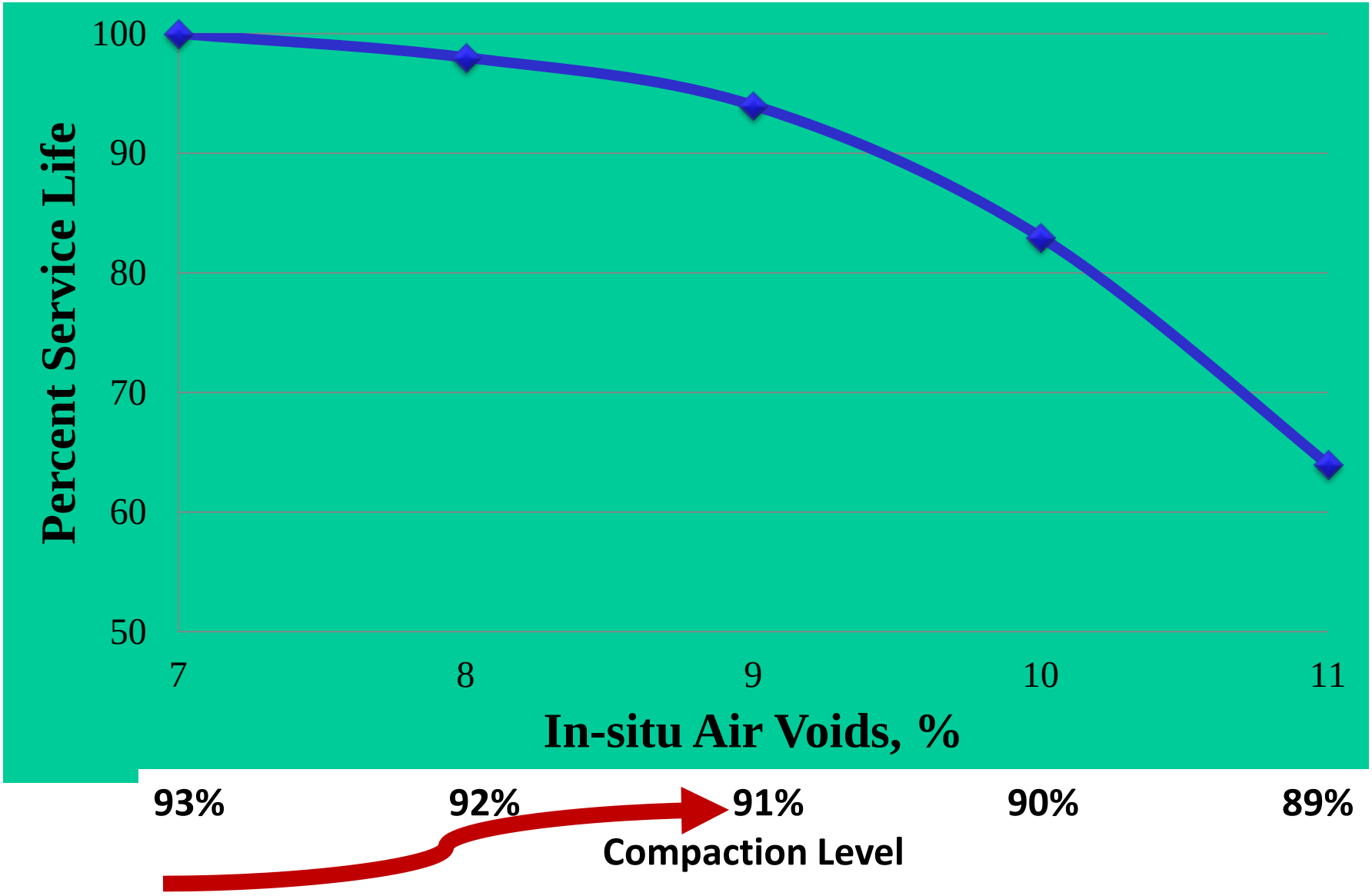

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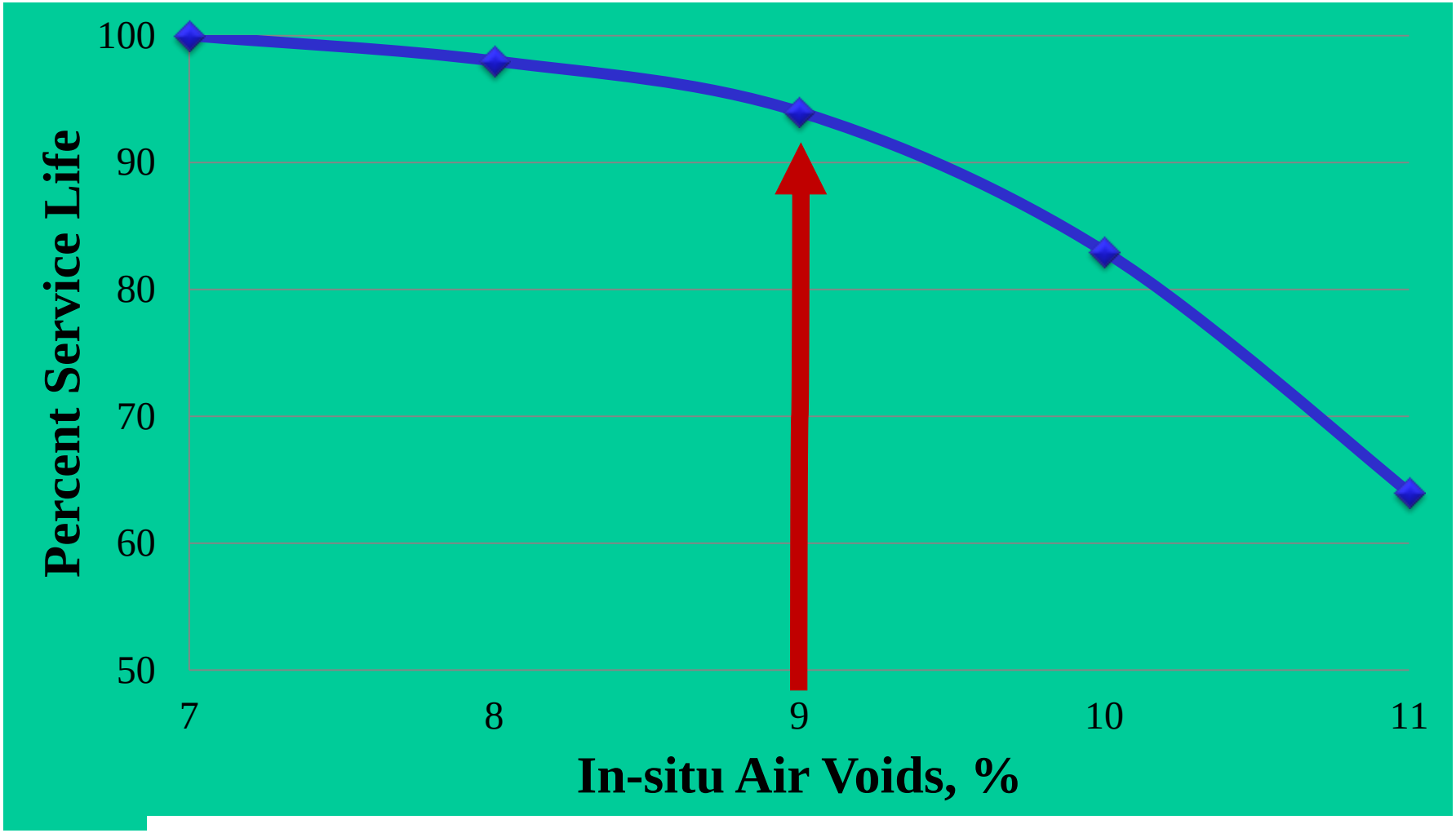

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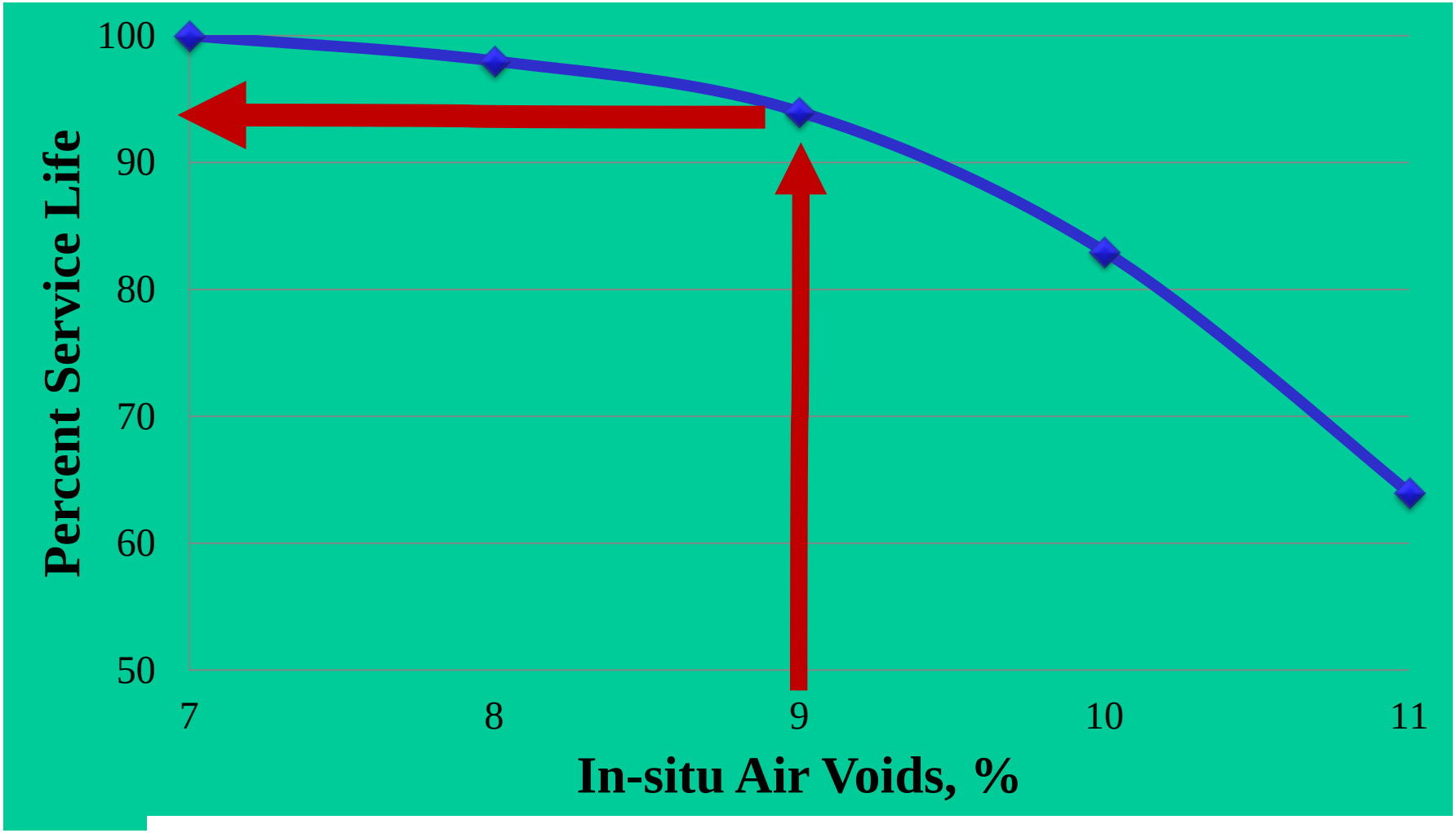

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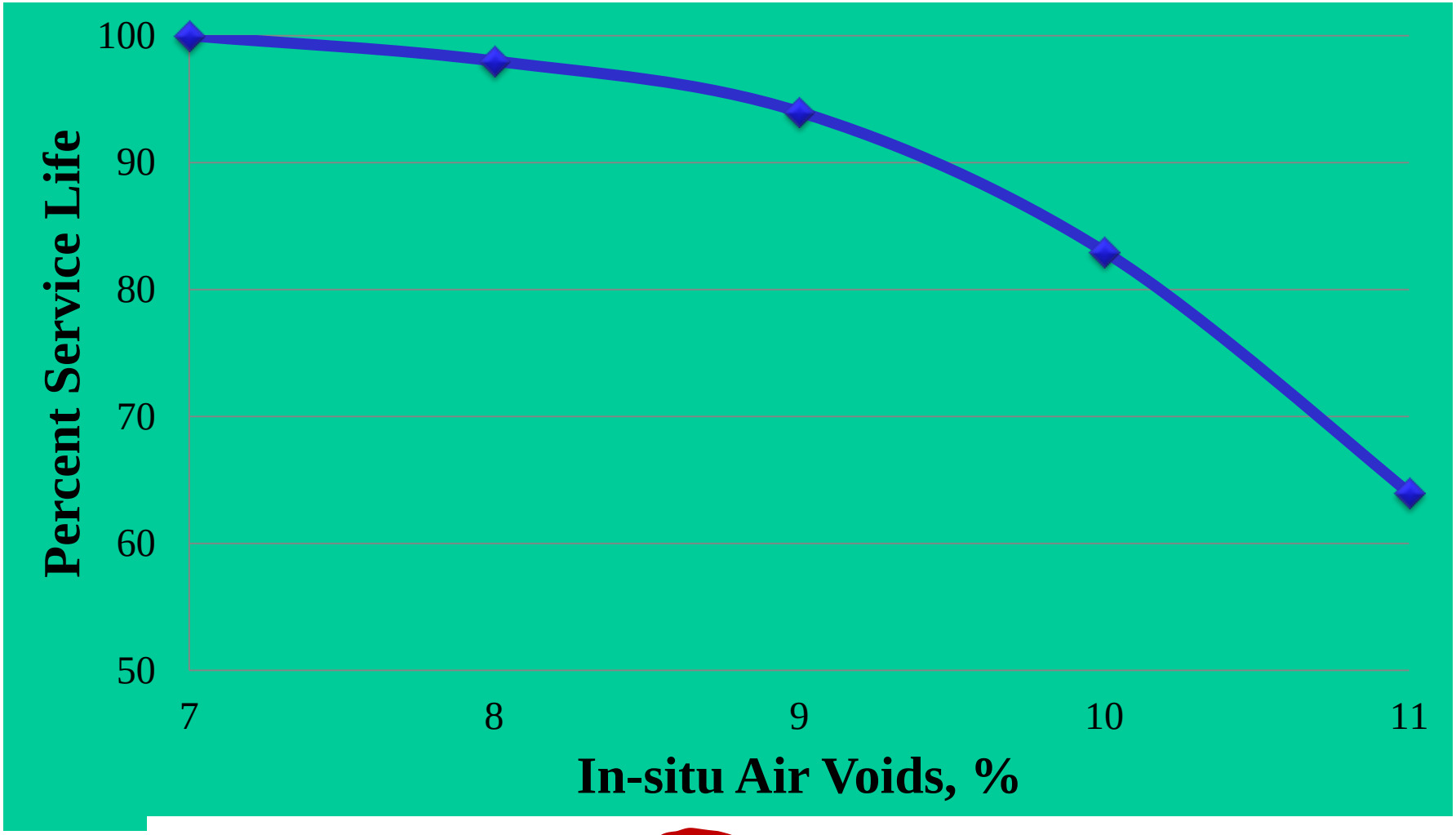

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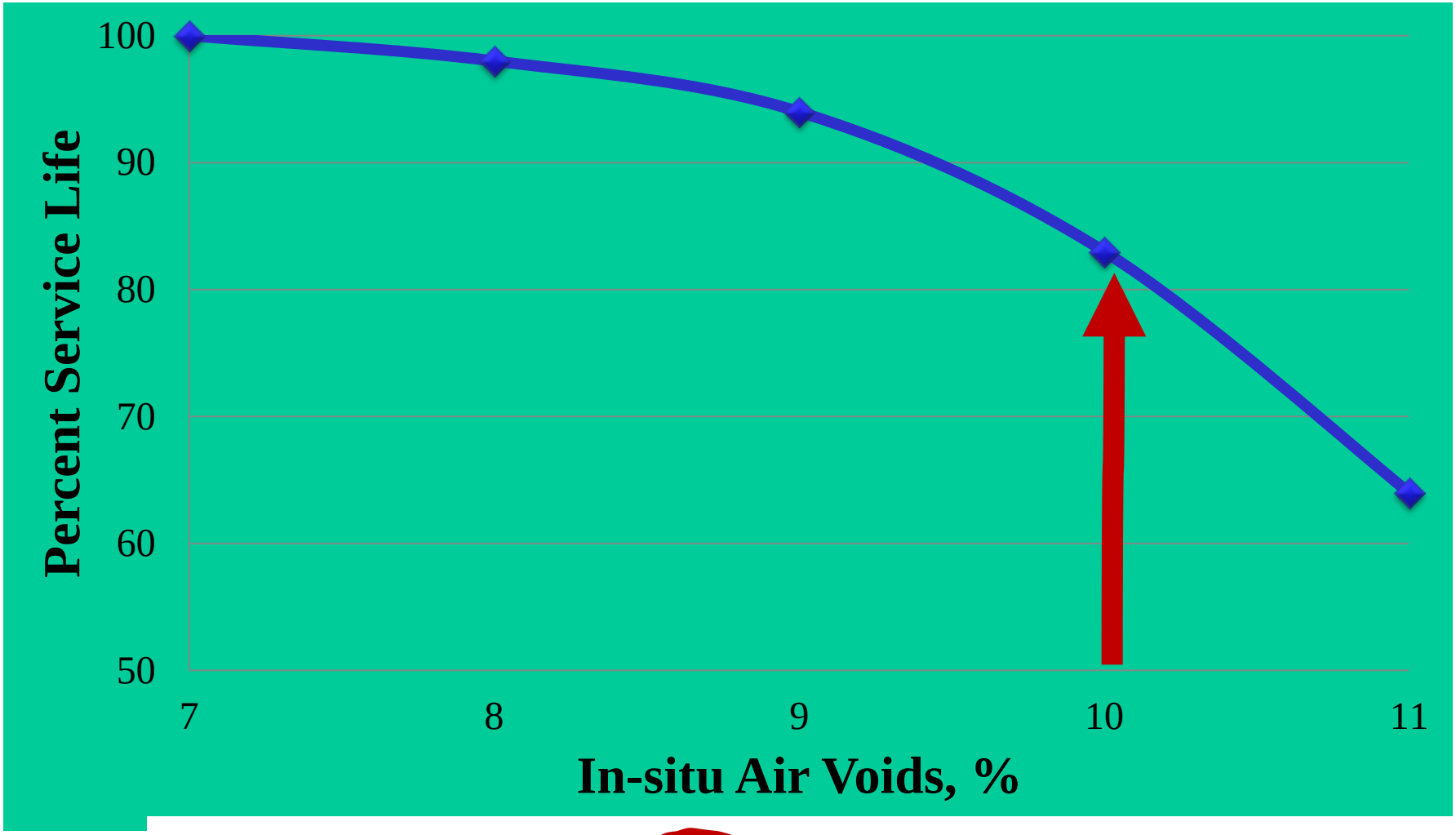

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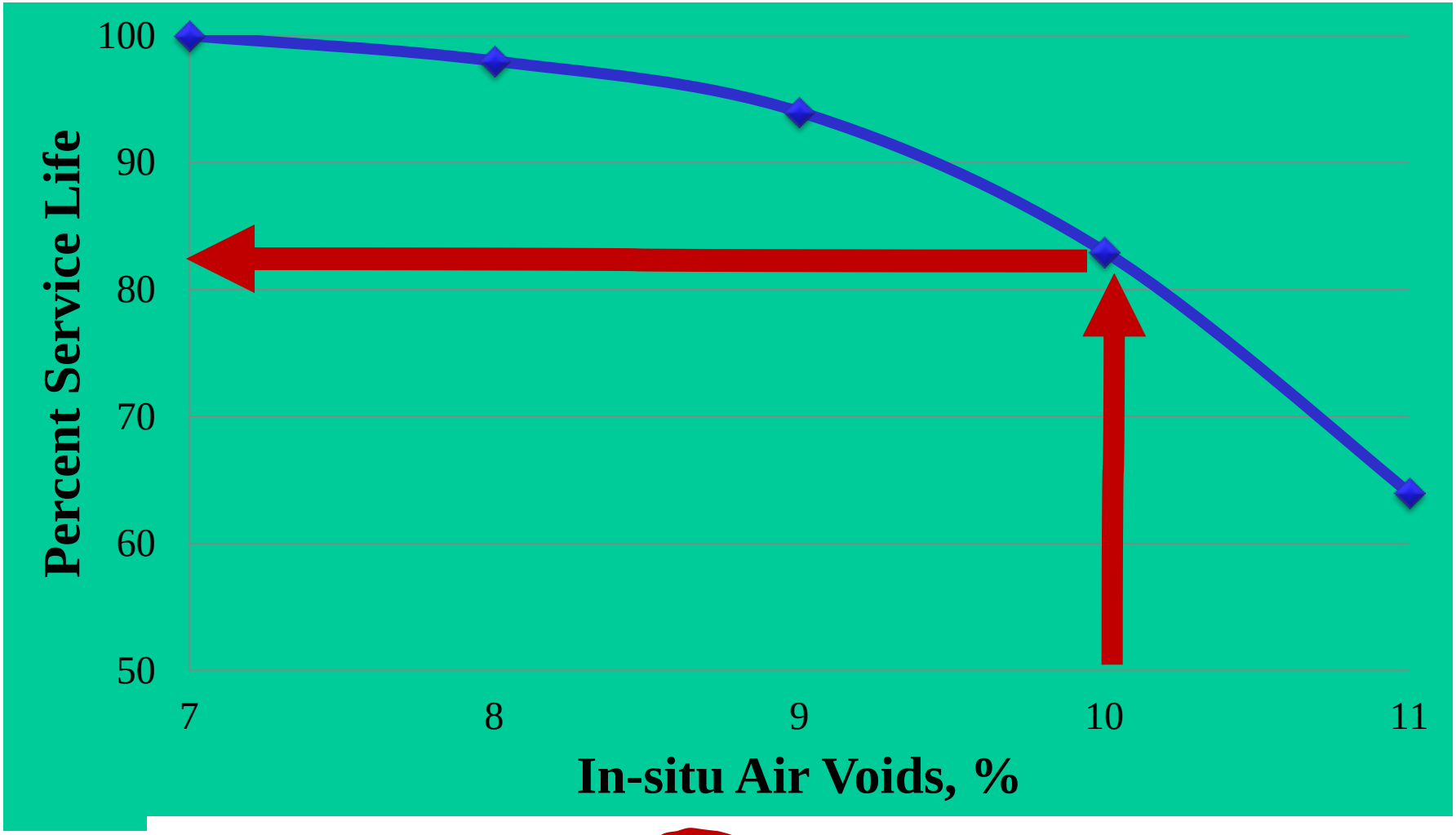

# Surface Mix – Erase Penalties If:

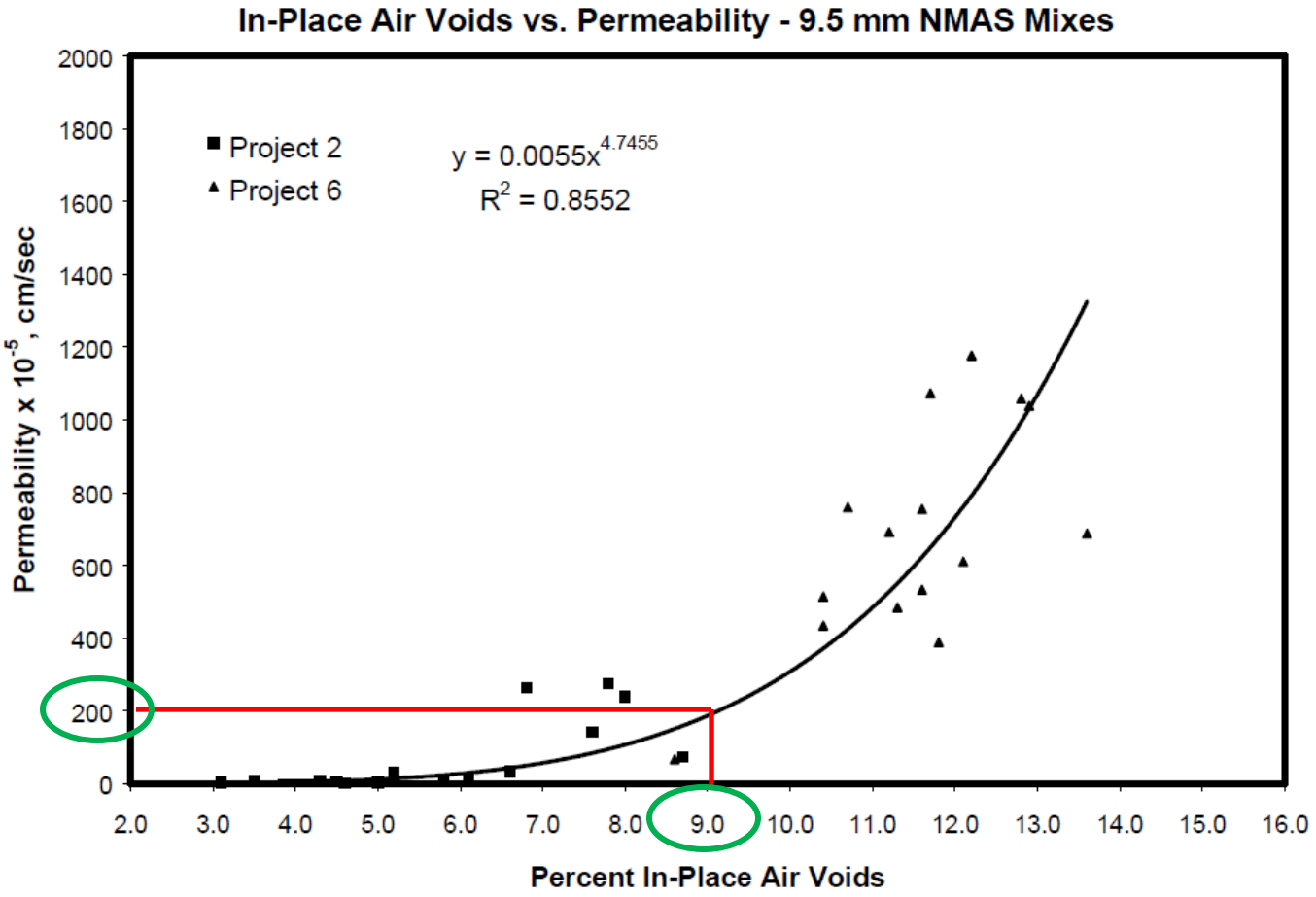


**Figure 5. Field Permeability-Density Relationship for 9.5 mm NMAS Mixtures**

# Binder Mix – Erase Penalties If:

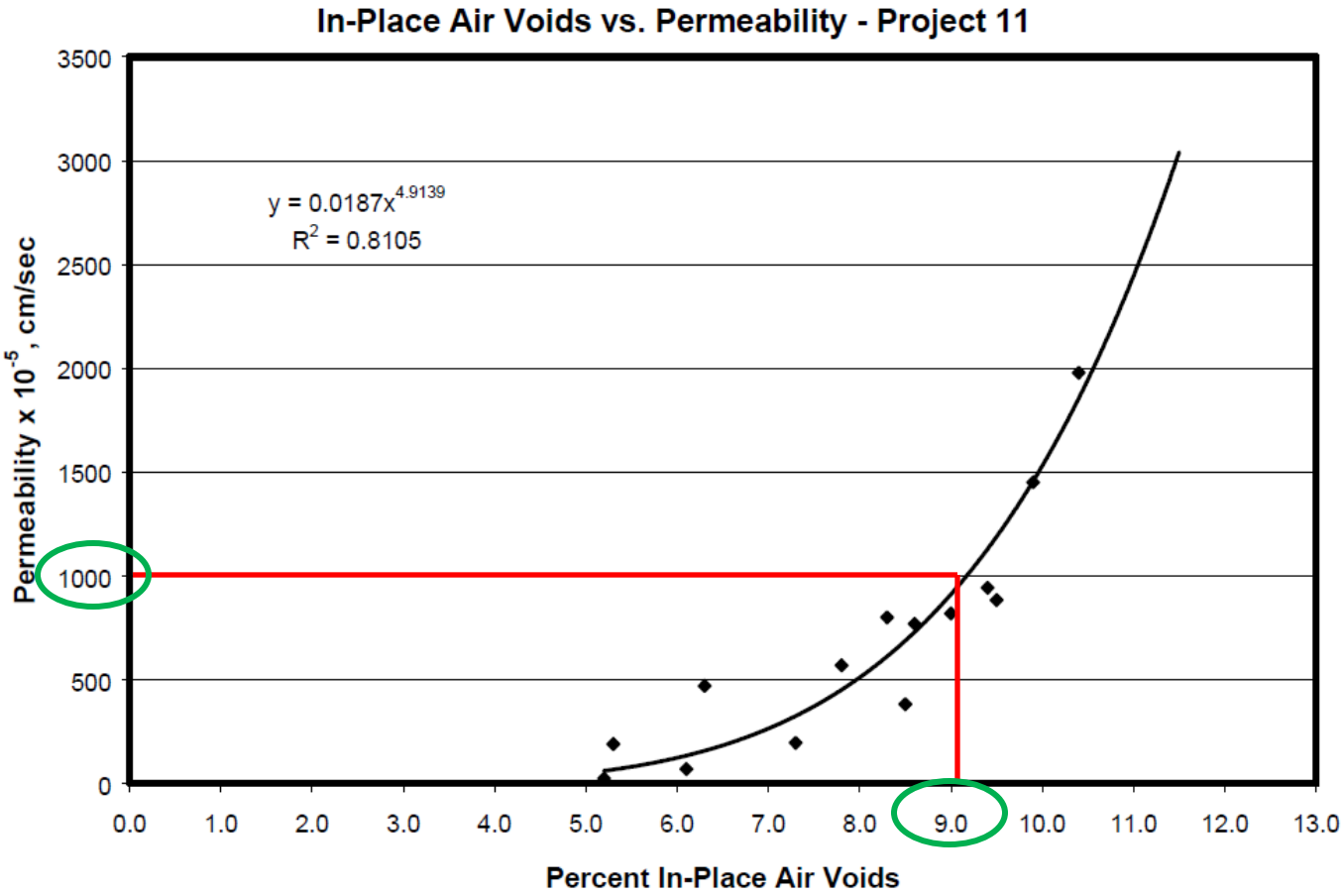


**Figure 3. Field Permeability-Density Relationship for Project 11 (19.0 mm NMAS Mix)**

# Paver Segregation

- Anti-segregation kits


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# The Future of Longitudinal Joints ??

- Require Longitudinal Joint Seal for all C/L Joints Unless:
  1. Lift Paved Against a Confined Edge

     or

  1. Full Width or Echelon Paving (i.e. no C/L Joint)

     or

  2. Remove Low Density Mat'l from Unconfined Edge (i.e. Trim Off 6 inches)

# Longitudinal Joint Seal 12 Yrs Later

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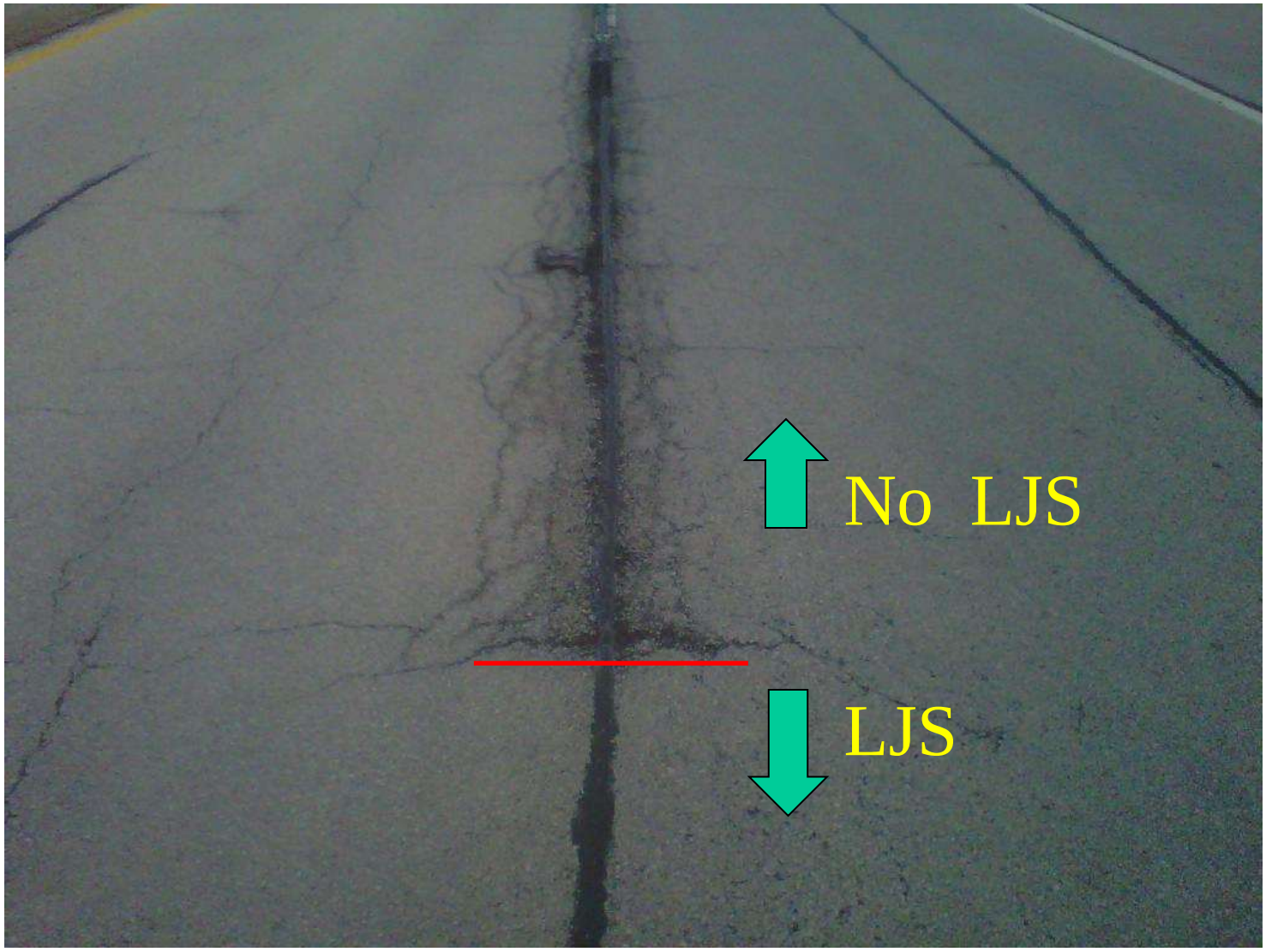


# Material Transfer Device
# Proposed Specification

# Current Spec

- MTD w/ > 20 psi contact pressure not allowed on lower lifts of a full depth HMA pavement until 10 in. thickness in place.

# Proposed Spec

- Require an MTD on all lifts of a Full Depth pavement.
- Only MTD's with contact pressure ≤ 25 psi allowed on lower lifts where < 10 inches in place.
- Spec will be drafted & sent to BDE.

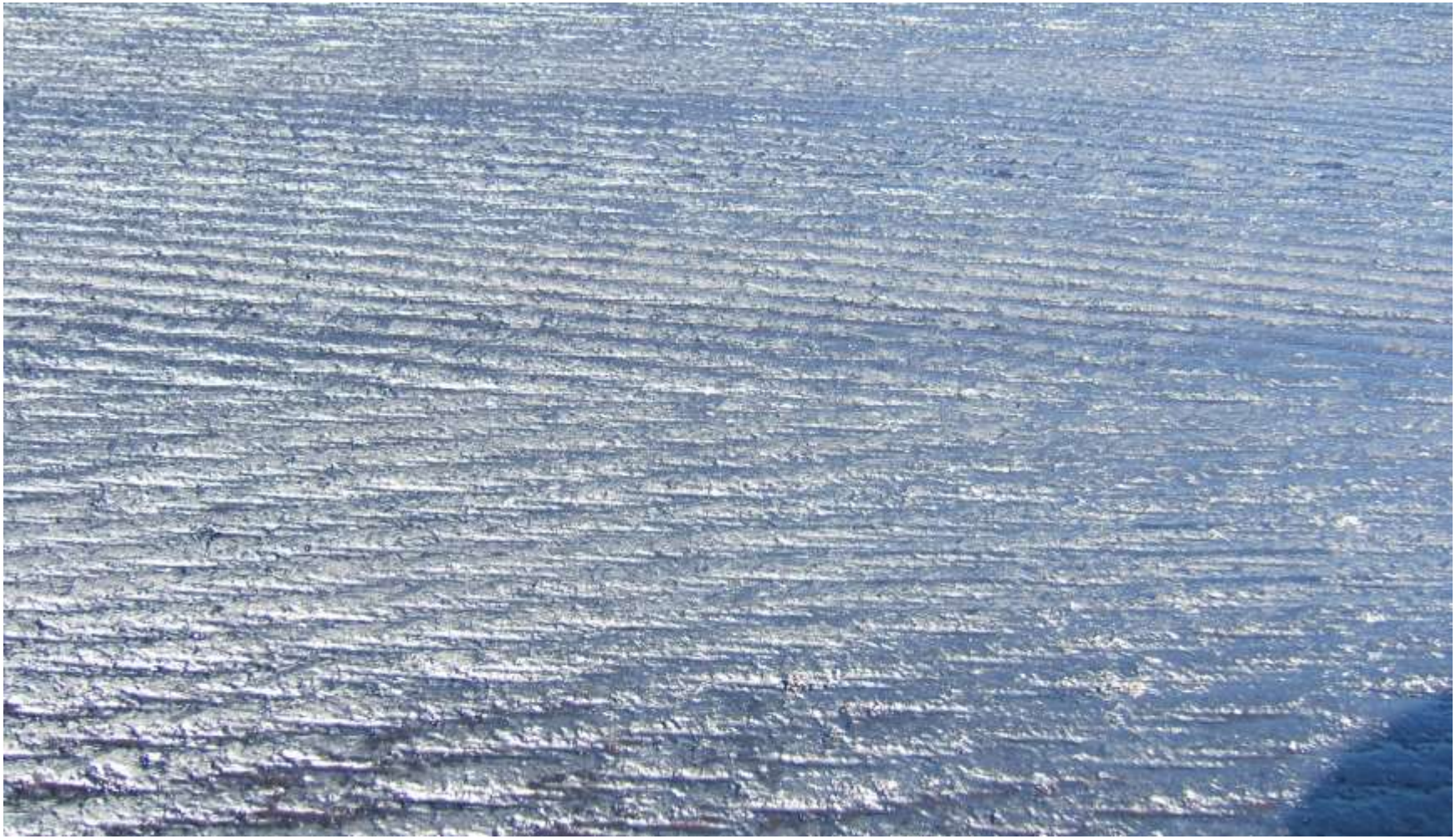
# Tack Coat Spec Status


FREIGHTLINER
006

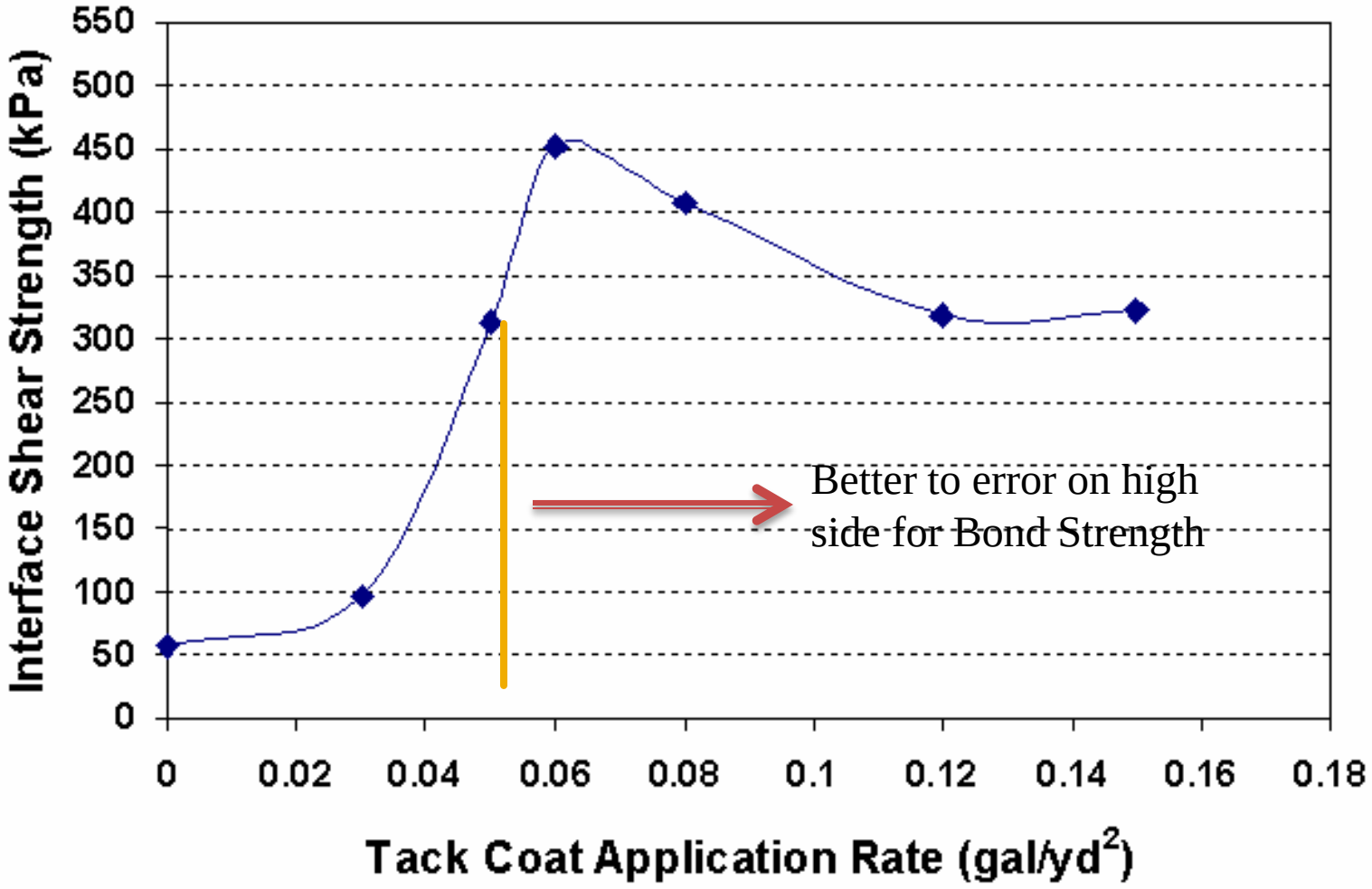
# 2013 Experience

- Not Enough Tack Coat being Applied
  - Jobs visited Tack Coat was < ½ the specified rate.
- Improper Cleaning
  - Vacuum Sweeper either not being used or
  - Wrong type of Vacuum Sweeper.

# Still Not Enough



# Bond Strength vs Residual Asphalt Application Rate



# Current Tack Coat Spec

- BMPR Special is on the Website
- Latest Revisions:
  - "Vacuum sweeping shall be accomplished with a regenerative air vacuum sweeper."
  - "A bituminous prime coat shall be applied between each lift of HMA according to Article 406.05(b)."
  - "The regenerative air vacuum sweeper shall blast re-circulated, filtered air through a vacuum head having a minimum width of 6.0 feet at a minimum rate of 20,000 cubic feet per minute."

# Regenerative Air Vacuum Sweeper

# What's Next?

- Monitor success of pavement cleaning with brooming and air blasting or sweeping.
- Test additional emulsions for applicability to rapid set.
- Monitor the use of "spray pavers".
- Target 2015 as BDE Special.
- Correct terminology from Prime Coat to Tack Coat for next Spec Book.

# Hamburg Wheel

# Hamburg Spec

- Effective Nov. 2013 Letting – All mixes must pass Hamburg Wheel

*HMA – Mixture Design Verification and Production*

# Hamburg Spec

- Production – A 300 ton Test Strip will be required at the beginning of HMA production
  - for each Mixture with 3000 tons or more
  - for each Contract
  - The 300 tons are excluded from pay adjustments on QCP and PFP. However, requirements of Section 406 still apply.

# Hamburg Spec

- Required Hamburg Wheel Test (run by Dept). If Hamburg Test fails, production shall cease.
  - All prior produced material may be paved out, if other mix criteria met.
  - No additional mix produced until Engineer receives passing Hamburg Wheel test from Contractor.

# 2013 PFP Summary

# 2013 PFP Projects

| District | Projects | Tons | % Jobsite |
|---|---|---|---|
| 1 | 24 | 351,596 | 0 |
| 2 | 0 | 0 | N/A |
| 3 | 2 | 34,727 | 100 |
| 4 | 2 | 19,509 | 100 |
| 5 | 3 | 48800 | 100 |
| 6 | 2 | 54,378 | 100 |
| 7 | 7 | 155,000 | 100 |
| 8 | 4 | 89,000 | 100 |
| 9 | 3 | 52,381 | 100 |
| Total | 47 | 981,396 | |

Nov 1, 2013

# 2013 PFP Projects

| Final Pay | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 96.4 | 99.3 | | 99.0 | 97.5 | 102.2 | 102.2 | 100.2 | 92.7 | 94.2 |
| 100.3 | 102.8 | | 99.7 | 101.4 | 103 | 101.2 | 102.6 | 97.8 | 96.2 |
| 99.6 | 97.7 | | | | 99.5 | | 100.9 | 99.3 | 99.2 |
| 101.9 | 92.3 | | | | | | 101.6 | 96.0 | |
| 100.1 | 101.2 | | | | | | 102.4 | | |
| 99.4 | 93 | | | | | | 102.5 | | |
| 100.7 | 92.9 | | | | | | 102.2 | | |
| 101.9 | 96.3 | | | | | | | | |
| 99.0 | 103 | | | | | | | | |
| 97.8 | 100.5 | | | | | | | | |
| 99.8 | 92.7 | | | | | | | | |
| 102.1 | 100.1 | | | | | | | | |

# 2013 PFP Average Pay

- Binder = 98.6
- Surface = 99.5
- Overall = 99.1

# PFP Issues

- Low Longitudinal Joint Density
  - Numerous ½ mile sections had pay deducts according to PFP Pay Adjustment Table or required **Remedial Action**
  - Most sections needing Remedial Action were treated with Rapid Penetrating Emulsion (RPE)

# PFP Spec Revisions for 2014

- Editorial Cleanup
- Remove wording that PFP cannot be used on Shoulders
- PFP Spec Stable Δ will become a BDE Special for November Letting

# 2013 QCP Summary

# 2013 QCP Projects

- 31 Mixtures Completed
- 211,680 Tons
- Average Pay = 99.7%
- Range => 96.4% – 100%
- Department Tested 53.0% of Samples

# QCP Spec Revisions for 2014

- Allow the sublot size to be adjusted by project.
- Revised Pay Document to allow $yd^2$ pay item.
- Eliminate Dust/AC Precision Limit.
- Added footnote to Dust/AC Pay Table that District will test all 4 sublots if Dust/AC out-of-spec.

# Local Agency Acceptance

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One Scenario

# PFP
# QCP
# Quality Managed Plant (QMP)

- Specification
  - QA by Local Agency
  - Mix from a Qualified Plant
    - District splits samples once/month or 10,000 tons per plant
    - District monitors problems
    - District coordinates round robin testing

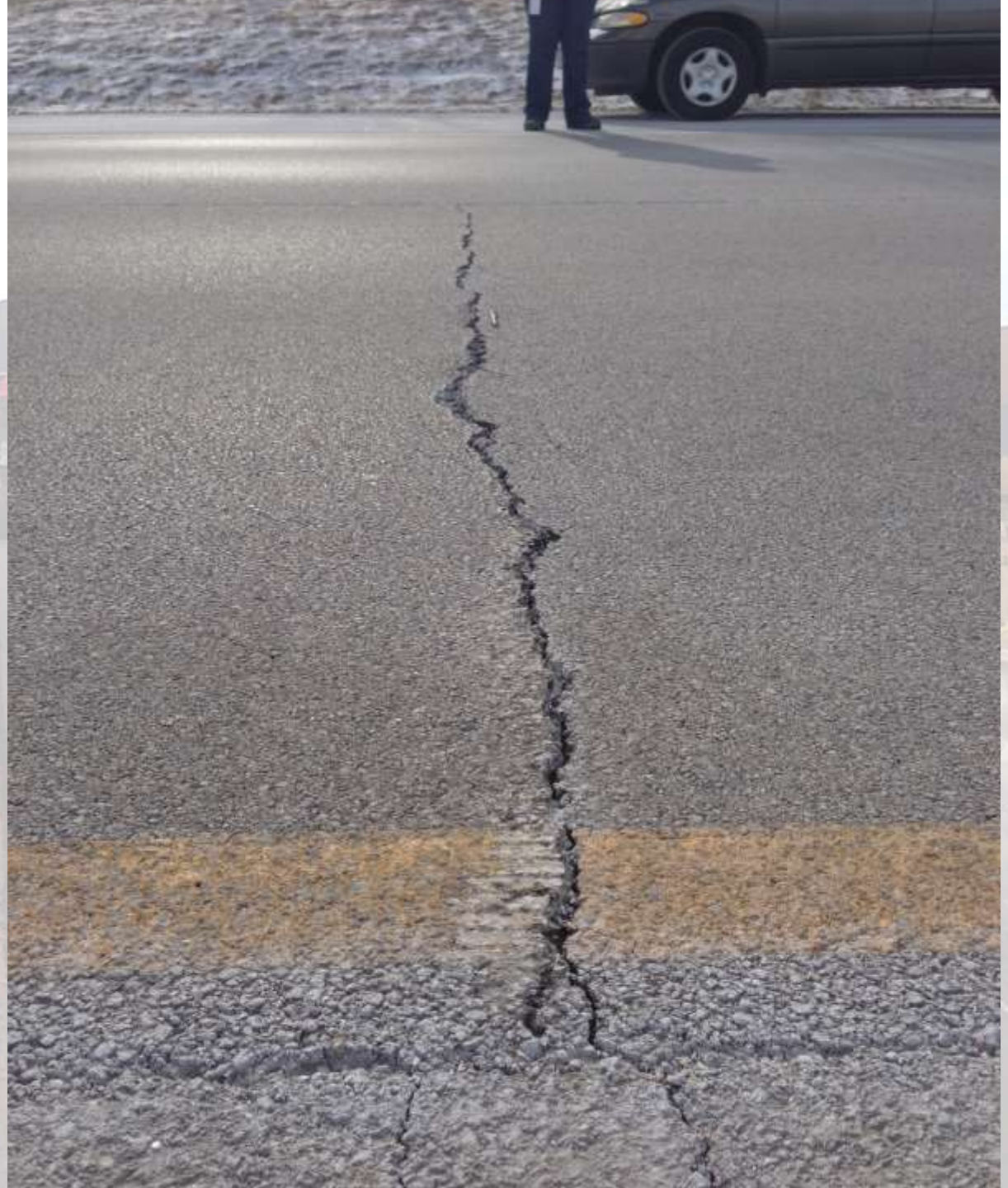
# HMA Inspection Course (a.k.a. - RE Training)

# HMA Inspection Course

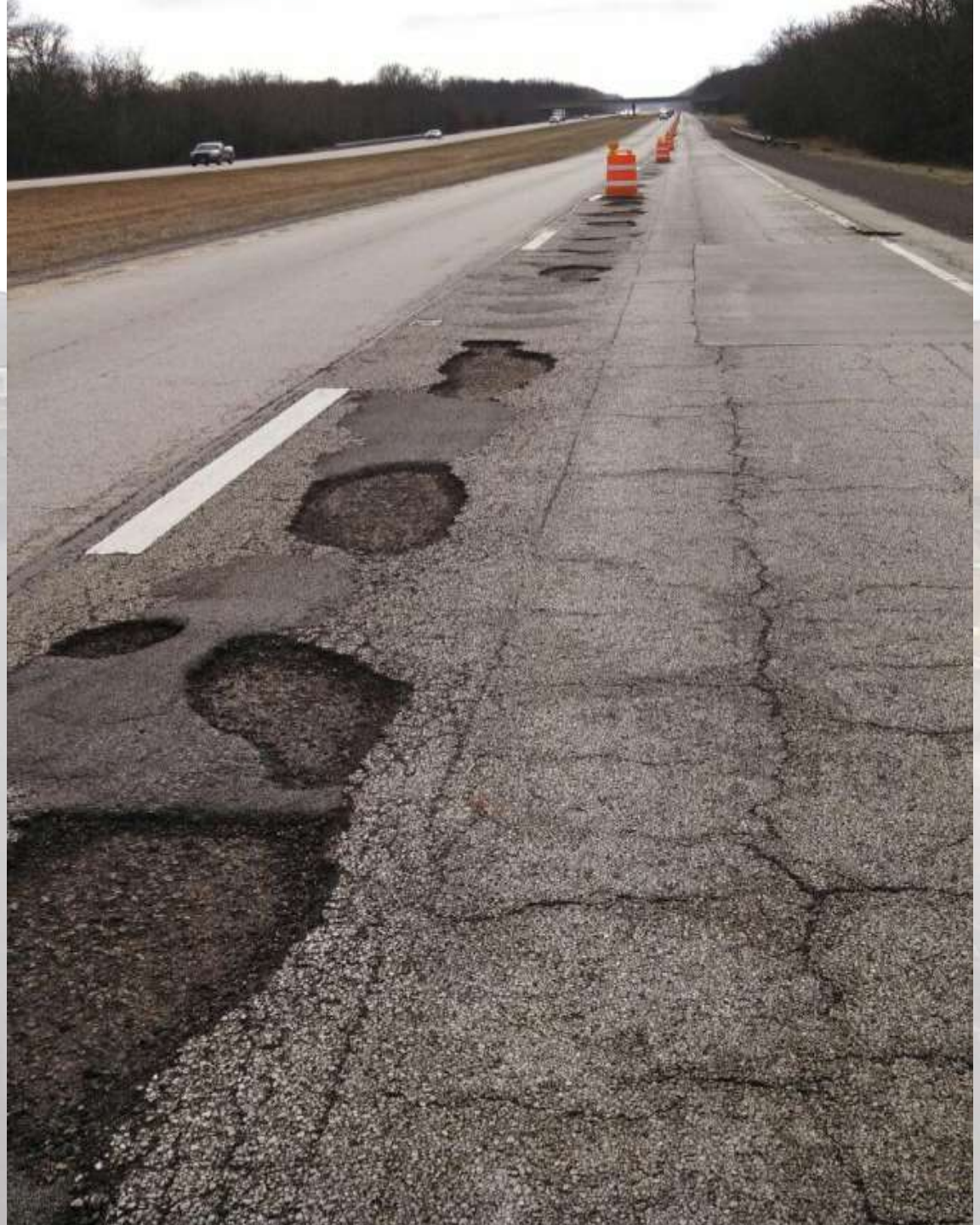
- One day course developed for & being taught in all Districts this spring
- Targets PI (Materials &Construction) personnel
- Emphasis on:
  - PFP & QCP Duties
  - Jobsite Sampling
  - Longitudinal Joints
  - New Tack Coat Spec
  - Paver Segregation
- Future of Course – department STTP class

# HMA Toughness/Brittleness Test

- ICT project, Prof. Imad Al-Qadi
- Testing Protocols to Ensure Performance of High Asphalt Binder Replacement Mixes Using RAP & RAS  Project ID: R27-128
- Fatigue?
- Cold weather Thermal Cracking?



# Future Challenges



# Rubblizing and Full Depth HMA