



# Performance Specifications for Rapid Renewal (R07)

Peer-to-Peer Technical Exchange

September 20-21, 2016

So. Burlington, Vermont

**Mark Woolaver, Vermont AOT Construction Paving Engineer**



U.S. Department of Transportation  
Federal Highway Administration



# Vermont Facts...

- VT Land Area = 9,248 Square Miles Rank 43<sup>rd</sup>
- Vermont Population = 626,930 Ranking 49<sup>th</sup>
- Still Have Highest Ratio of Dairy Cows to People



Second Oldest Median Age In USA (42.8)



# Vermont Facts...

Discovered (Seen) in 1535 by Jacques Cartier, Vermont became the 14<sup>th</sup> State on March 4<sup>th</sup> 1791. (Vers Mont)



In 1609, Samuel de Champlain was the first European to step foot in Vermont. (Vert Mont)

**Vermont Facts...Highest Elevation, Mt.  
Mansfield @ 4,393' (Washington @ 6,289'  
Denali @ 20,310')**



Vermont Facts...Lowest Elevation, Lake Champlain @ 95' (Death Valley @ -282')





# SHRP2 SOLUTIONS

STRATEGIC HIGHWAY RESEARCH PROGRAM

## Performance Specifications for Rapid Renewal (R07)

### Full Depth Reclamation With Cement

*Advances Towards PRS/PBS*



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- We / They Can Do It. ie. “Design” a Product Beyond a “Recipe” Formulation That will Exhibit and Stand up to Performance Expectations
- We Now Take a few Tests During Construction, Apply I/D's, Take Down the Orange Signs, Cross Our Fingers, and Hope for the Best for the Next 20 Yrs

# Moving On....



**The attitude that you have as a parent is what your kids will learn from, more than what you tell them. They don't remember what you try to teach them. They remember what you are.**

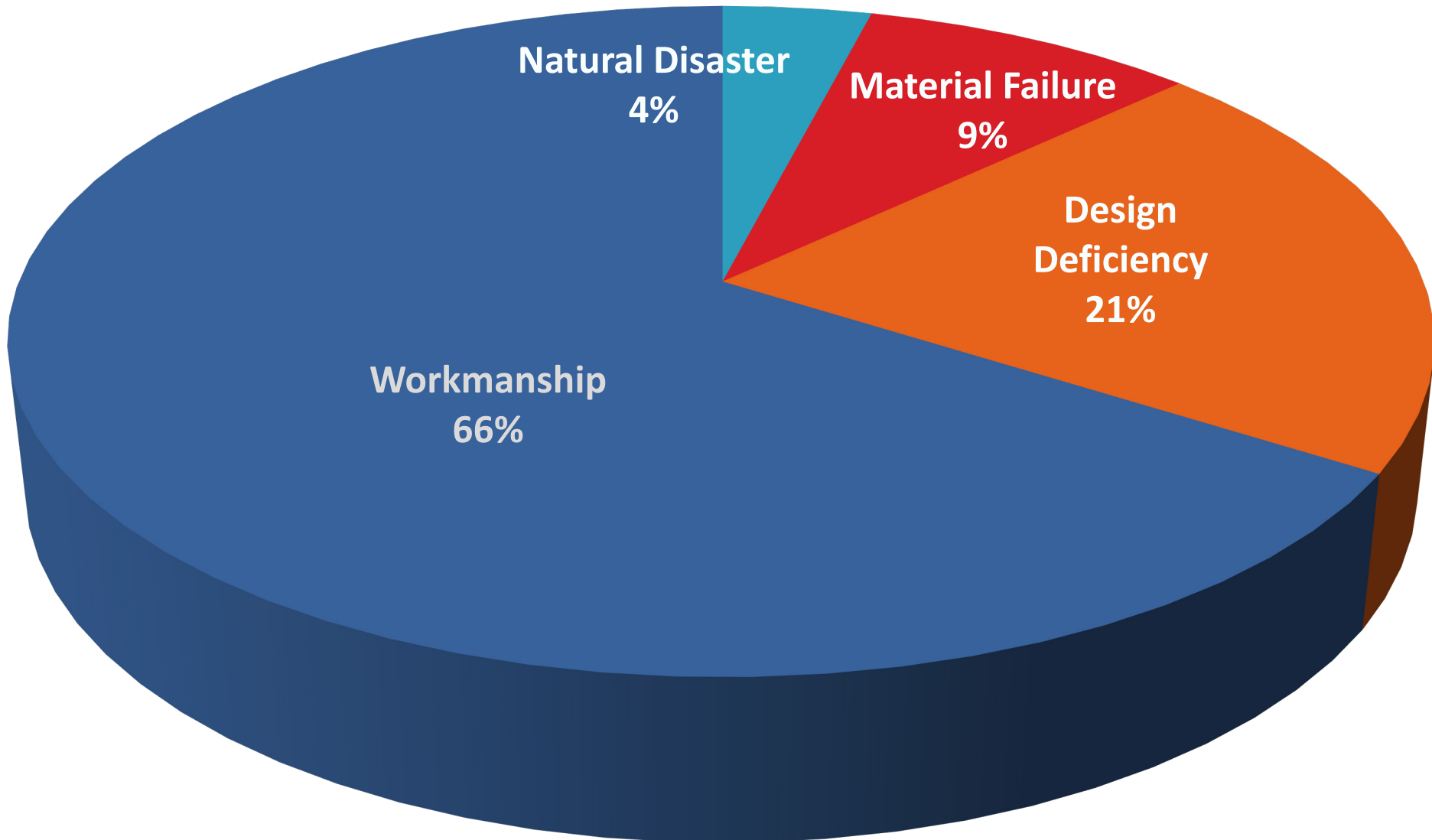
**~ Jim Henson**

Done Venting....

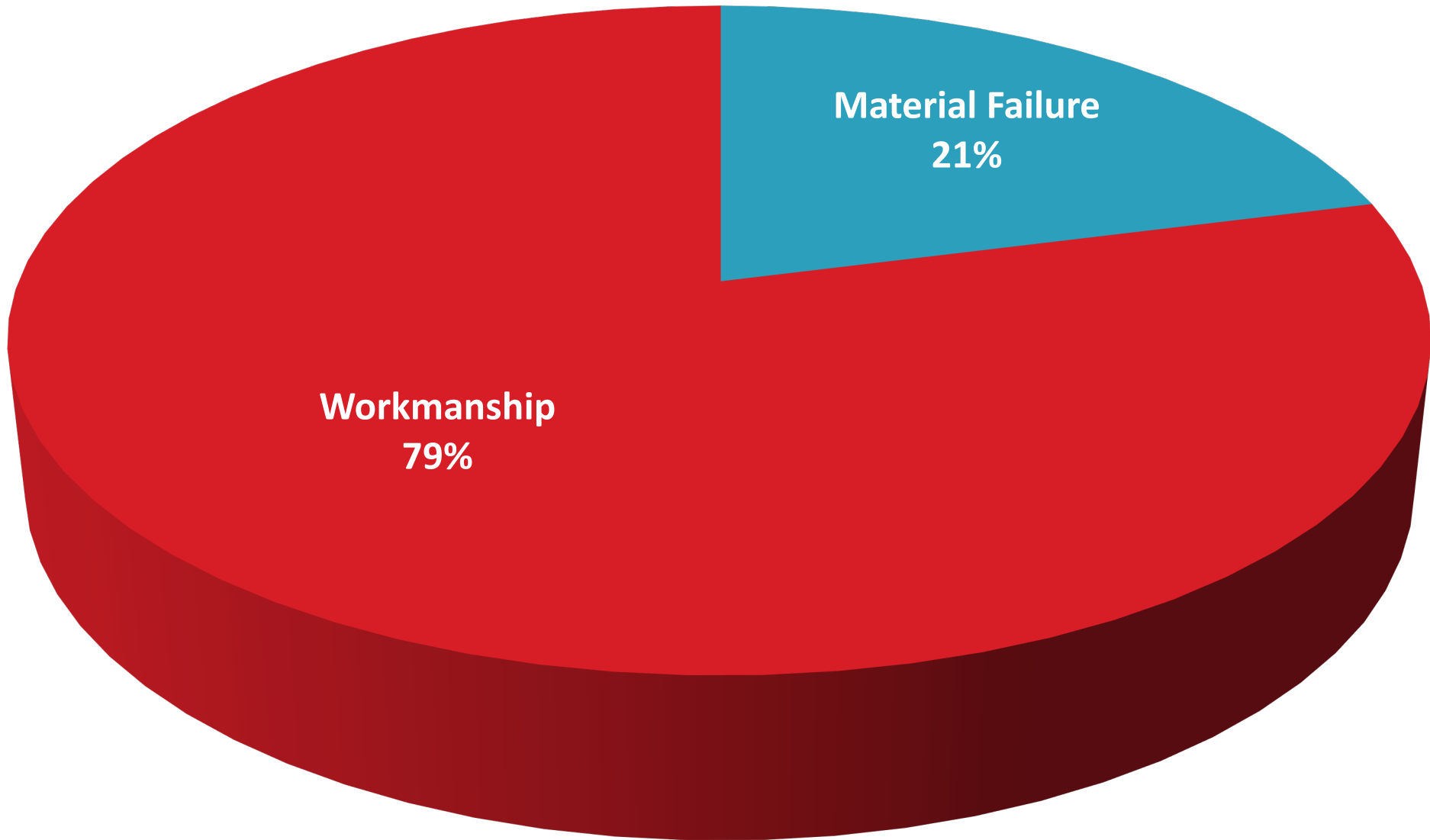
Just Remember "End of Life" vs  
"End of Project"

# Construction Causes of Failure

Source : IBA Consultants, Inc.



# VT (Paving) Construction Causes of Failure



# Compaction, Compaction, Compaction





# Brief History of FDR in Vermont

What Is FDR w/Cement in VT?

It Was...

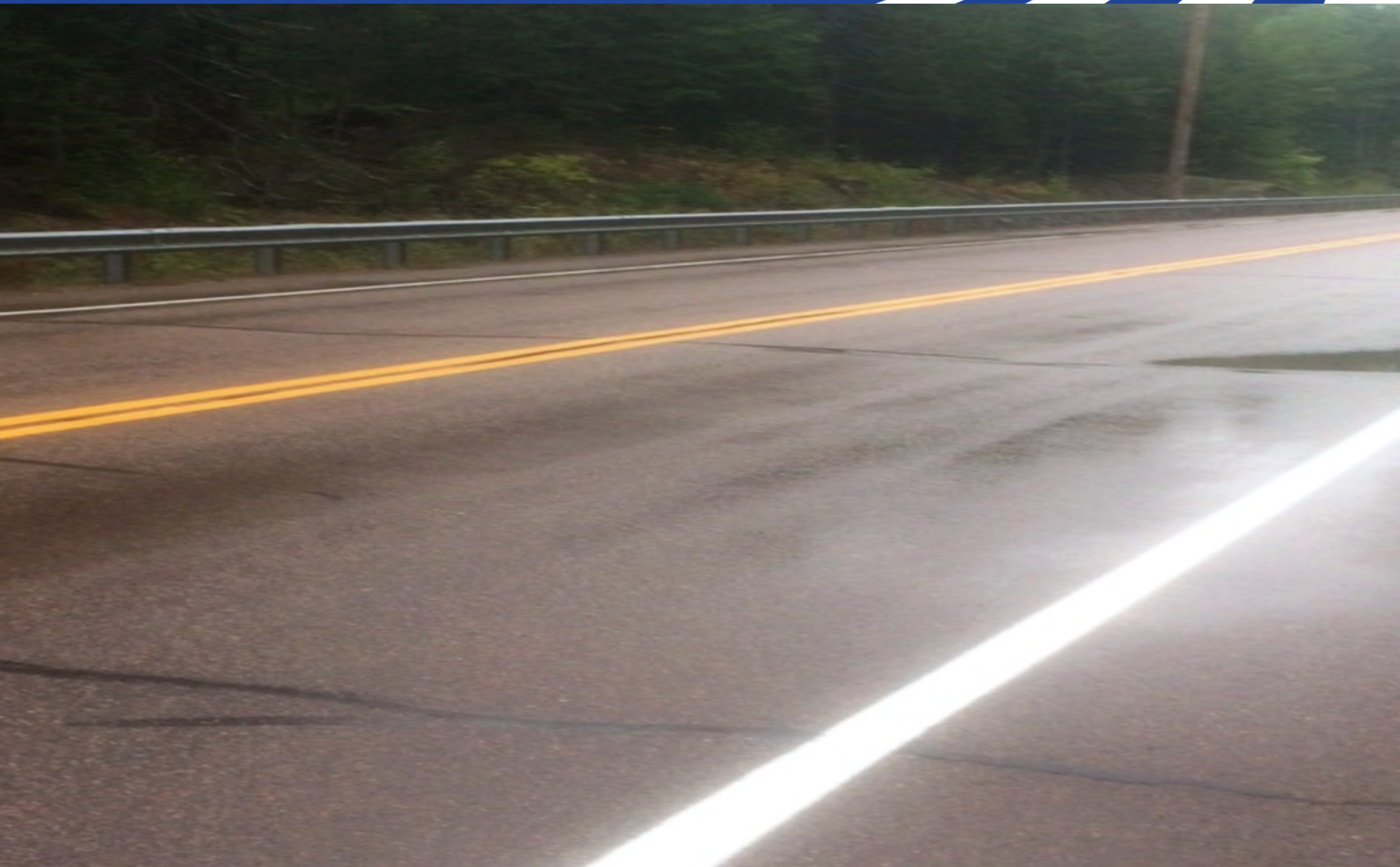
- Purely Method Spec
- QC / QA Marginal at Best
- No Borings / Test Pits (Rare)
- Contractor Mix Design Under Production
  - Field Cores @ 7 Days
- Target (Spec) Strength = 175 – 350 psi
  - Field Breaks = >350 – 1200 psi

So What Were the Results?

# VT FDR Distresses



# VT FDR Distresses



# VT FDR Distresses



# Executive Repairs



# The Next Step...

- So What did we do?
  - ETG Scanning Tour / Formed
  - Moratorium on Cement at Executive Level
- RSB Scanning Tour
  - Recommended Spec Revisions / Improvements
  - Primarily Construction (Workmanship) Based
- Specification Revisions
  - Redline / Blueline Versions
  - Partial Implementation 2015 / Shadow 2016

# ETG Findings

- Quickly Realized That Method Spec Was Insufficient
- Identified Key Performance Indicators (KPI's) to Base Spec Improvement
  - Capacity
  - **Uniformity**
  - Durability
  - Safety
  - **Rider Comfort**
- Pseudo Performance Related / QA Spec Developed

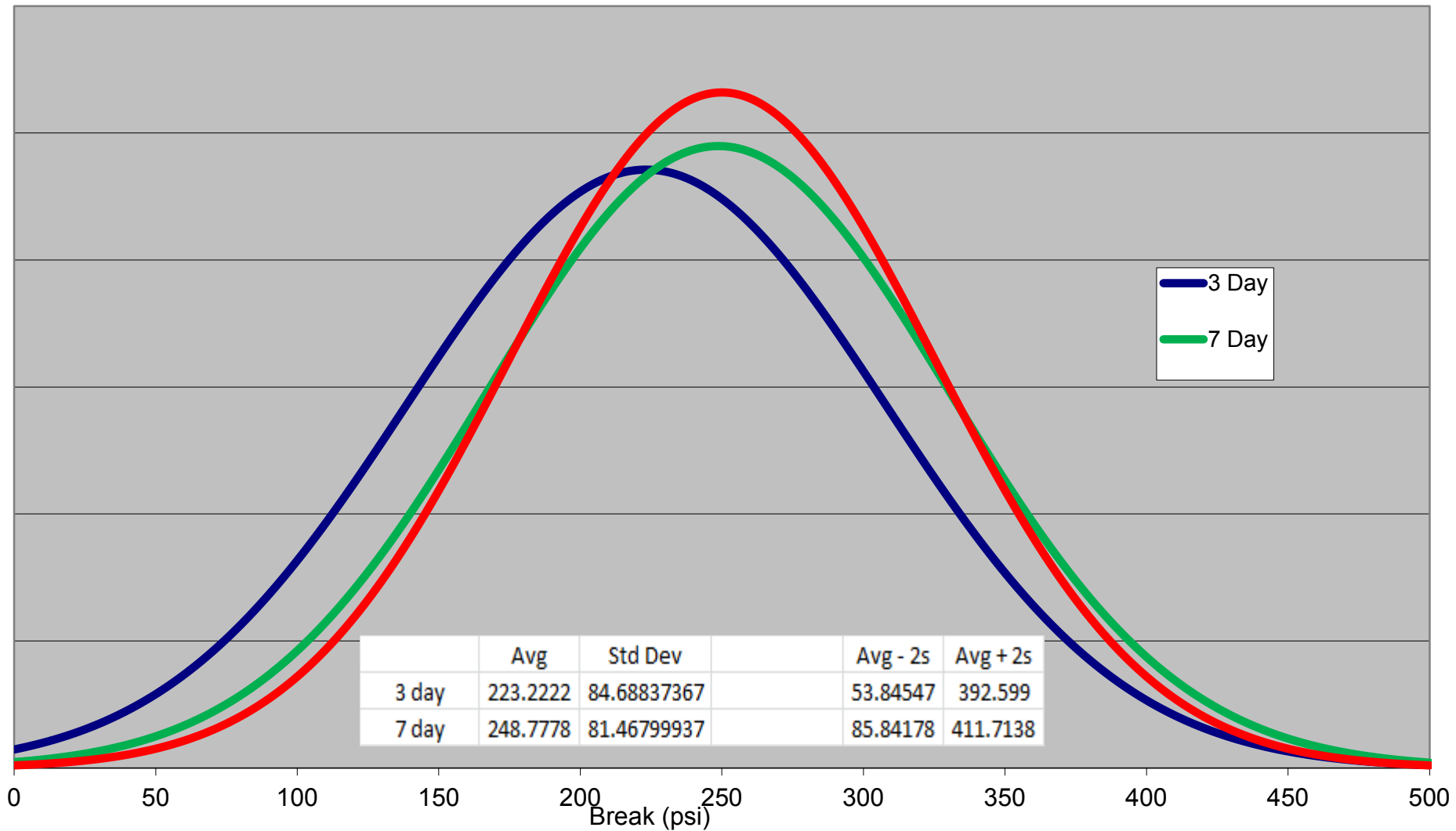
# Specification Revisions

- **Agency Mix Design Based on Contractor Sampling**
- **Required QC Plan**
- **Defined “Supplemental Aggregate”**
- **Equipment Requirements**
- **Tightened Moisture Requirements**
- **3 and 7 Day Split Molds Allowing QC Feedback**
- **Cement Application / Monitoring**
- **Fog Seal Required**
- **Microcrack Emphasized**
- **Soils Trailer Required**
- **Field Staff Roundtables**



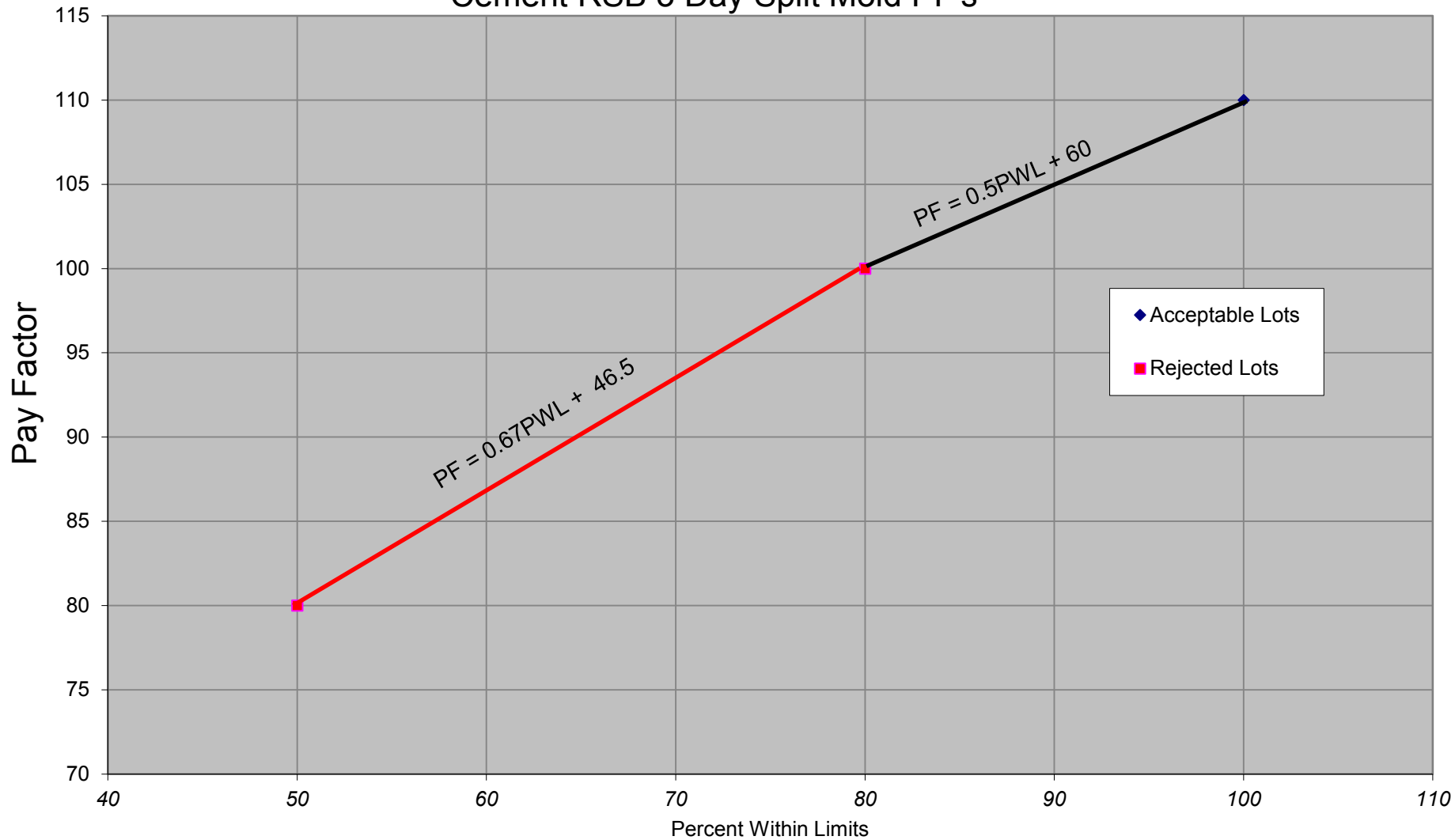
# FDR Split Mold Normal Dist's.

Split Mold Break Normal Distributions



# Vermont Shadow PWL / PF

Cement RSB 3 Day Split Mold PF's



# Summary



- Method Specification Outdated
- We're not Fully There but Advancing Towards PRS
- KPI's Must be Identified and Accepted by All Interested Parties
- Spec Revisions Should be Vetted Through all Interested Parties
- Training / Emphasize Inspection Requirements

# Next Steps



- Continue to Shadow Current Spec for 2017
- Continue to Monitor Performance of Projects Constructed Utilizing Current Spec
- Further Modify Spec in the Future for Possible Development into True Performance Spec.

**Questions?**

