



Illinois Center for Transportation
University of Illinois at Urbana Champaign



I-FIT (Illinois Flexibility Index Test) Protocol – Contractor Perspectives

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Balanced Mixes!

Not too **Brittle** that
can cause cracking:

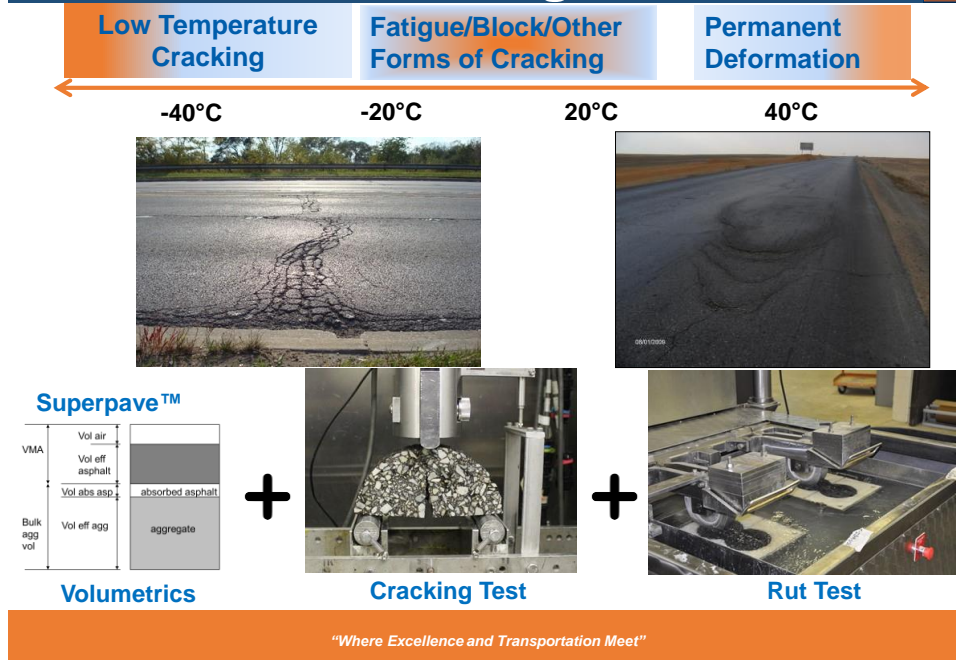
Not too **Flexible** that
can cause rutting:



A Balanced
Mix Design!

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Solution: Testing Scheme

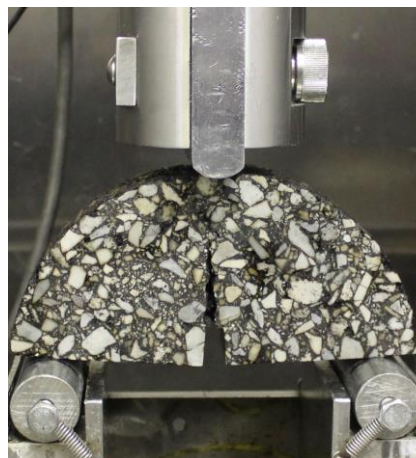


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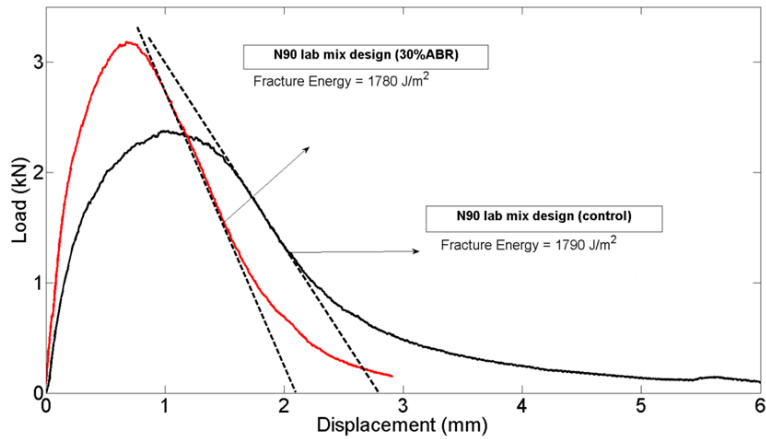
I-FIT Protocol

- Developed in ICT R27-128 study (2015)
- Published as AASHTO TP 124
- It is now being experimented by many states and researchers all over the US
- Currently, 5 manufacturers are making devices for I-FIT



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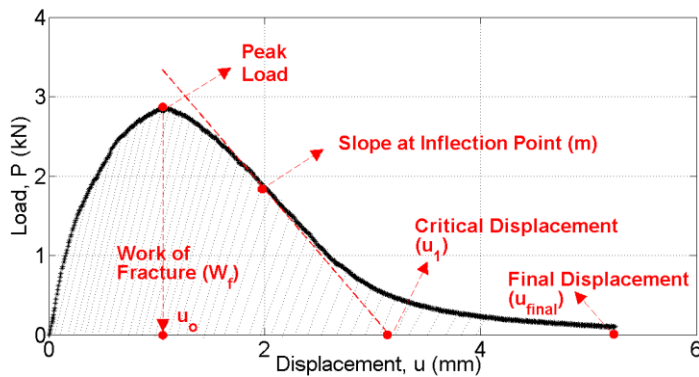
Fracture Energy Ambiguities



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Development of Flexibility Index

$$\text{Flexibility Index (FI)} = G_F \times \frac{1}{\text{abs}(m)}$$



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I-FIT Variability

- Goal: Identify a difference in the performance of:

Mix	ABR	Binder	Constant Properties	Expected Behavior
L4	0%	64-22	AC (%): 6	Increment in ABR Decreases Toughness
L7	20%	58-28	VMA (%): 15.3	
L9	30%	58-28		
L10	60%	52-34		

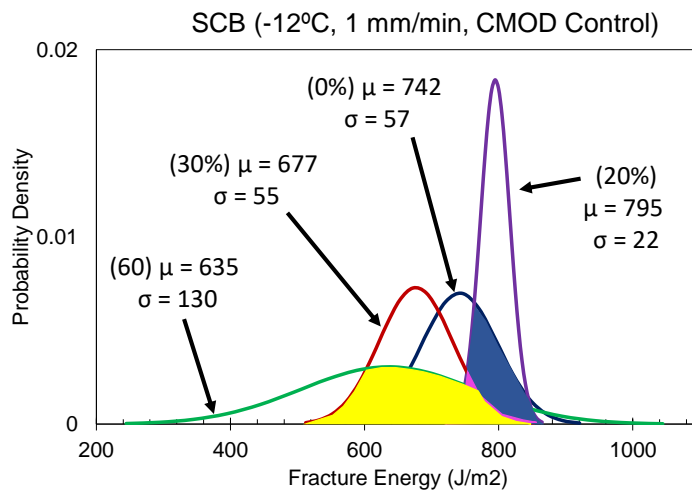
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Low Temperature SCB (-12°C):

ABR
0% vs 20%,
Overlap: 43%

ABR
20% vs 30%,
Overlap: 11%

ABR
30% vs 60%,
Overlap: 58%



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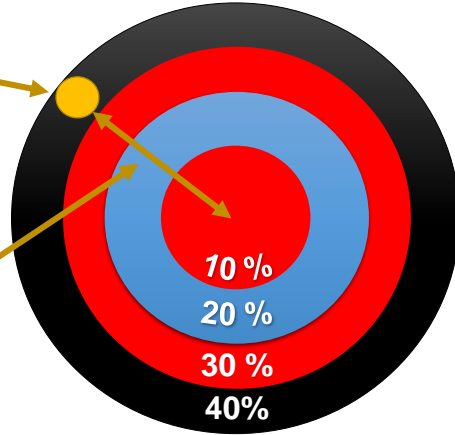
Low Temperature SCB:

- High Repeatability:

- ~ 9% COV

- Low Discrimination:
- 40% Overlap

Normal Distribution Overlap:



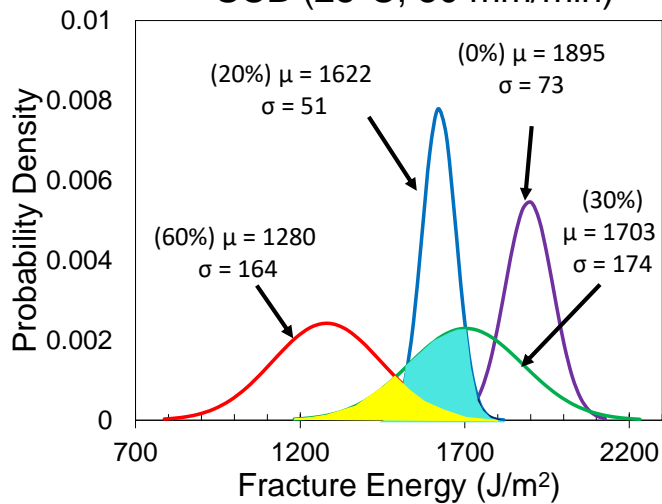
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Intermediate Temperature SCB: SCB (25°C, 50 mm/min)

ABR
0% vs 20%,
Overlap: 3%

ABR
20% vs 30%,
Overlap: 37%

ABR
30% vs 60%,
Overlap: 21%

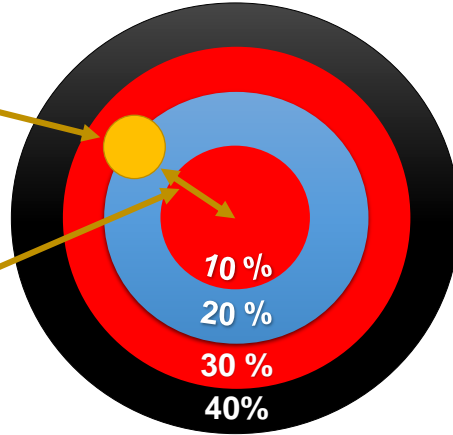


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Intermediate Temperature SCB:

- Intermediate Repeatability:
 - ~ 10% COV
- Intermediate Discrimination:
 - ~ 25% Overlap

Normal Distribution Overlap:

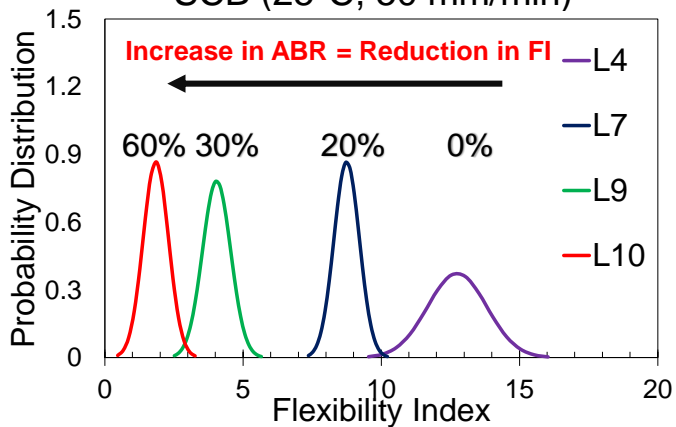


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Flexibility Index SCB (25 °C):

SCB (25°C, 50 mm/min)

Overlaps:
< 3%



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Flexibility Index SCB (25 °C):

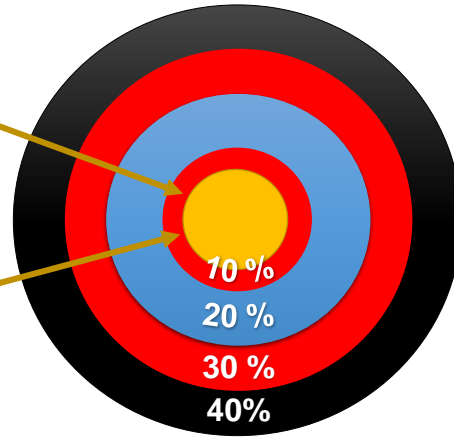
Normal Distribution Overlap:

- Reduced Repeatability:

- ~ 15% COV

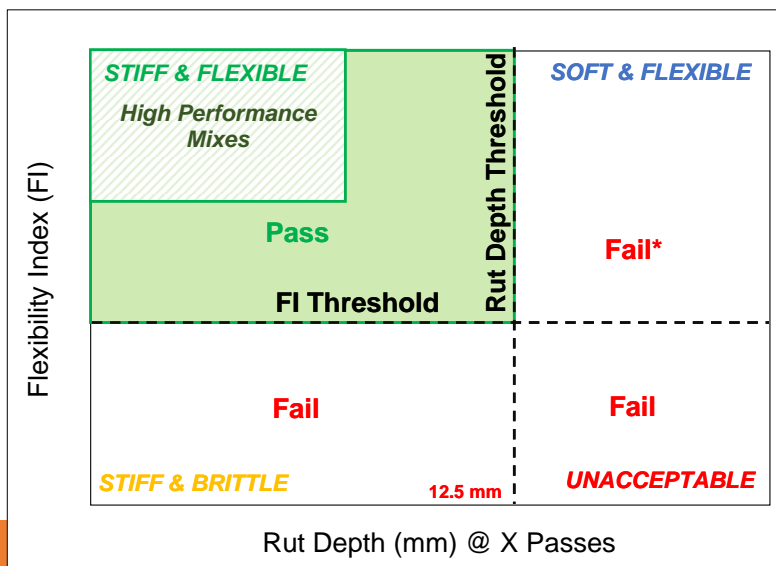
- High Discrimination:

- ~ 3% Overlap

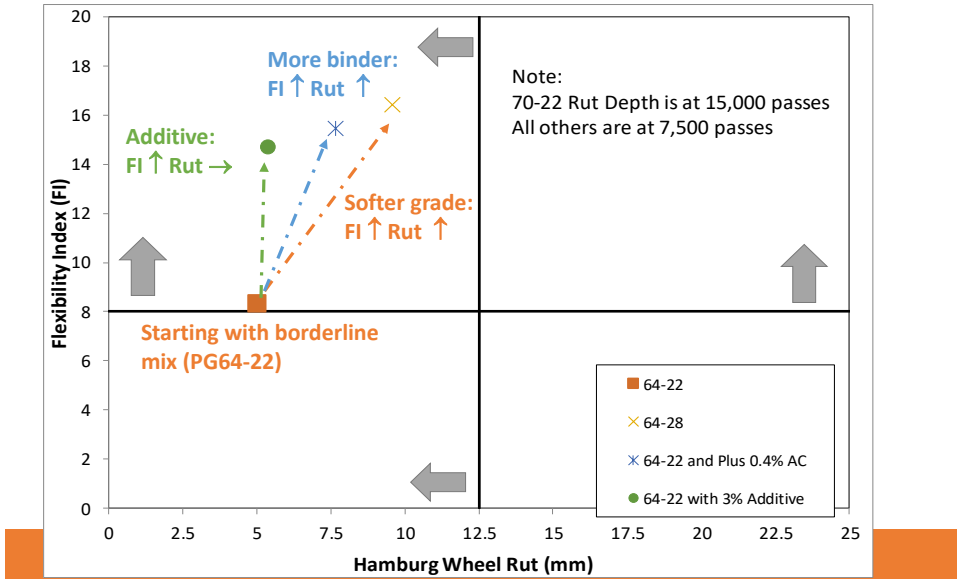


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Balanced Mix Approach



Optimizing Performance: Binder Strategies



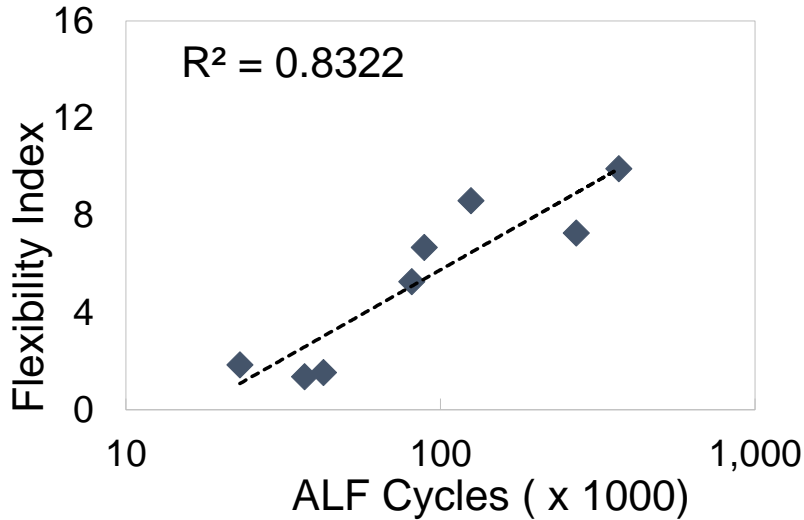
Accelerated Loading Facility

- Simulates truck traffic with controlled loading and pavement temperatures at FHWA Turner Fairbank Research Laboratory.
- Up to 35,000 cycles can be applied per week.
- Wheel load can be varied from 33 kN (7,500 lb)



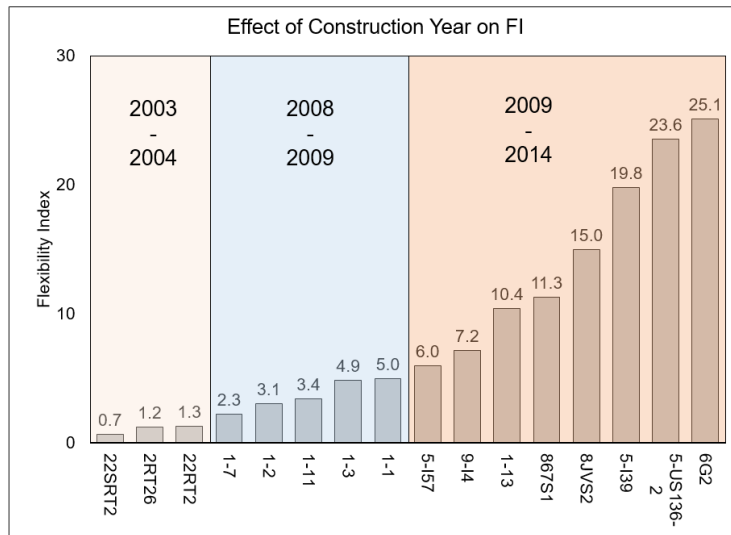
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I-FIT Prediction of Fatigue (ALF)



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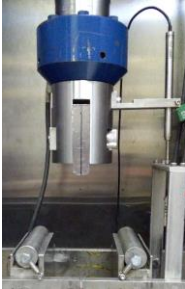
Effect of Construction Year



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Tests on Different Machines



Machine A

- Spring Rollers
- Hydraulic



Machine C

- Bearing rollers
- Hydraulic



Machine B

- Spring Rollers
- Screw driven



Machine D

- Spring Rollers
- Hydraulic

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Closing Remarks

- I-FIT protocol is progressing in the right direction for DOTs and industry
- AASHTO provisional standard and the test have received nationwide attention
- Precise and cost-effective equipment are in the market
- Better understanding of our mixes when combined with Hamburg (better mix = better product)

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