Effective Strategies to Address
REFLECTIVE CRACKING
Virginia Case Studies

Trenton M. Clark, P.E.
Executive Vice President

Background

- Virginia's highway network over 100 years old
- VDOT maintains asphalt, concrete, composite and gravel roads
- Vast majority of concrete and composite roads are on interstate and primary routes

Background (cont.)

- Initial interstate pavements built as Jointed Reinforced Concrete Pavement and Asphalt
- In 1980's, switch to Continuously Reinforced Concrete Pavement for I-295, I-664, and I-195
- By early 1990's, VDOT started overlaying exposed concrete interstates

WHAT WAS THE RESULT?

Strategies Tried

- Extensive Joint/Crack Patching
- Undersealing Slabs
- Joint Tape and Fabrics
- Saw and Seal
- Straight Asphalt Overlays
- SMA Overlays

Were They “Effective”?

Effective – Adequate to accomplish a purpose, producing the intended or expected result

Expectations –Something expected; a thing looked forward to. (Dictionary.com)

For years, individual expectations ruled

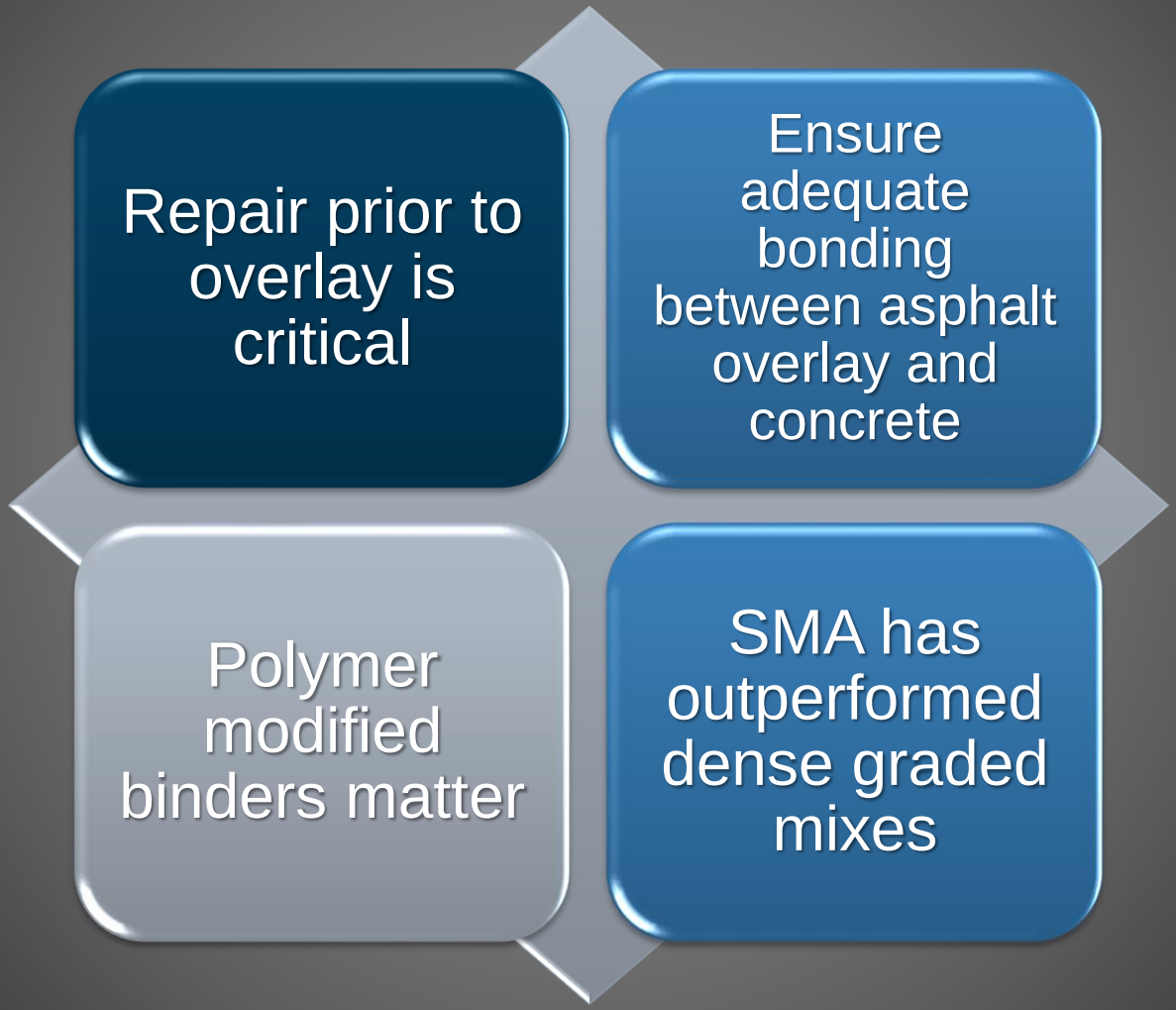
15 years service life | Good Ride

Little or no maintenance | Etc.

Were They “Effective”?

- Results have been mixed
  - Some lasted 8 years, some almost 20 years
- Depends on amount of concrete deterioration
  - Were punch outs repaired?
  - Were joints replaced?
- Are the joints/cracks moving vertically or horizontally?

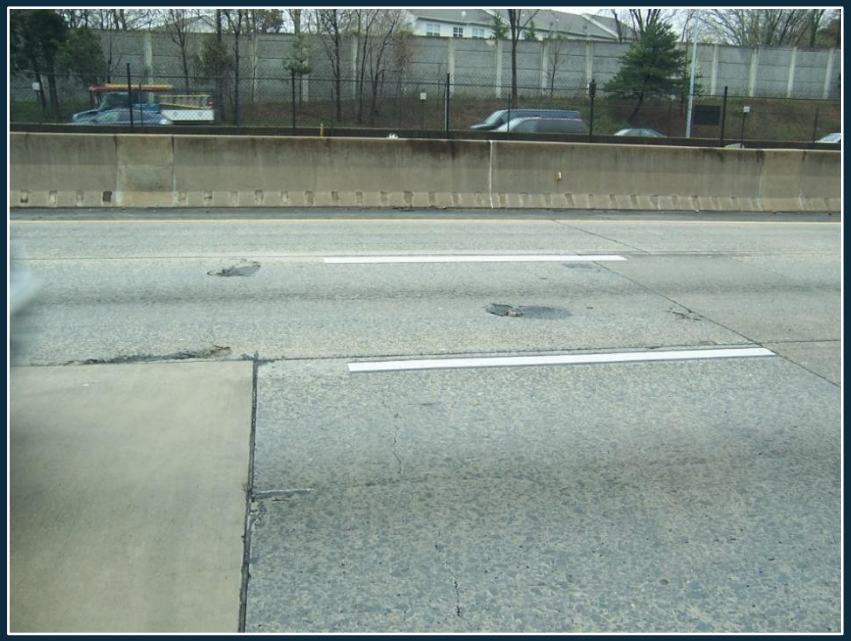
Commonality of “Effective” Projects



Two Case Studies

I-64 Richmond District

I-66 NOVA District



I-64 Project History

- Laburnum Ave. to Bottoms Bridge
- By mid-2000's, existing jointed concrete pavement very deteriorated
- Deteriorated joints with poor ride quality

Define “Effective” After 10 Years

Asphalt Solution

- Average **IRI less than 110** inch/lane-mile
- No 0.1-mile with an IRI **greater than 170 inch/mile**
- Average **rut depth less than 0.5 inches** per wheel path per mile
- No. 0.1 mile section with **a rut depth greater than 1 inch** per wheel path
- No more than **15 Severity 3 reflective cracks** per lane mile.

Concrete Solution

- Average **IRI less than 110** in/lane-mi
- No 0.1 mi. with an IRI **greater than 170 in/mi**
- No more than **15 deteriorated transverse joints or asphalt patches** located at a joint per lane mile requiring Type I or II PCC Patches
- No more than **15 deteriorated concrete patches** per lane mile with a condition of Severity 3

Asphalt Solutions – Henrico

Laburnum Avenue to I-295

- Remove and replace distressed PCC with AC
- Overlay with SM-12.5E (1.5”) as Leveling Course
- Overlay with SMA-19.0 (76-22) (2”)
- Overlay with SMA-12.5 (76-22) (1.5”)

Asphalt Solutions – New Kent

I-295 to Bottoms Bridge

- Remove and replace distressed PCC with PCC
- Overlay with SMA-19.0 (76-22) (2”)
- Overlay with SMA-12.5 (76-22) (1.5”)

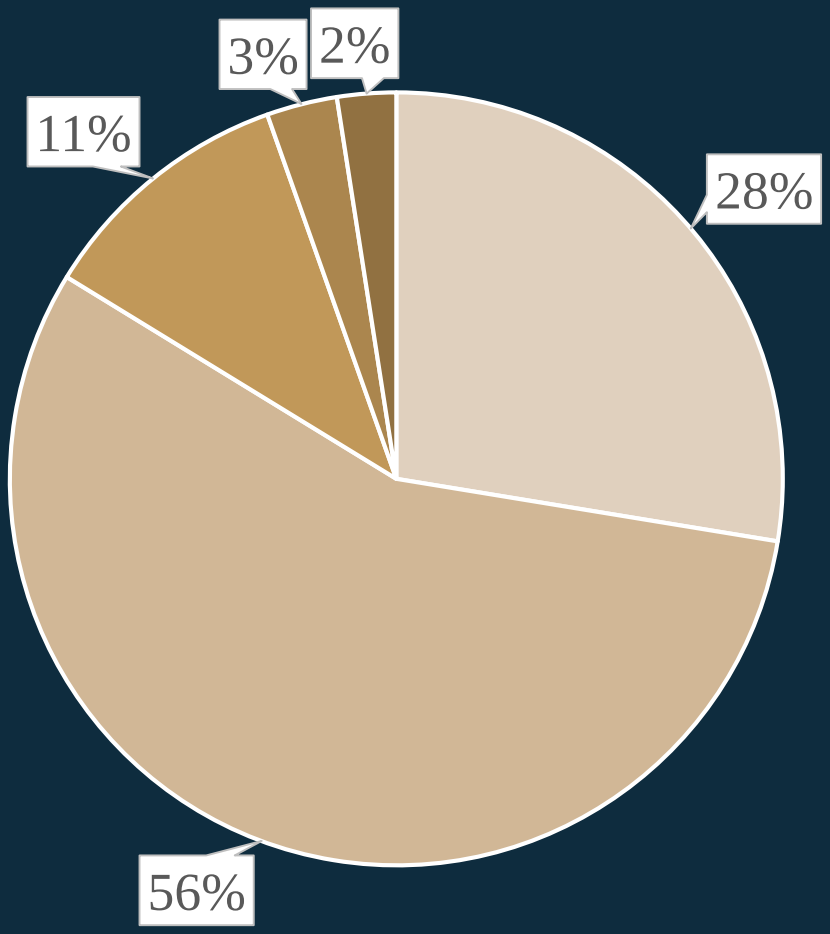
Important to note: VAA proposal was only used in Henrico County; deemed as experimental due to AC patches. New Kent approach was standard VDOT rehab

Were the Fixes "Effective"?

- Project awarded to Mega Contractors (later acquired by Branscome)
- Construction from late 2004 to 2007
- Ride Quality Prior to Rehab
  - Travel Lane Measurements
  - Average 162 – 175 inches per mile
- By 2011, Ride Quality
  - Average 62 inches per mile in EB
  - Average 77 inches per mile WB
  - No segments with IRI greater than 170 in per mile

Sources – VTRC 10-R3 and VDOT Pavement Management Data

Ride Data for 2016



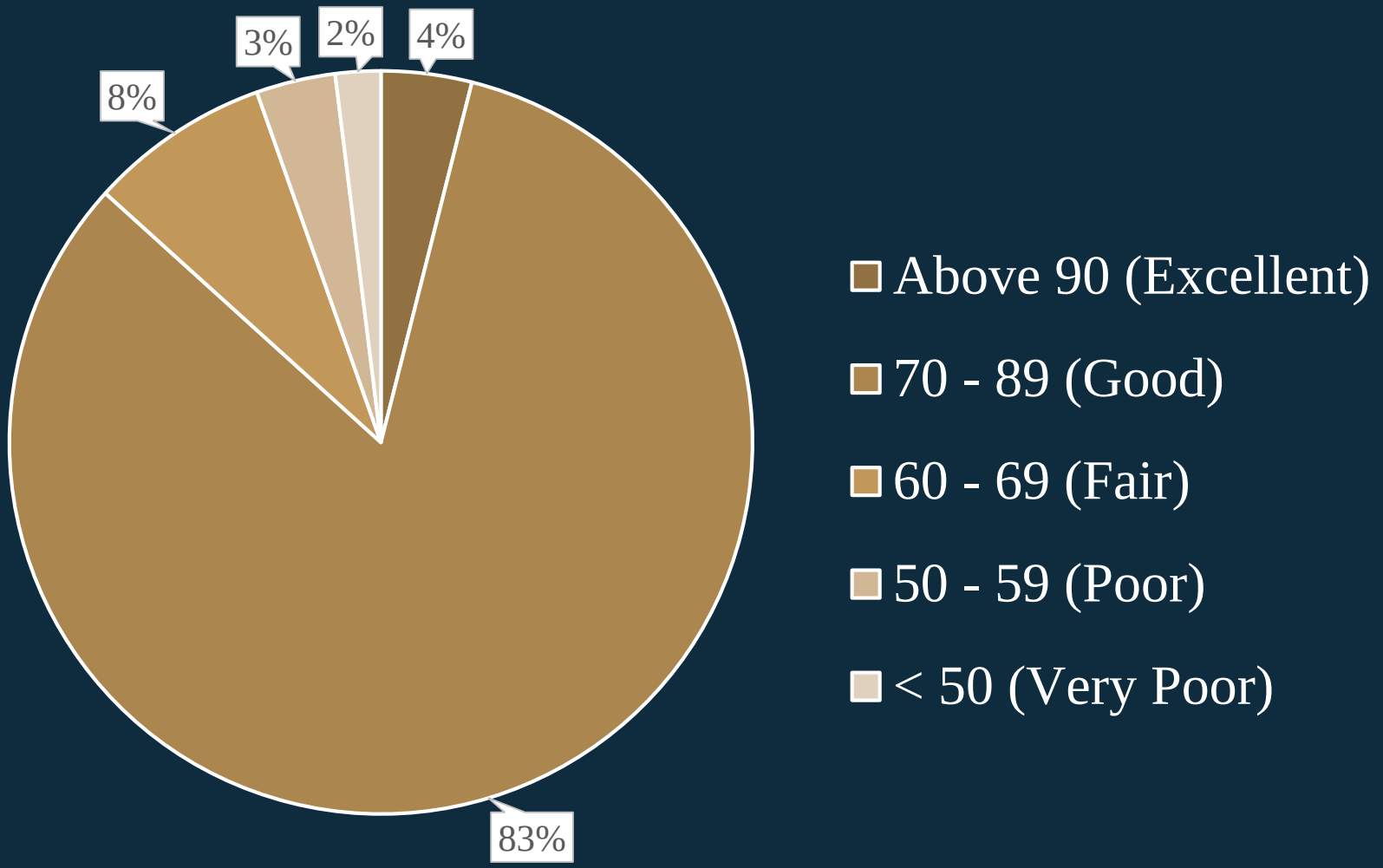
Source – VDOT Pavement Management Data for 2016

How About Today?

- Average IRI both directions is 80 inches per mile
- Seven 0.1 mile segments exceed 170 inches per mile
- All but one segment is between truck weigh station and I-295 (Henrico Section)
- EB average IRI is 69; WB average IRI is 91
- In 2004 – IRI of 169; In 2016 – IRI of 80

Source – VDOT Pavement Management Data for 2016

CCI Data for 2016



I-64 Conclusions

Both asphalt fixes were effective (7 segments failed the 170 inches per mile criteria)

Total of 195 segments analyzed (3.5% failure in 10 years)

More failures in standard VDOT repair approach (but traffic is heavier)

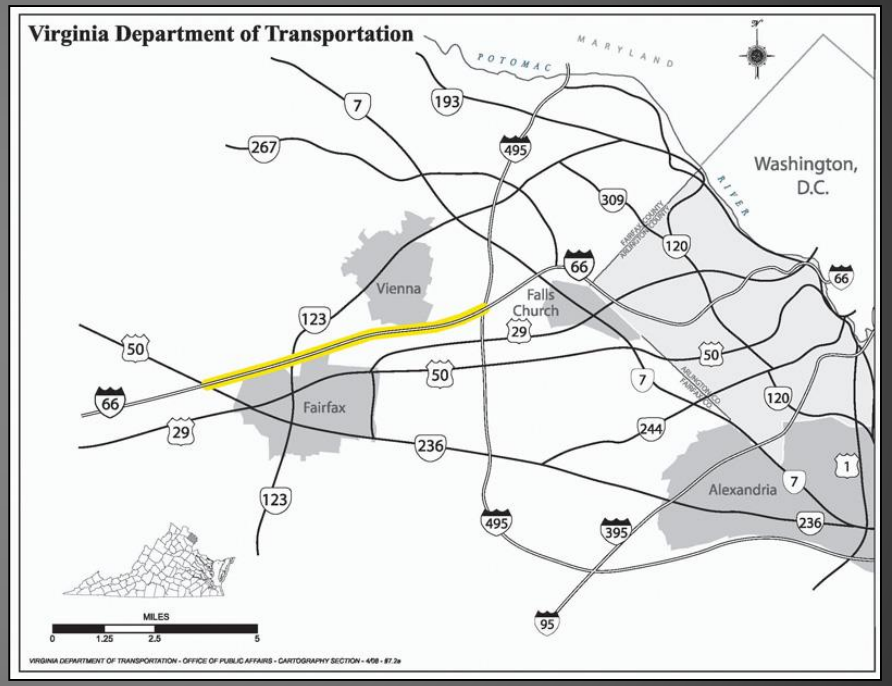
Polymer modified binders in all layers

With right depth, AC patches & Concrete patches equivalent (Consider costs & project details)

I-64 Summer 2017

I-66 Project History

- Approximately from US 50 to Beltway
- By mid-1990's, existing jointed concrete pavement very deteriorated
- Deteriorated joints with poor ride quality



How Was "Effective" Defined?

Goal

- Provide a cost effective pavement rehabilitation that will last for 20 years with minimum disruption to the traveling public

Challenges

- Limited space for Maintenance of Traffic (MOT)
- Limited times for dual lane closures
- Limited overhead clearance for existing bridges
- Drainage
- Concrete barriers
- Lane shifts across longitudinal joints in concrete
- Coordination with adjacent Mega Projects

Source – I-66 Pavement Rehab Presentation, 2012 Fall Asphalt Conference

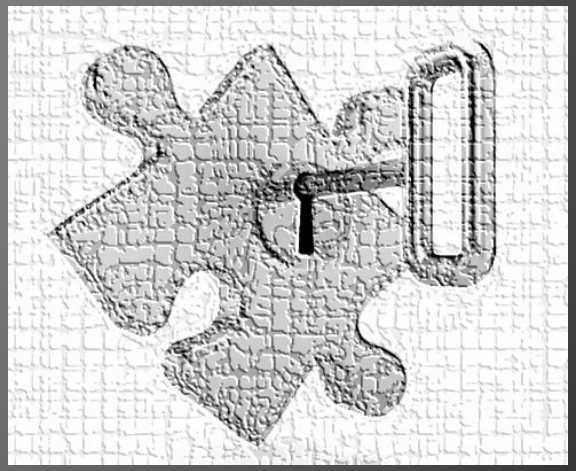
I-66 Prior to Rehab

- Old Pavement in Poor Condition
- Approx. 20% of all pavement in poor shape
- Distresses generally at transverse joints
- Isolated slabs have distress (spalling) throughout

Source – I-66 Pavement Rehab Presentation, 2012 Fall Conference

“Effective” Solutions

- Extensive Concrete Patching with PCC
- 5/8” THMACO bonding layer
- Scratch/Leveling Course of Superpave
- 2” SMA-12.5 (76-22)
- 1.5” SMA-9.5 (76-22)



Project Approach

- Met with industry associations (concrete and asphalt) on May 20, 2008
- Received industry suggestions/proposals on June 18, 2008
- Provided follow-up comments to industry
- Follow-up details received from industry on June 23 and June 24, 2008
- Performed comparison of alternatives
- Project was funded and advertised in September, 2010
- Delivery mechanism was design-build (pavement repairs specifically identified on RFP plans)
- Awarded to Fort Myer Construction Company on December 20, 2010
- Paving performed by Superior Paving and APAC-Southeast (THMACO)
- Total Contract Amount - $37.9 million

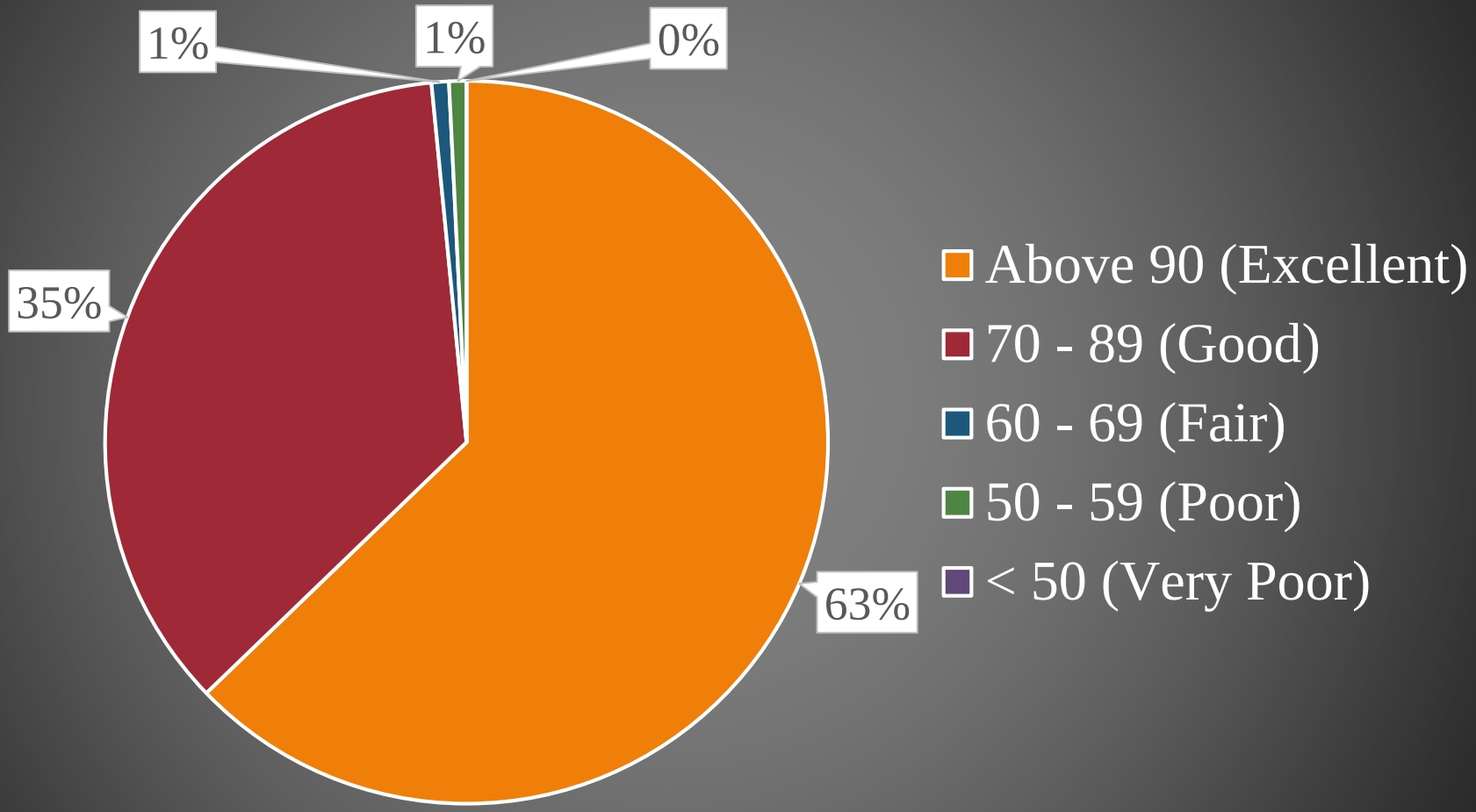
Source – I-66 Pavement Rehab Presentation, 2012 Fall Conference

Final Ride in 2012

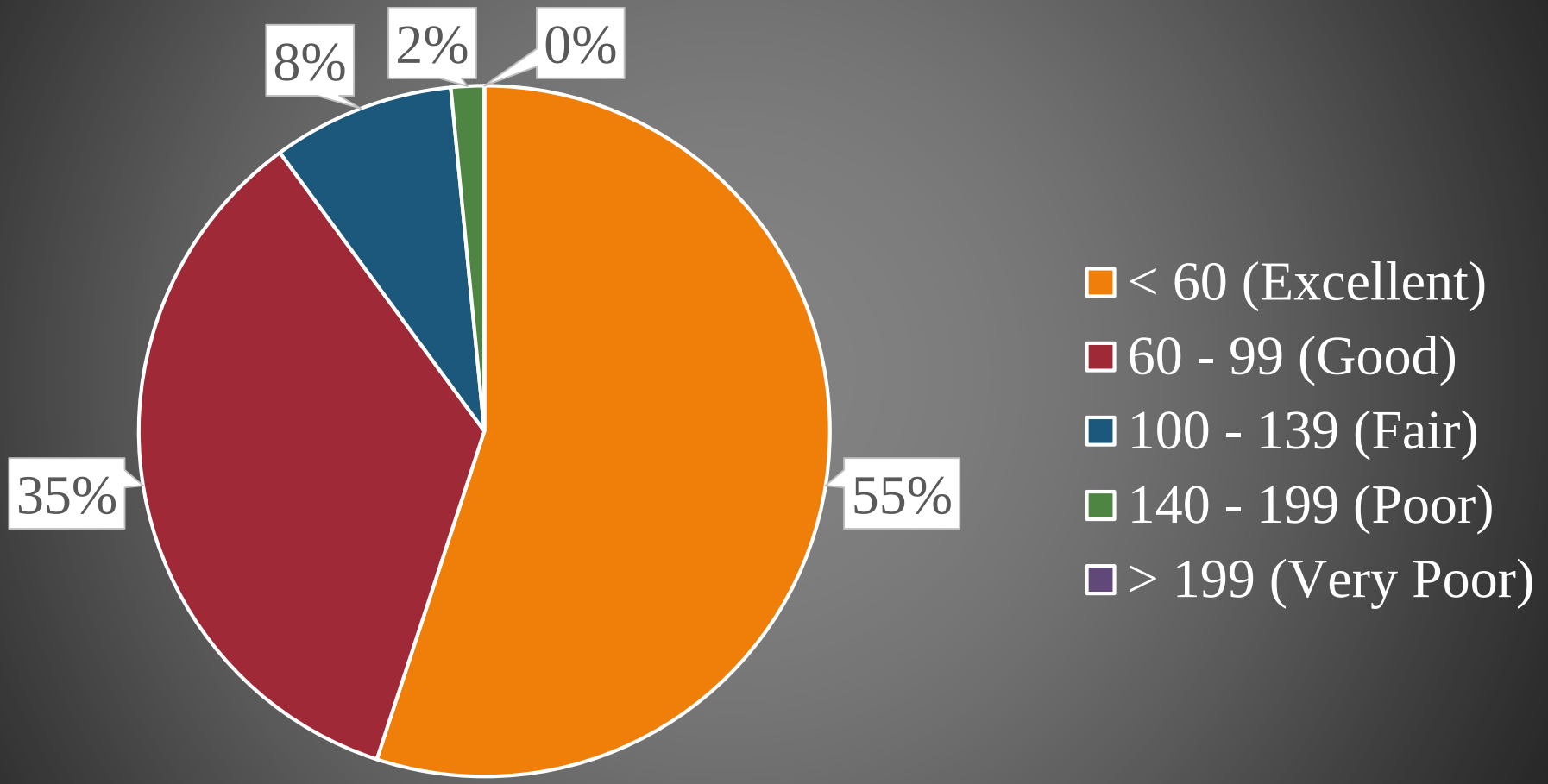
Average IRI (ins/mi.)		
Lane	**EB**	**WB**
1	**50**	**48**
2	**49**	**48**
3	**46**	**46**
4	**--**	**48**

Note: project design-build specification required average IRI < 70 ins./mi. with no individual 0.01 mile section >80 ins./mi.

How About Today? – CCI



How About Today? – Ride



I-66 Conclusions

Patching “all” failed PCC needed

THMACO beneficial for bonding AC to PCC in thin sections

SMA and Polymer modified binders work

Commonality of “Effective” Projects

- Repair prior to overlay is critical
- Ensure adequate bonding between asphalt overlay and concrete
- Polymer modified binders matter
- SMA has outperformed dense graded mixes

I-66 Today – THANK YOU