



September 2, 2020

# INDEPENDENCE INTERSECTIONS – DESIGN-BUILD

## 2019 DBIA MAR PROJECT OF THE YEAR



**INTRODUCTIONS**

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# Agenda

- Background / Executive Summary
- Design-Build Team and Contracting Approach
- Public Involvement
- Innovation, Design & Quality Implementation Plan
- Project Photography
- Lessons Learned

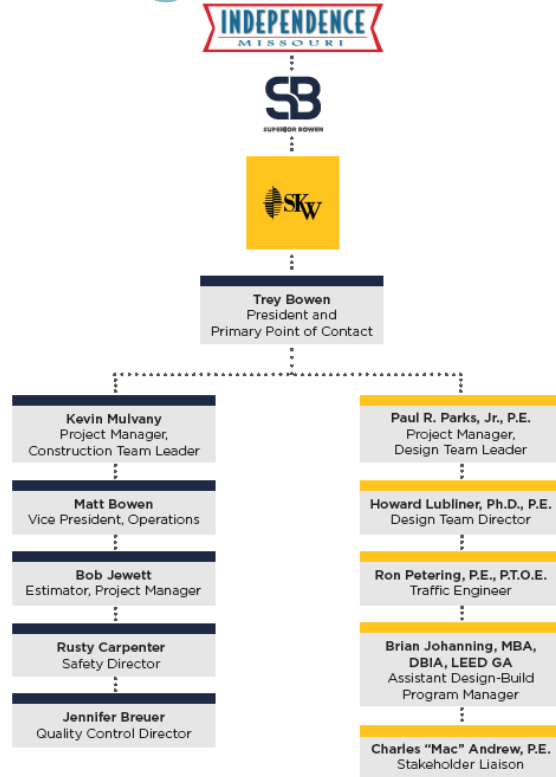


# Background/Executive Summary

- 2016 Independence for All, 5-year Strategic Plan
- Why Design-Build – August Ballot Initiative
  - Risk Mitigation
  - Innovation
  - Public Involvement
  - Maintenance of Traffic
- 80% Positive Vote



# Design-Build Team and Contracting Approach



- Solicitation of RFQ: March 28<sup>th</sup>
- Staff Selection: May 23<sup>rd</sup>
- Preliminary Services Agreement: June 5<sup>th</sup>
- Phase 1 GMP: June 29<sup>th</sup>
- Phase 2 GMP: August 21<sup>st</sup>
- Substantial Completion: November 22<sup>nd</sup>

# Public Involvement

- Door knockers to local businesses
- Conscious of the Sales Tax Vote
- Local Workforce

To Whom It May Concern:

Beginning July 15, 2017, we will perform a pavement repair project in your neighborhood. We are working with the City of Independence to improve the intersection of East Truman Road and North Liberty Street, and expect to finish by July 16, 2017.

What you can expect during this project:

- Minor construction will occur the week of July 10 involving the repair of curbs.
- Major construction will occur Friday, July 14 through Sunday, July 16.
- Full closure of the intersection will occur Friday at 6 p.m. and will reopen on Monday at 6 a.m.
- During construction all access will be restricted in the project area.

We understand this work may cause some inconvenience and we want to do our best to prepare you for this brief period of change. We know the end product will offer an improved intersection for the community. Please bear with us while we complete this project.

Contact us with questions:

- Superior Bowen | Kevin Mulvany, Construction Team Leader and Project Manager | 816.591.7705
- Shafer, Kline & Warren | Paul Parks, Design Team Leader and Project Manager | 913.307.2529

Respectfully yours,

Superior Bowen | Shafer, Kline & Warren

**SUPERIOR BOWEN**

the screening processes for programs, according to

**SMOOTH ROADS AHEAD**  
Vote YES August 8  
*Question 1 – Street Sales Tax Renewal*

Our Road Maintenance, Snow Removal, Road Repair and Signal Light Safety is the best in the Metropolitan area!

**CONTINUE THE PROGRESS!**

The existing 1/2 cent Street Sales Tax brings so much to our community...

**1/2 Cent**

- Safety to the drivers on our roads
- Improves home property values
- Attracts businesses that create local jobs
- Keeps car insurance premiums low

**VOTE, TUESDAY AUGUST 8**  
**FOR RENEWAL OF THE EXISTING 1/2¢ SALES TAX FOR STREET MAINTENANCE**

PAID FOR BY PAVE THE WAY INDEPENDENCE, IRAN WAGNER, TREASURER

# Innovation, Design & Quality Implementation Plan



- Marshall – Superpave – Balanced Mix Design
- Considerations:
  - Traffic Loading
  - Climate
  - Aggregate, Binder, Performance Testing, Optimum Binder Content, Voids & Density and Stripping

# Stone Mastic Asphalt (Stone Matrix Asphalt, SMA)

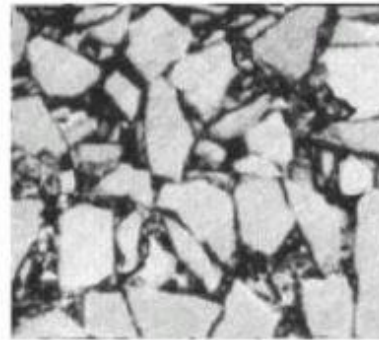
- Developed in 1960's in Germany
- Deformation resistant
- Durable surface
- Suitable for heavy traffic

## What's Special?

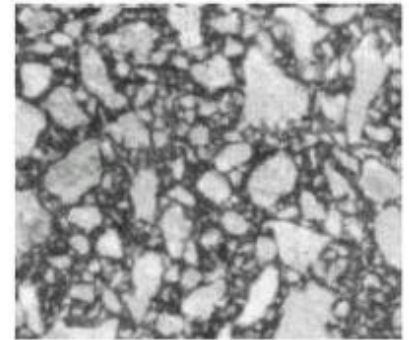
High Coarse Aggregate content that forms stone on stone contact to help resist permanent deformation.

The aggregate skeleton is filled with mastic (binder, filler, and fibers) for additional stability

Typical design 70-80% coarse aggregate, 5-10% filler, 6-7% binder, and 0.3% fiber



(a) Stone mastic asphalt



(b) Dense graded asphalt

# Mix Design



Gradation Adjustments  
Drain Down Concerns  
Mineral Filler / Fly Ash  
Cellulose Fibers



# Aggregate Requirements

**403.2.5 Stone Matrix Asphalt.** In addition to other requirements, material for SMA mixtures shall meet the following. Coarse aggregate shall consist of crushed limestone and either porphyry or steel slag in accordance with the quality requirements of [Sec 1002](#), except as follows. The Los Angeles (LA) abrasion, when tested in accordance with AASHTO T 96, shall not exceed 40 percent based on initial ledge approval and source approval. The percent absorption, when tested in accordance with AASHTO T 85, shall not exceed 3.5 percent based on the individual fractions. The amount of flat and elongated particles, measured on material retained on a No. 4 sieve, of the blended aggregate shall not exceed 20 percent based on a 3:1 ratio or 5 percent based on a 5:1 ratio.

# Drain down

**403.4.9 Draindown.** AASHTO T 305, Draindown Test, shall be performed on all SMA mixtures prior to job mix approval. The mixture shall be stabilized in such a way that the draindown of the asphalt binder shall not exceed 0.3 percent by weight of mixture.

**403.4.10 Voids in Coarse Aggregate.** The percent VCAMIX of SMA mixtures shall be less than or equal to the VCADRC as determined using AASHTO T 19. This may be calculated using the following equations:

$$VCA_{DRC} = 100 \times (G_{CA}\gamma_w - \gamma_s) / G_{CA}\gamma_w$$

$$VCA_{MIX} = 100 - (P_{bp} \times G_{mb} / G_{CA})$$

$$P_{bp} = P_s \times PA_{bp}$$

Where:

- $G_{CA}$  = bulk specific gravity of the combined coarse aggregate (AASHTO T 85),
- $\gamma_s$  = unit weight of coarse aggregate in the dry-rodded condition (DRC) (lb/ft<sup>3</sup>) (AASHTO T 19),
- $\gamma_w$  = unit weight of water (62.34 lb/ft<sup>3</sup>),
- $P_{bp}$  = percent aggregate by total mixture weight retained on No. 4 sieve and
- $PA_{bp}$  = percent aggregate by total aggregate weight retained on No. 4 sieve\*.

\*Use No. 8 sieve for SP095xSM

# Quality Control



Gradation  
Volumetrics  
Ignition Samples AC content  
Compaction on Roadway  
Performance Testing



# QC (cont.)

**403.5.2 Density.** The final, in-place density of the mixture shall be  $94.5 \pm 2.5$  percent of the theoretical maximum specific gravity for all mixtures except SMA. SMA mixtures shall have a minimum density of 94.0 percent of the theoretical maximum specific gravity. The theoretical maximum specific gravity shall be determined from a sample representing the material being tested. Tests shall be taken not later than the day following placement of the mixture. The engineer will randomly determine test locations.



# Performance Testing





Hamburg  
I-Fit  
DCT



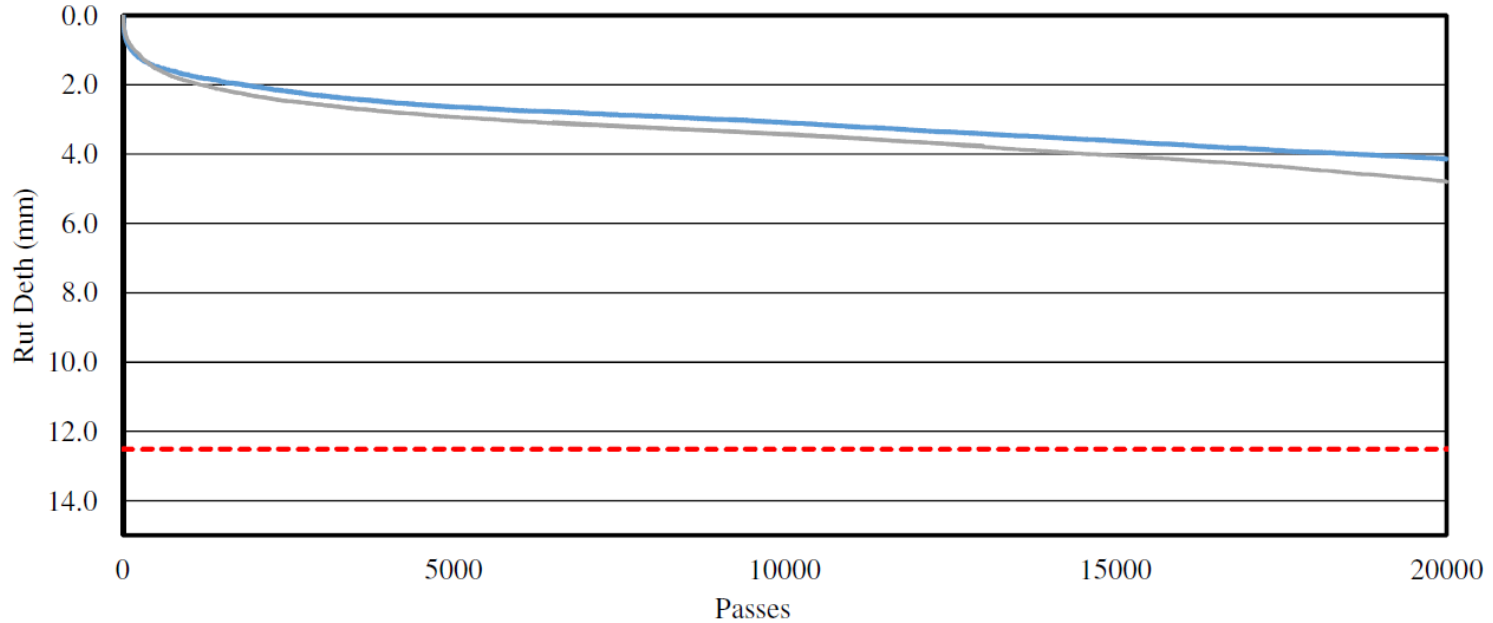
# CMTG

**CONSTRUCTION MATERIALS TESTING GROUP**

Date Sampled	07/30/18			
User Name	C. Haahr			
Organization	CMTG			
Project / Mix	Superior Bowen Performance Testing 2018 / SP9.5 MODOT18-29			
Specimen ID:	L-1	L-2	R-1	R-2
Thickness (mm)	65.0	65.0	65.0	65.0
% Air Voids	5.9	6.0	5.8	5.8
<b>RESULTS</b>	Left Wheel		Right Wheel	
Rut Depth Limit (mm)	12.5		12.5	
Target Passes to Failure	20,000		20,000	
Final Rut Depth (mm)	4.14		4.79	
Total Passes	20,000		20,000	
Passes at Failure	20,000		20,000	
Stripping Inflection Point (SIP)	None		None	
Rut Depth at SIP (mm)	N/A		N/A	
Rutting Acceptance (Pass/Fail)	PASS		PASS	

HAMBURG Wheel Tracker  
 Rut Depth Vs. Passes  
 Superior Bowen Performance Testing 2018  
 SP 9.5 (MoDOT 18-29)

- Rutting Limit
- Left Wheel
- Right Wheel

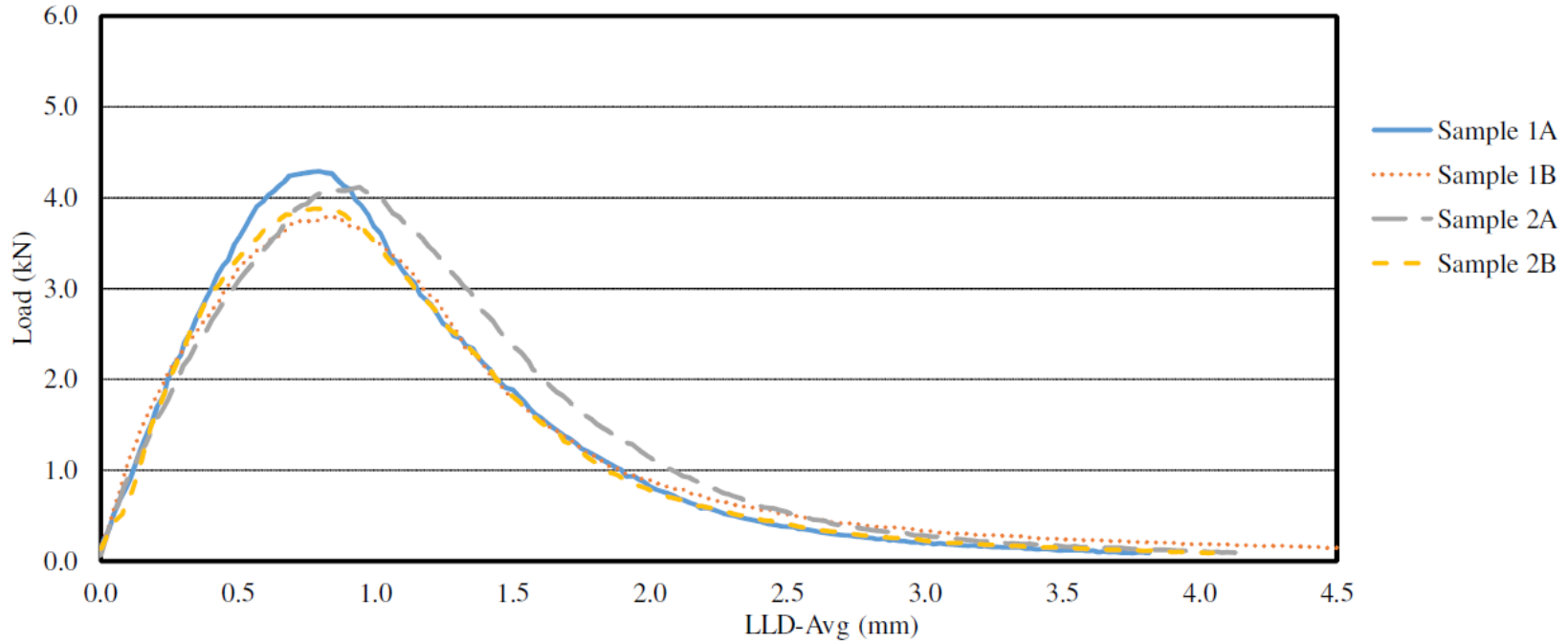


# CMTG

CONSTRUCTION MATERIALS TESTING GROUP

Date Sampled	7/30/2018				
User Name	C. Haahr				
Organization	CMTG				
Mix / Project	SP 9.5 (MoDOT 18-29) / Superior Bowen Performance Testing 2018				
Specimen ID	Pill 1A	Pill 1B	Pill 2A	Pill 2B	
Test Temperature	25 C	25 C	25 C	25 C	
Specific Gravity	2.264	2.264	2.261	2.261	
Air Void Content	5.8	5.8	6	6	
Thickness (mm)	50.5	50	49.5	50.2	
Ligament (mm)	58.4	59.3	58.7	58.8	
Notch Depth (mm)	15.2	15.2	15.1	14.9	
Peak Load (kN)	4.293	3.796	4.117	3.879	
Time to Peak Load	0.992	1.066	1.165	0.967	
Disp at Peak Load	0.796	0.863	0.943	0.778	
Test Duration (seconds)	4.588	6.6216	5.0344	4.8608	Average
Fracture Energy (J/m <sup>2</sup> )	1870.9	1939.1	2074.8	1802.0	1921.7
Strength (kPa)	577.5	509.5	563.5	524.2	543.7
Slope at Inflection Point	-4.26 k	-3.54 k	-3.59 k	-3.46 k	-3.71 k
Flexibility	4.4	5.5	5.8	5.2	5.2
Secant Stiffness (kN/mm)	5.4	4.4	4.4	5.0	4.8
Critical Displacement (mm)	1.9	2.0	2.2	2.0	2.0

Semi-Circular Bending  
 Load Vs. LLD-Avg  
 MoDOT SP 9.5 (Mix # 18-29)

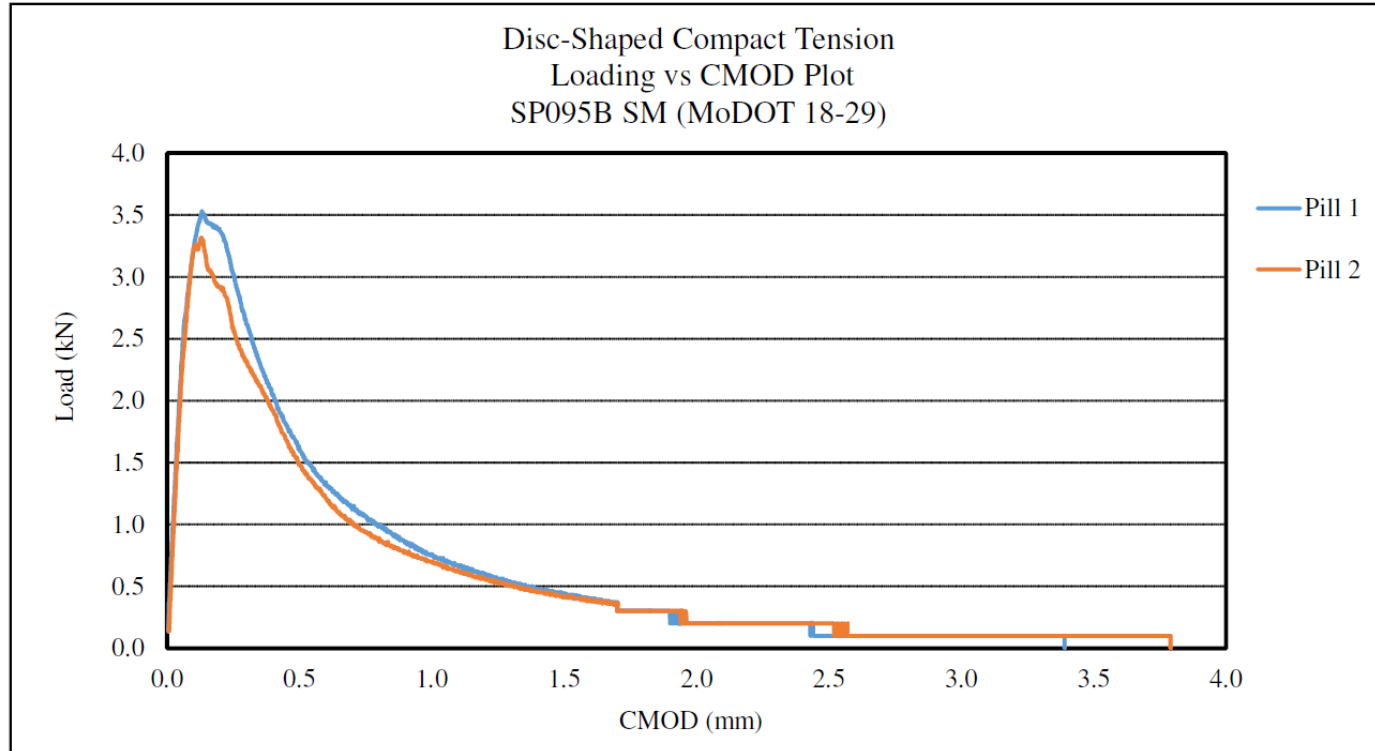


# CMTG

CONSTRUCTION MATERIALS TESTING GROUP

Date Sampled	7/30/2018		
Operator Name	C. Haahr		
Organization	CMTG		
Mix / Project	SP095B SM (MoDOT 18-29) / Superior Bowen Performance Testing 2018		
Specimen ID	Pill 1	Pill 2	Pill 3
Test Temperature	-12 C	-12 C	---
Diameter	150.00 mm	150.00 mm	---
Thickness	50.58	50.51	---
Ligament	82.12	82.43	---
Cumulative Area	2479.37 N-mm	2370.84 N-mm	---
Actual Test Rate	0.0170 mm/second	0.0170 mm/second	---
Disp at Max Load	0.1281 mm	0.1225 mm	---
Time at Max Load	7.80 seconds	7.44 seconds	---
Ave Chamber Temp	-12.0 C	-12.0 C	---
Test Duration	199.88 seconds	223.20 seconds	---
<b>Significant Performance Values</b>			
Max Load	3.531 kN	3.317 kN	---
Fracture Energy (J/m <sup>2</sup> )	597 J/m <sup>2</sup>	569 J/m <sup>2</sup>	---

# Mix Design



# Construction Implementation

- Traffic Control and Message Boards
- Concrete Work
- Friday 5 PM – Monday at 6 AM



# Project Photography



# Project Photography



# Project Photography



# Summary/ Lessons Learned

- Face to Face Meeting / Co-Location
- Trust is good, contracts are better
- Formal Teaming Agreement
- DBIA Certification



# Summary / Lessons Learned



- SMA good field performance in the intersections
- The stone on stone contact provides required stability for the traffic stopping
- Higher AC content in the SMA provides for better stripping protection
- Higher quality aggregates provide higher skid resistance
- Paper fiber and mineral filler add additional stiffness to the binder to help with flushing and binder drain down

# Contact Info

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