

# Lessons Learned



# Lessons Learned



# Lessons Learned



**INDIANA**  
TRANSPORTATION TEAM



# Riprap



# Riprap

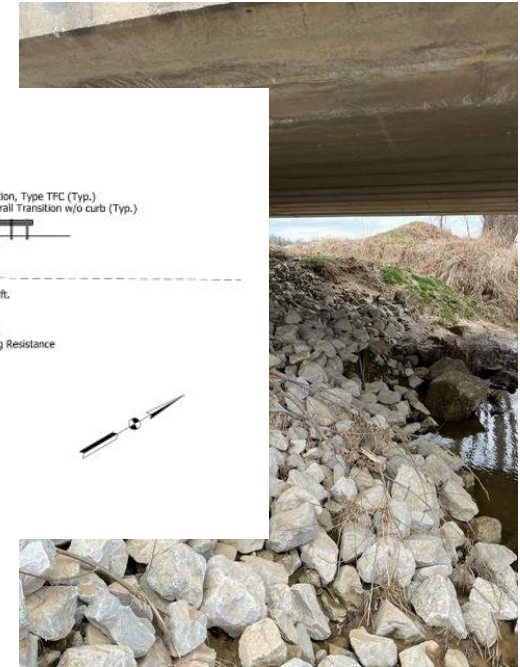
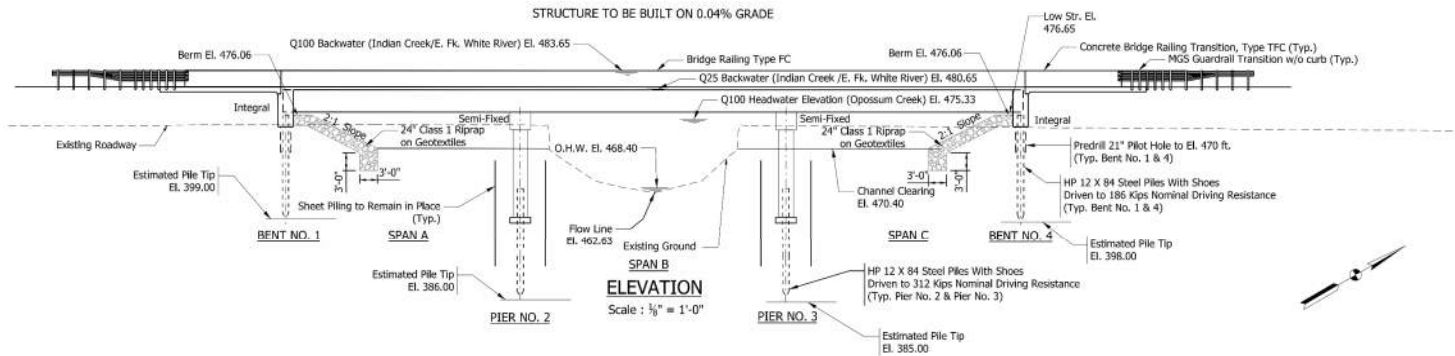




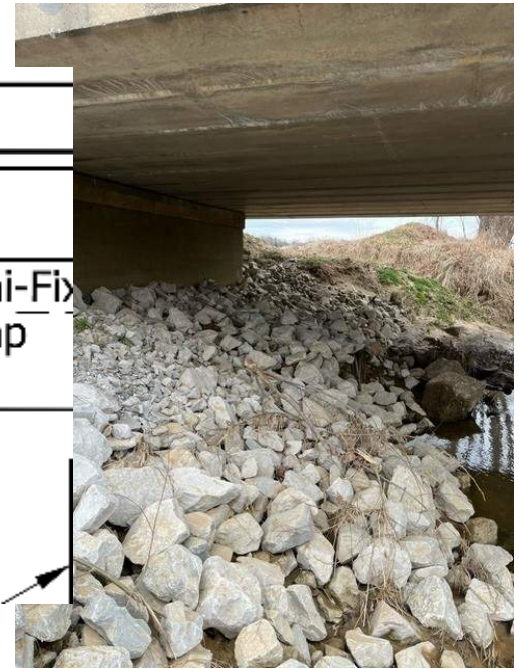
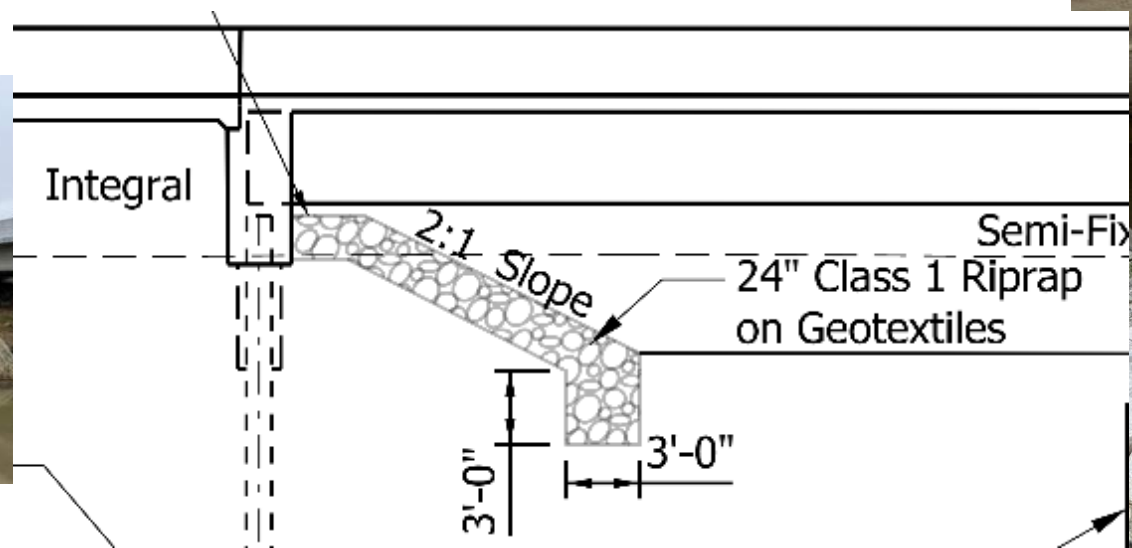
# Riprap



# Riprap

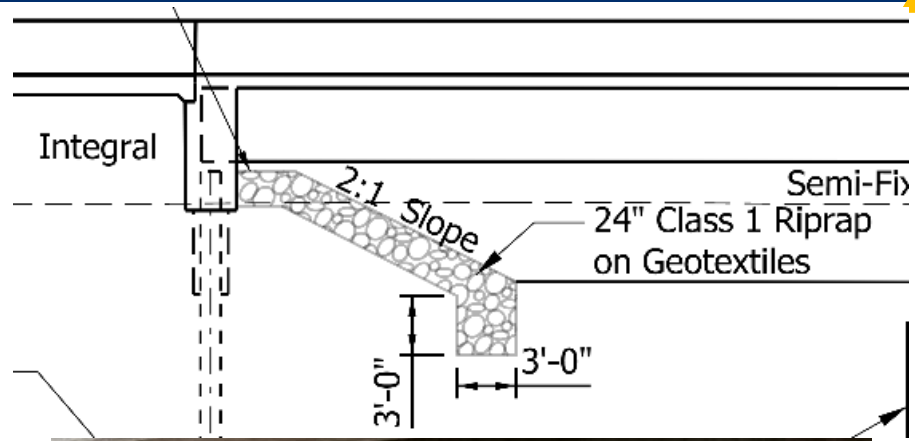


# Riprap





# Riprap



# Riprap




Asphalt Mixtures		Compacted Aggregate	
Pavement Thickness	Factor	Aggregate Thickness	Factor
1 in.	110 lb/yd <sup>2</sup> = 0.055 T/yd <sup>2</sup>	3 in.	0.167 T/yd <sup>2</sup>
1.25 in.	140 lb/yd <sup>2</sup> = 0.070 T/yd <sup>2</sup>	4 in.	0.222 T/yd <sup>2</sup>
1.5 in.	165 lb/yd <sup>2</sup> = 0.083 T/yd <sup>2</sup>	5 in.	0.278 T/yd <sup>2</sup>
1.65 in.	180 lb/yd <sup>2</sup> = 0.090 T/yd <sup>2</sup>	6 in.	0.333 T/yd <sup>2</sup>
2 in.	220 lb/yd <sup>2</sup> = 0.110 T/yd <sup>2</sup>	7 in.	0.389 T/yd <sup>2</sup>
2.25 in.	250 lb/yd <sup>2</sup> = 0.125 T/yd <sup>2</sup>	8 in.	0.444 T/yd <sup>2</sup>
2.5 in.	275 lb/yd <sup>2</sup> = 0.138 T/yd <sup>2</sup>	9 in.	0.500 T/yd <sup>2</sup>
2.75 in.	300 lb/yd <sup>2</sup> = 0.150 T/yd <sup>2</sup>	12 in.	0.667 T/yd <sup>2</sup>
3 in.	330 lb/yd <sup>2</sup> = 0.165 T/yd <sup>2</sup>	<b>B Borrow for Drainile</b>	
3.25 in.	360 lb/yd <sup>2</sup> = 0.180 T/yd <sup>2</sup>	Pipe Dia.	Factor
3.5 in.	385 lb/yd <sup>2</sup> = 0.193 T/yd <sup>2</sup>	6 in.	0.257 yd <sup>3</sup> /ft
4.5 in.	495 lb/yd <sup>2</sup> = 0.248 T/yd <sup>2</sup>	8 in.	0.269 yd <sup>3</sup> /ft
8 in.	880 lb/yd <sup>2</sup> = 0.440 T/yd <sup>2</sup>	10 in.	0.278 yd <sup>3</sup> /ft
Asphalt for Prime Coat	0.63 gal./yd <sup>2</sup> = 0.0028 T/yd <sup>2</sup>	12 in.	0.304 yd <sup>3</sup> /ft
Asphalt for Tack Coat	0.08 gal./yd <sup>2</sup> = 0.00034 T/yd <sup>2</sup>	18 in.	0.502 yd <sup>3</sup> /ft
Spray Paver Emulsion	0.20 gal./yd <sup>2</sup> = 0.00084 T/yd <sup>2</sup>	<b>Aggregate for Underdrains</b>	
<b>Riprap</b>		Pipe Dia.	Factor
Riprap	1.5 T/yd <sup>3</sup>	6 in.	0.090 yd <sup>3</sup> /ft
<b>Water for Sodding</b>		8 in.	0.110 yd <sup>3</sup> /ft
Water	4 gal./yd <sup>2</sup> = 0.004 kgal/yd <sup>2</sup>	10 in.	0.136 yd <sup>3</sup> /ft
<b>Pavement Markings</b>		<b>Shoulder Drains</b>	
Permanent Broken Centerline	0.25 lft/ft	Flat Terrain	24.8 T/mi
		Rolling Terrain	30.2 T/mi
		Hilly Terrain	35.5 T/mi

## ROADWAY QUANTITIES FACTORS

Figure 17-4A  
[Rev. Sep. 2021]



# Riprap

Asphalt for Tack Coat	$0.08 \text{ gal./yd}^2 = 0.00034 \text{ T/yd}^2$	
Spray Paver Emulsion	$0.20 \text{ gal/yd}^2 = 0.00084 \text{ T/yd}^2$	
<b>Riprap</b>		
Riprap	$1.5 \text{ T/yd}^3$	Pipe D 6 in.
<b>Water for Sodding</b>		
Water	$4 \text{ gal./yd}^2 = 0.004 \text{ kgal/yd}^2$	8 in. 10 in.
<b>Pavement Markings</b>		
		 Flat T



# Riprap





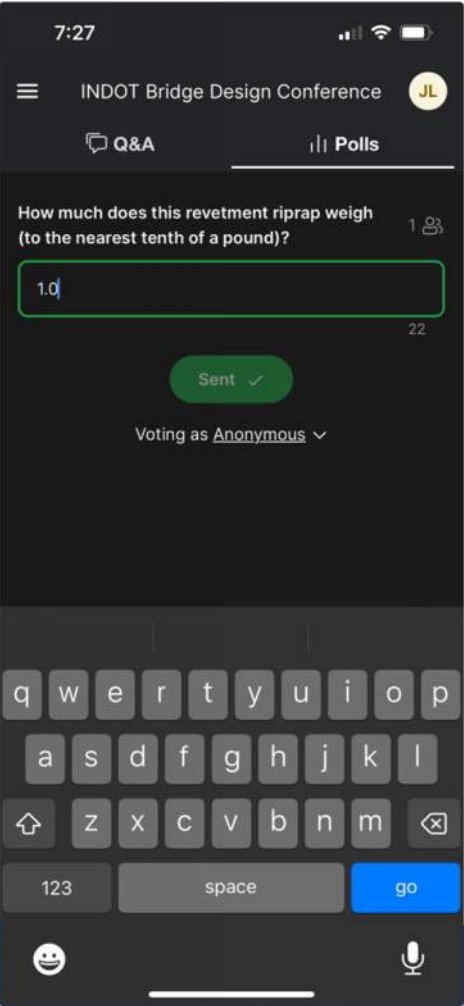
# Riprap



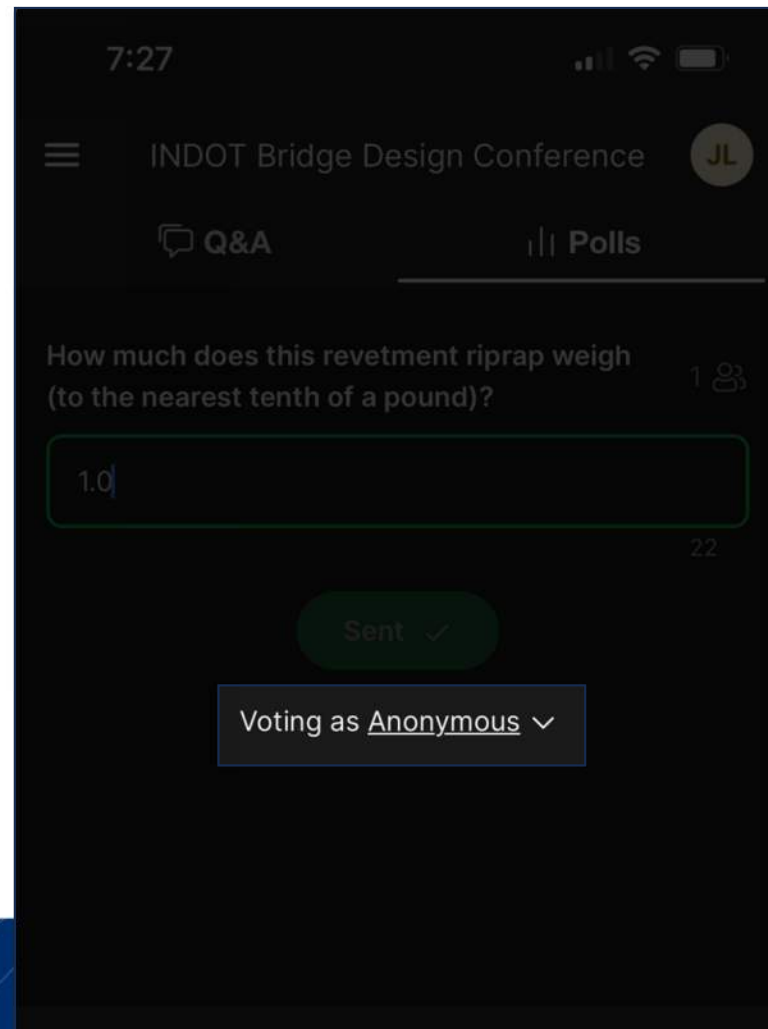
Join at  
**slido.com**  
**#1256 865**



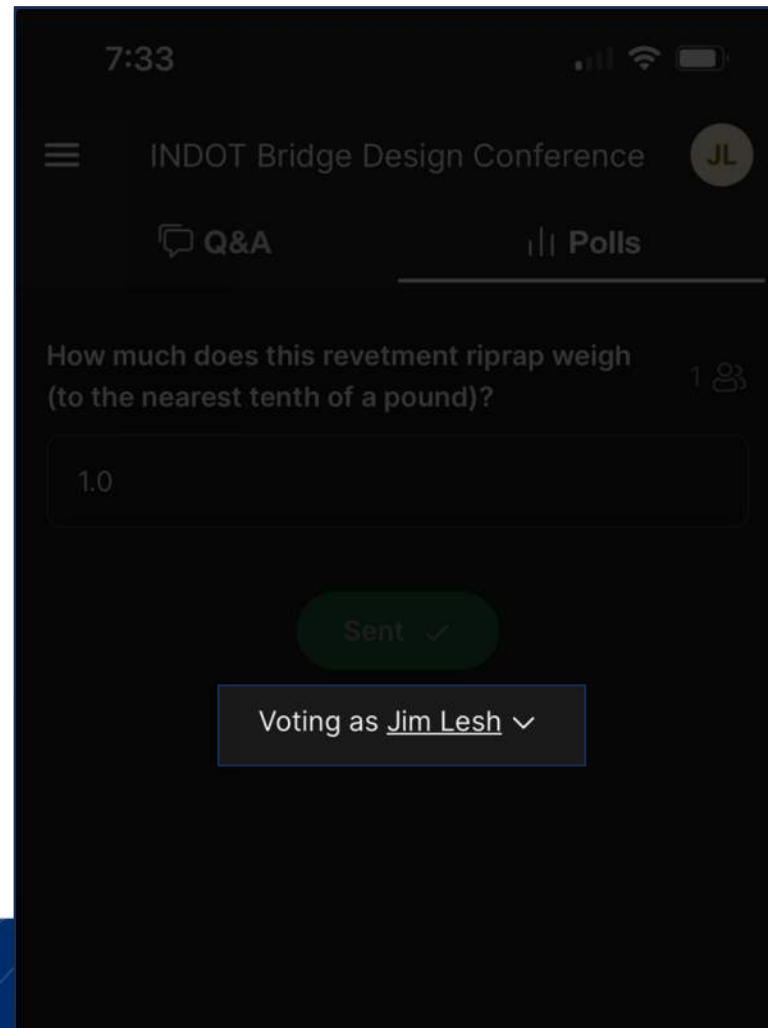
# Riprap



# Riprap

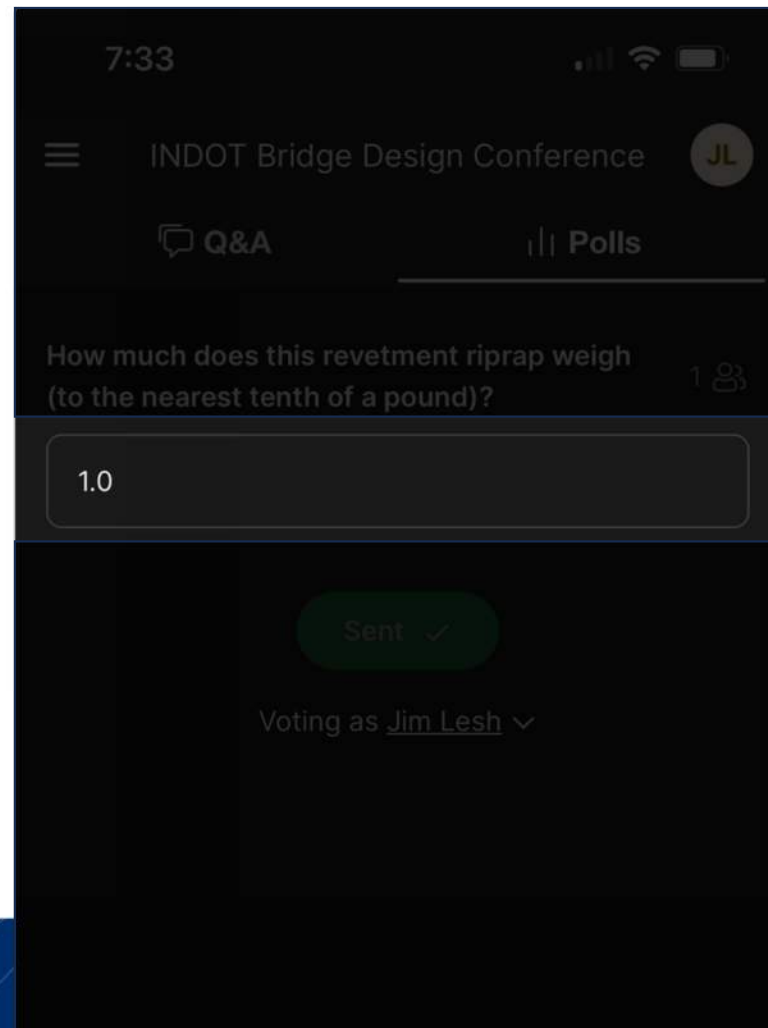


# Riprap





# Riprap



# Riprap



7:33 📶 🔋

☰ INDOT Bridge Design Conference JL

💬 Q&A ||| Polls

How much does this revetment riprap weigh (to the nearest tenth of a pound)? 1 👤

1.0

Sent ✓

Voting as Jim Lesh ▾



# Riprap



7:33

INDOT Bridge Design Conference

Q&A | Polls

How much does this revetment riprap weigh (to the nearest tenth of a pound)?

1.0

Sent ✓

Voting as Jim Lesh ▾



Join at  
**slido.com**  
**#1256 865**

Active poll

1

How much does this revetment riprap weigh (to the nearest tenth of a pound)?

10



# Riprap

7:21  
◀ Camera

☰ INDOT Bridge Design Conference JL

💬 Q&A || Polls

How much does this revetment riprap weigh (to the nearest tenth of a pound)? 3 👤

1.0 lbs

This will be considered as 1 entry

Send

Voting as Jim Lesh ▾





# Riprap



7:21  
Camera

INDOT Bridge Design Conference JL

Q&A Polls

How much does this revetment riprap weigh (to the nearest tenth of a pound)? 3

1.0 lbs

This will be considered as 1 entry

Send

Voting as Jim Lesh

Active poll 18

How much does this revetment riprap weigh (to the nearest tenth of a pound)?



Join at  
**slido.com**  
**#1256 865**

1.0 lbs



slido



**How much does this revetment riprap weigh (to the nearest tenth of a pound)?**

ⓘ Start presenting to display the poll results on this slide.

slido



**How much does this Class 1 riprap weigh (to the nearest tenth of a pound)?**

ⓘ Start presenting to display the poll results on this slide.

# Riprap





slido



**How much does this Class 2 riprap weigh (to the nearest tenth of a pound)?**

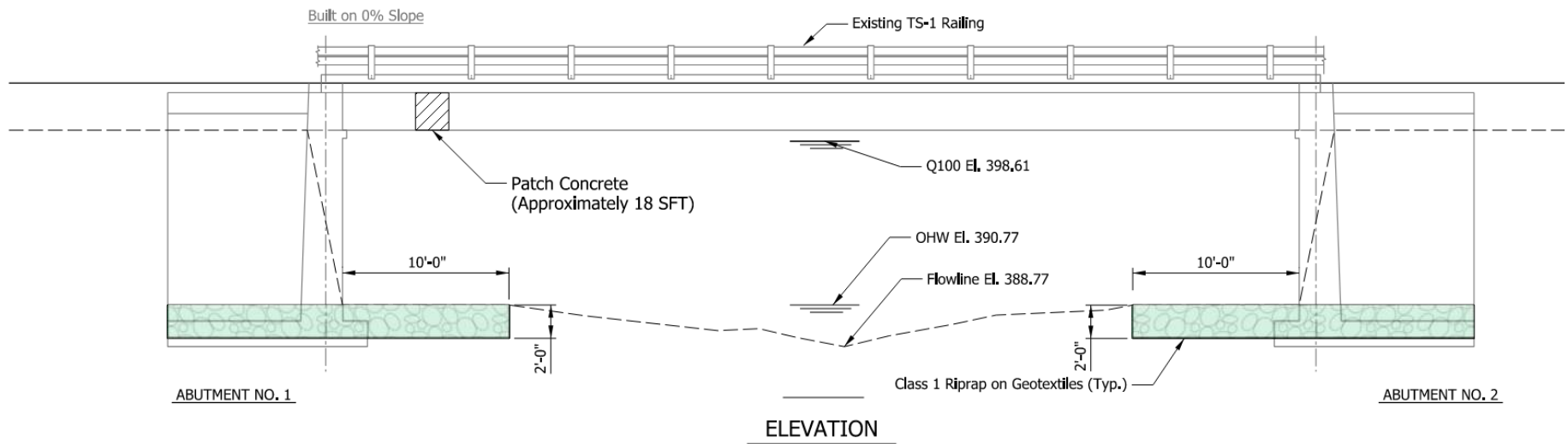
ⓘ Start presenting to display the poll results on this slide.

# Riprap





# Riprap



# Riprap





# Riprap

Riprap Sizing for Erosion Protection		Velocity, v (fps)			
		v<6.5	6.5≤v<10	10≤v<13	v>13
Span of Structure, x	x≤2'	Revetment	Revetment	Revetment	Revetment
	2'<x≤2.5'	Revetment	Class 1	Class 1	Class 1
	2.5'<x≤3'	Revetment	Class 1	Class 2	Class 2
	x>3'	Revetment	Class 1	Class 2	Energy Dissipator
Stream Protection		Revetment	Class 1	Class 2	Class 2

Notes:

1. If clear-zone or other issues prohibit the use of the required erosion-protection method, the Office of Hydraulics should be contacted for additional instructions.
2. Substitution of partially grouted riprap of one size smaller than that recommended in the table may be used.

**STREAM VELOCITY FOR EROSION PROTECTION**

**Figure 203-2D**  
[Rev. Jan. 2023]



# Riprap



2. Substitution of partially grouted riprap of one size smaller than that recommended in the table may be used.



# Riprap



## Recurring Special Provisions & Plan Details

- [September 2023 Edition](#)  
For Lettings on or after **September 1, 2023 thru August 31, 2025**
- [September 2021 Edition](#)  
For Use with [2022 Standard Specifications](#)  
For Lettings on or after **September 1, 2021 thru August 31, 2023**

## Unique Special Provisions

Effective October 1, 2020, all USPs must be submitted for review and approval through SharePoint.

You must be a member of the INDOT Unique Special Provisions Team via Microsoft Teams to access the SharePoint site. [Click here](#) to send a request to be added to the team.

- [Unique Special Provision Process](#)
- [List of Unique Provisions \(samples\) \(MS Excel\) // \(pdf\)](#)
- [Instructions for Use Unique Special Provisions](#)
- [USP Menu](#)



# Riprap



- List of Unique Provisions (samples) ([MS Excel](#)) // ([pdf](#)).



# Riprap



## Sample Unique Special Provisions Updated 10/26/2023

*These sample Unique Special provisions are provided as examples only.*

*They will need to be revised to fit your unique project.*

Contract: Scott Trammell /Specifications Engineer

strammell@indot.in.gov

#	Section*	Subsection*	Subject	Comments
1	100	104	Design Build Contracts	
2	100	107	Listed Bat Avoidance and Mitigation Measures	revised 09/28/22
3	100	107	Non-listed Bat Inspection and Coordination	added 8/27/19
4	100	107	WORK ZONE Incident Management	added 10/26/23
5	100	108	Delay in Issuing the Notice To Proceed	
6	100	108	Critical Path Method Scheduling and Float	added 6/15/20
7	100	109	Special Maintenance Work	added 1/17/20
8	100	109	Undistributed Quantities	
9	200	201	Tree Trimming, Clearing and Grubbing	added 11/10/15
10	200	202	Plug Existing Drainage Pipes	added 11/10/15
11	200	205	Data Logging Rain Gauge	
12	300	303	Arema No. 5 Ballast	
13	400	401	HMA Vibratory Compaction Prohibition	
14	500	501	QC/QA, PCC, Thin Bonded Overlay	added 5/4/17
15	500	503	Terminal Joint Polymer Modified Asphalt	revised 2/10/21
16	500	507	RCBA Crack Filling, PCC Sealer Healer	added 2/16/23
17	600	615	Bollards	
18	600	616	Partially Grouted Riprap	added 11/10/15
19	600	621	Double Shredded Hardwood Bark Mulch	
20	600	621	Permanent Turf Reinforcement Mat	
21	700	700	Temporary Shoring	added 11/10/15
22	700	701	Vibration Monitoring	added 11/10/15
23	700	701	Pile Sleeves for Mechanically Stabilized Earth Retaining Walls	revised 8/23/23
24	700	702	Fiber Wrap	revised 8/11/23
25	700	703	Embedded Galvanic Anodes	updated 8/16/23
26	700	715	Water Mains - (Sample 1)	
27	700	715	Water Mains - (Sample 2)	
28	700	720	Stormwater Treatment System	
29	700	725	Centrifugally Cast Concrete Pipe	revised 1/29/18
30	700	734	Soil Nailed Wall	
31	800	801	Temporary Traffic Control Rolling Slowdown	
32	800	801	Maintaining Pedestrian Accessibility during Construction	added 11/10/15
33	800	801	Possible Use of Truck Mounted Attenuator (TMA)	added 3/5/18
34	800	801	Trucks for Advanced Queue Awareness with Detail	revised 6/30/20; updated format 8/18/21
35	800	801	Temporary Accessible Pedestrian Path	added 8/11/23
36	800	801	Temporary Curb Ramp	added 8/11/23
37	800	801	Temporary Pedestrian Channelizer	added 8/11/23
38	800	802	Cored Hole in Sidewalk For Sign Post Installation	added 11/10/15
39	800	805	Solar Powered Flashing Beacon Assembly	
40	800	805	Rectangular Rapid Flashing Beacon, RRFB	added 6/3/20

\* Section and Subsection numbers referred to INDOT's Standard Specifications



# Riprap



18	600	616	Partially Grouted Riprap	<i>added 11/10/15</i>
----	-----	-----	--------------------------	-----------------------

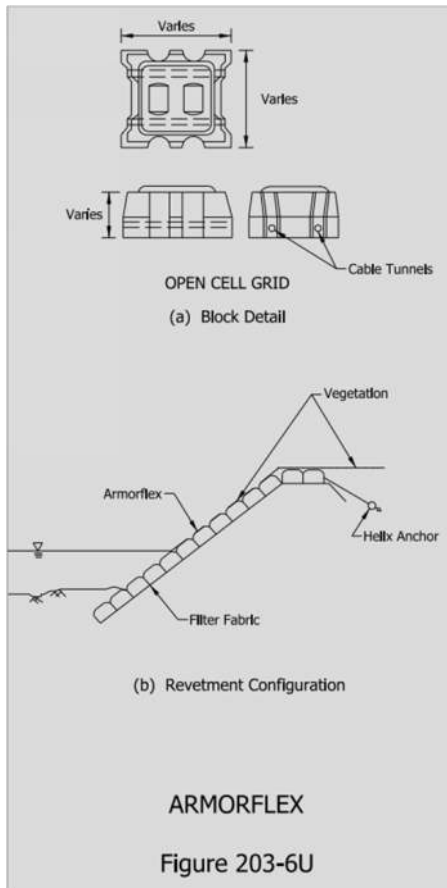




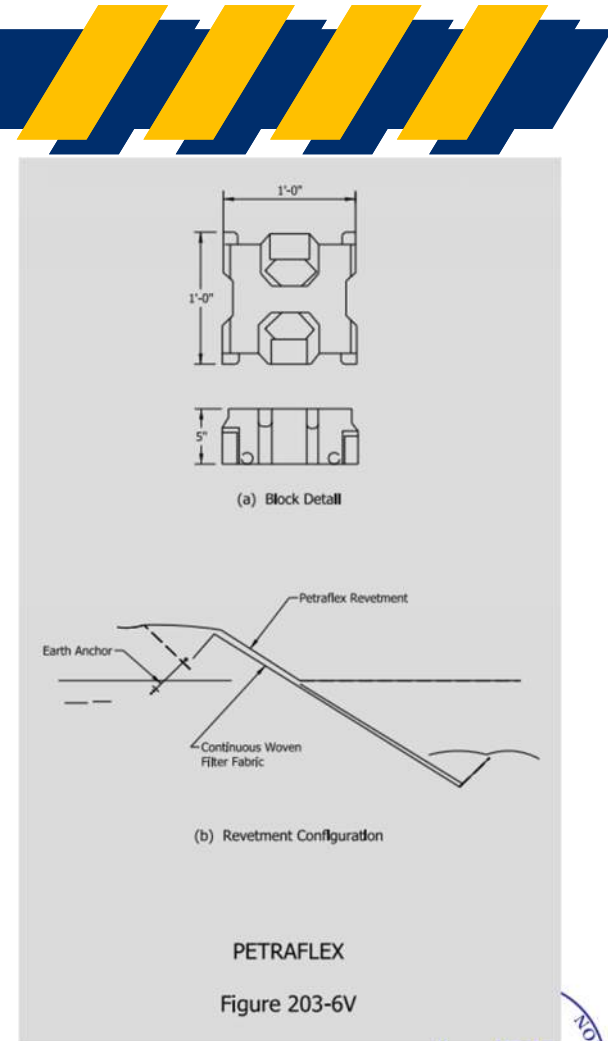
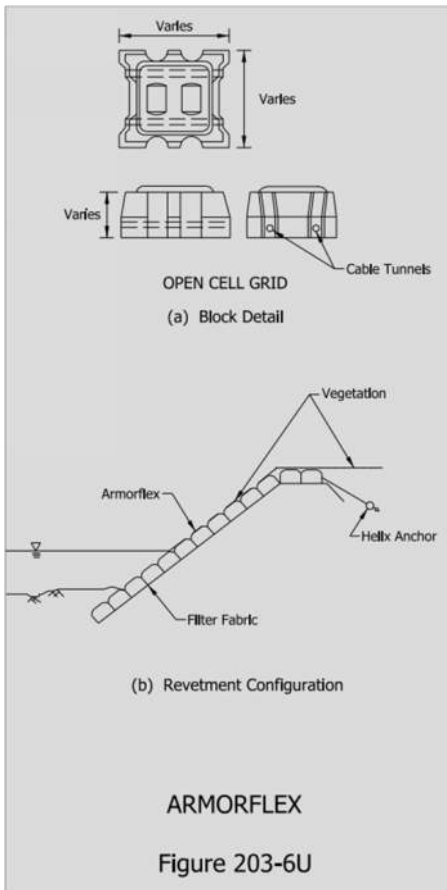
# Riprap



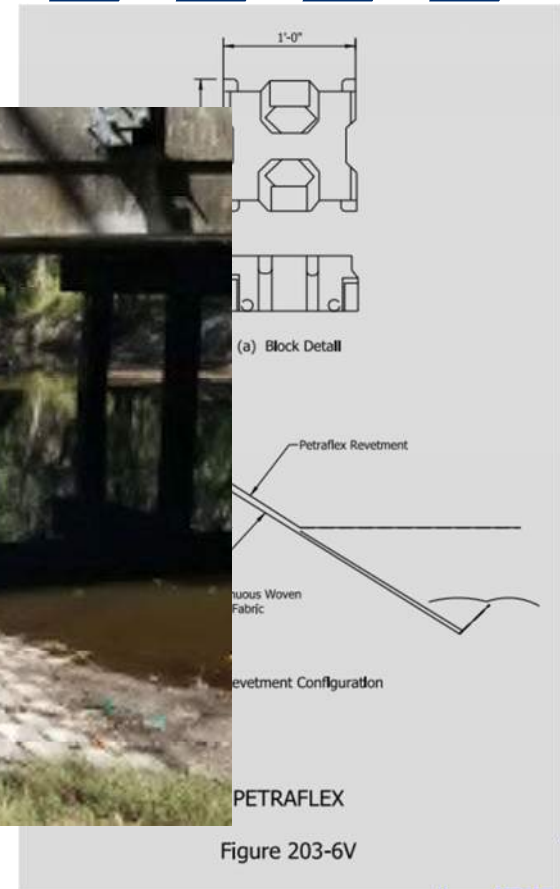
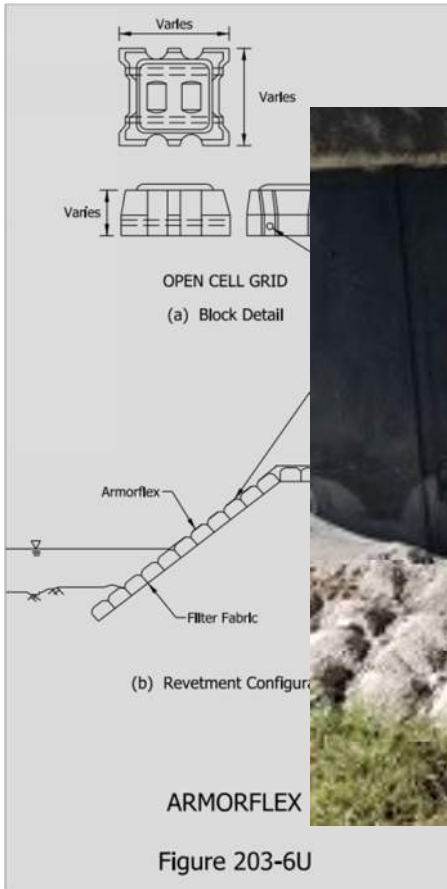
# Riprap



# Riprap



# Riprap



# MOT Shoulder Widths

## 503-3.04(02) Lane or Shoulder Width, Lateral Offsets [Rev. **May 2023**]

Desirably there should not be a reduction in the width of the roadway cross section through the construction zone. However, this may not be practical for every work zone. When such a reduction is unavoidable on a non-Interstate freeway, expressway or higher volume arterial highway (AADTs > 12,000 for a two lane highway and 30,000 for facilities with 4 lanes or more), a traffic capacity analysis should be conducted as part of the Traffic Management Plan to assess potential queuing and delay issues that may occur. Depending on the outcome of the analysis, additional maintenance of traffic countermeasures may be required, such as establishing alternative routes or adjusting signal timings. The results should be shared and discussed with the TMP team.



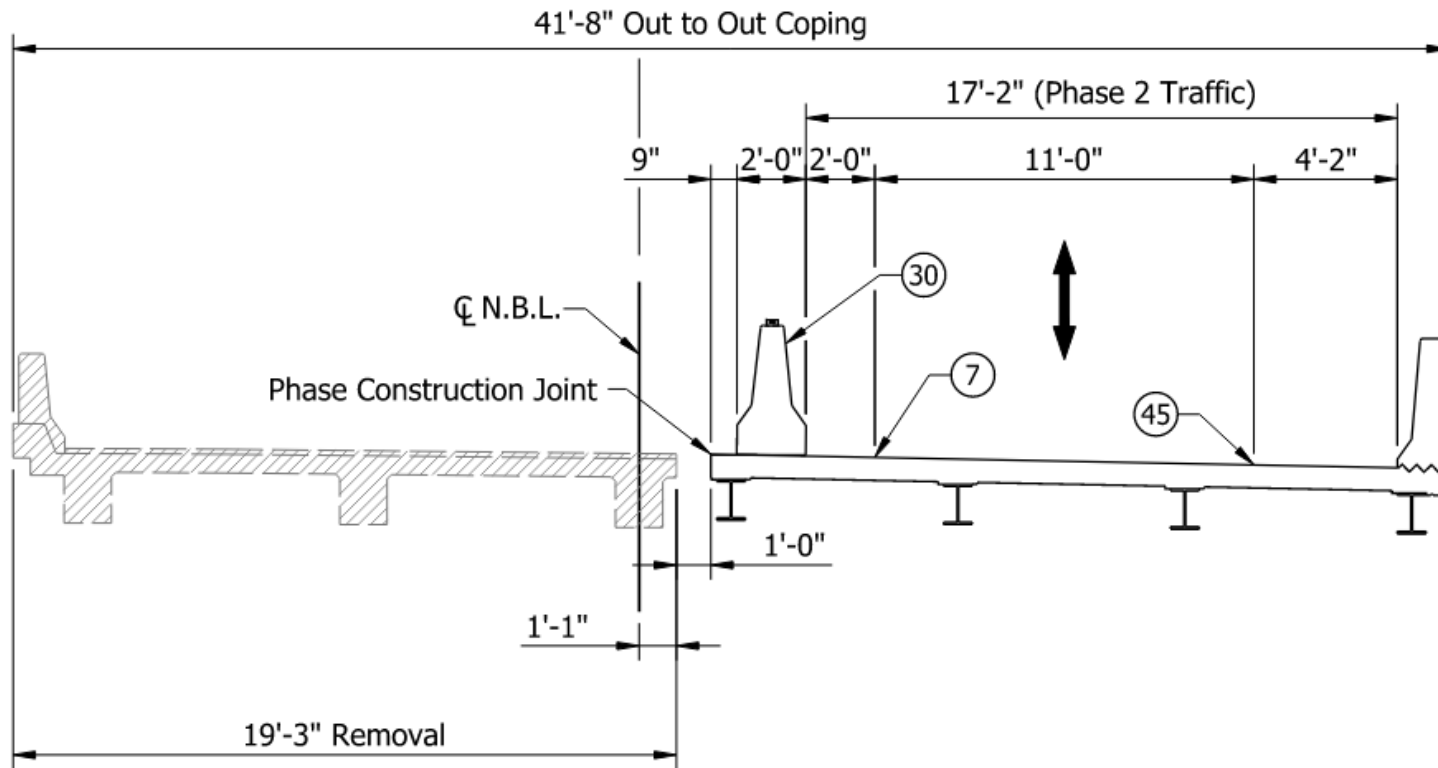
# MOT Shoulder Widths

1. Freeway. For a freeway, a minimum 11-ft lane width should be maintained with shoulders or barrier offsets of 2 ft or wider. At bridges and their approaches an 11-ft lane with 1-ft shoulder or barrier offset may be used when any of the following conditions are present:
  2.
    - The available cross section is at least 13 ft but less than 15 ft for one lane work zones, 24 or 25 ft for two lanes, and 35 or 36 ft for three lanes, etc. Note: if there are more than two lanes in a travel direction the inside lane(s) should be 11 ft in width at minimum.
    - A reduction in the number of lanes is not allowed by the IHCP established closure schedule.

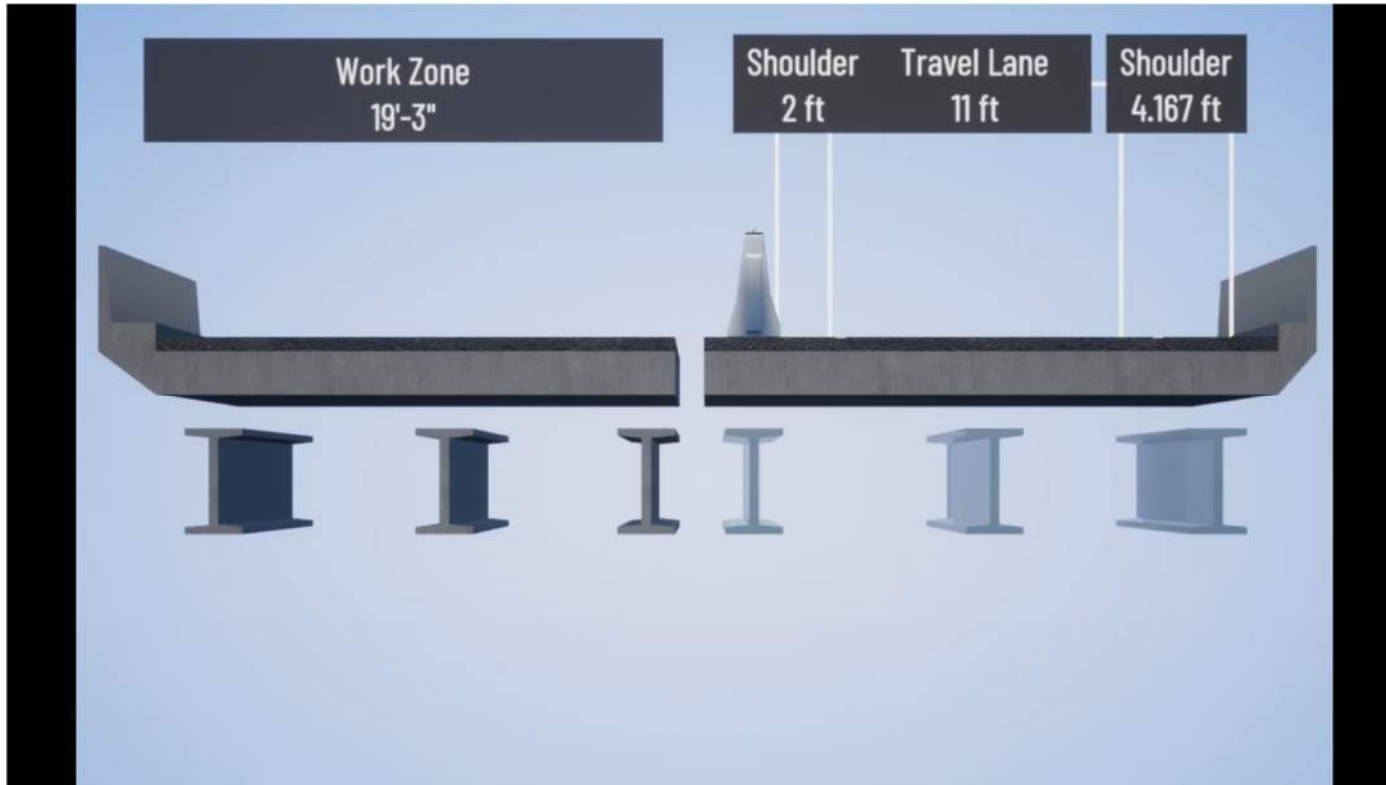




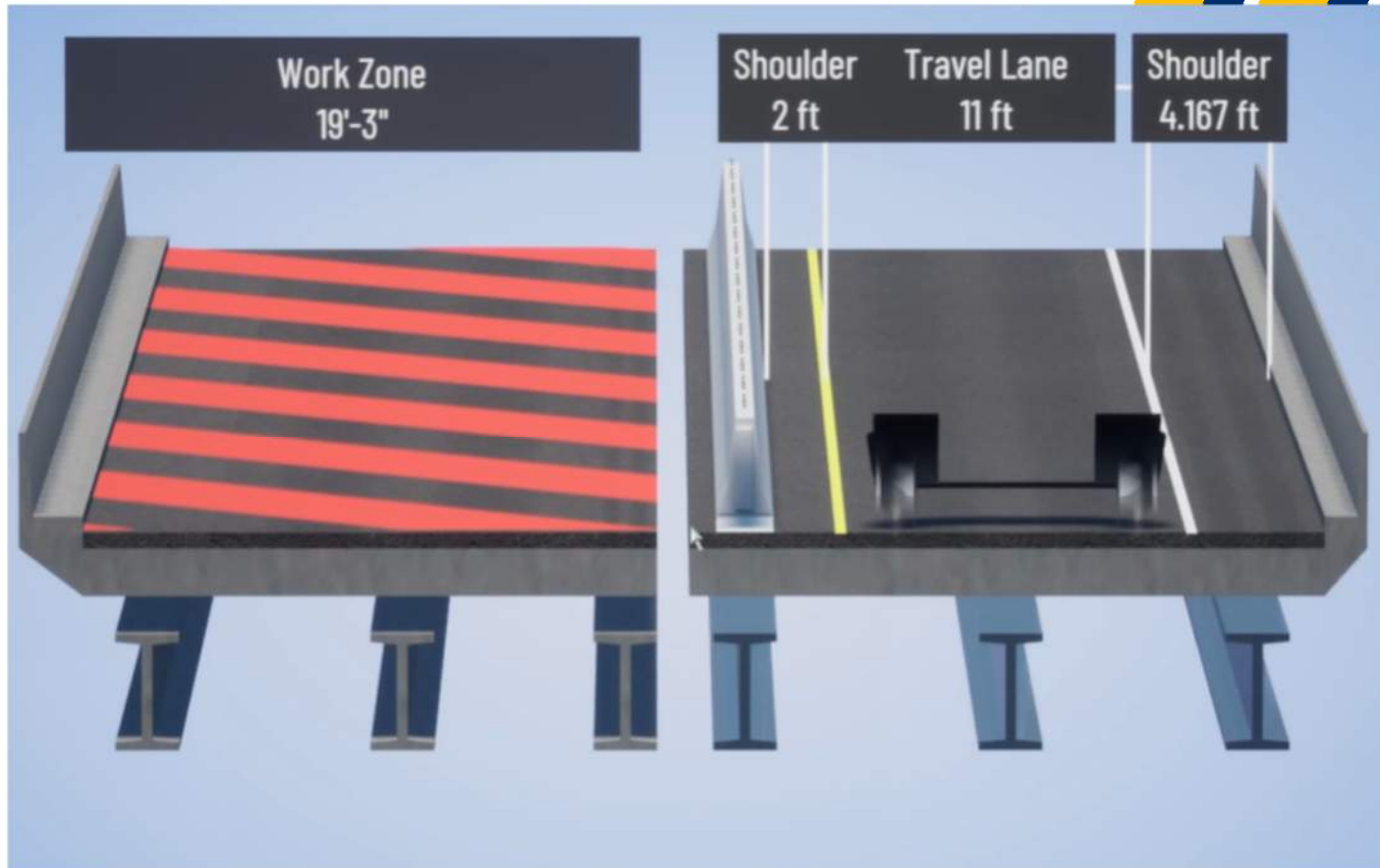
# MOT Shoulder Widths



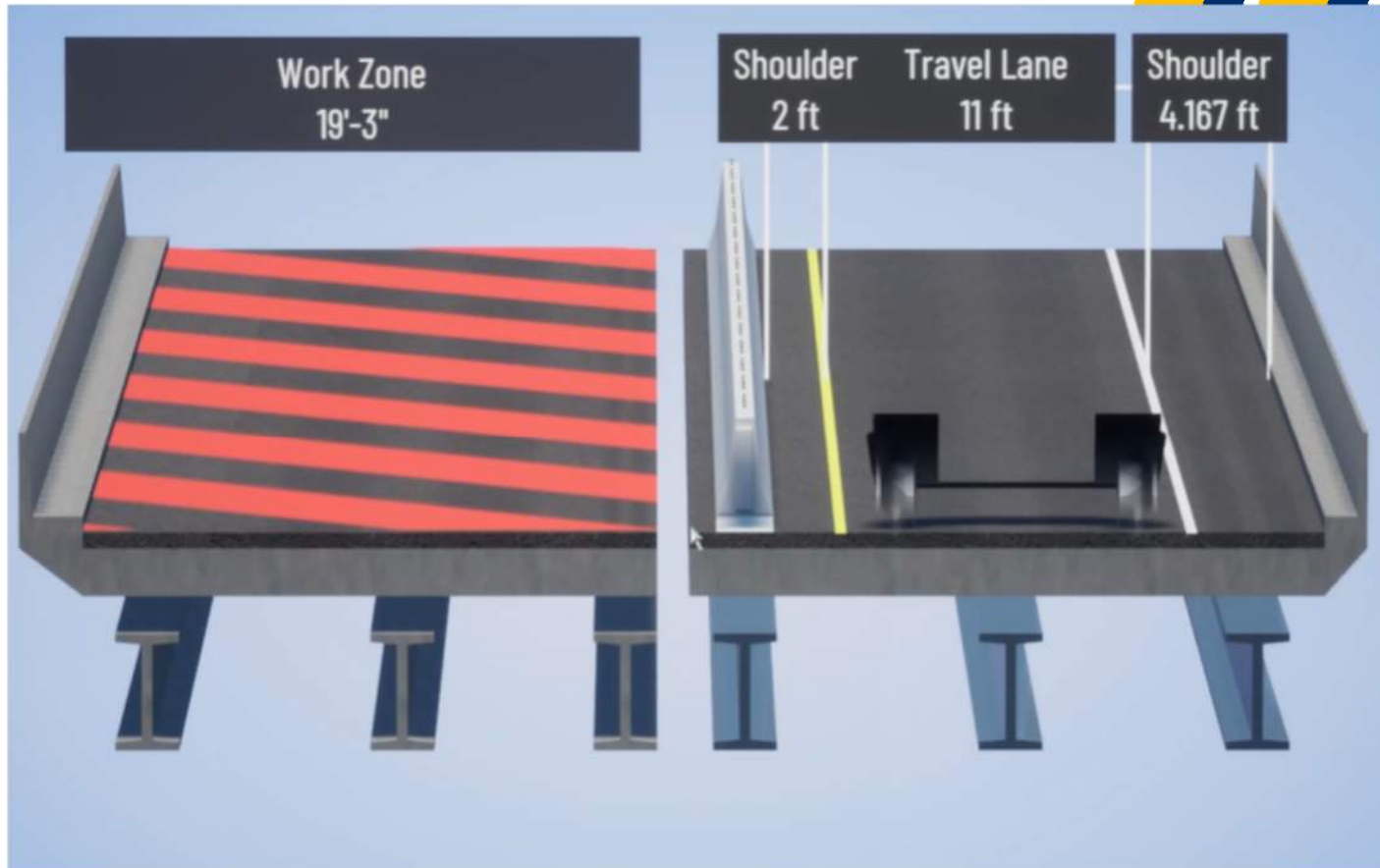
# MOT Shoulder Widths



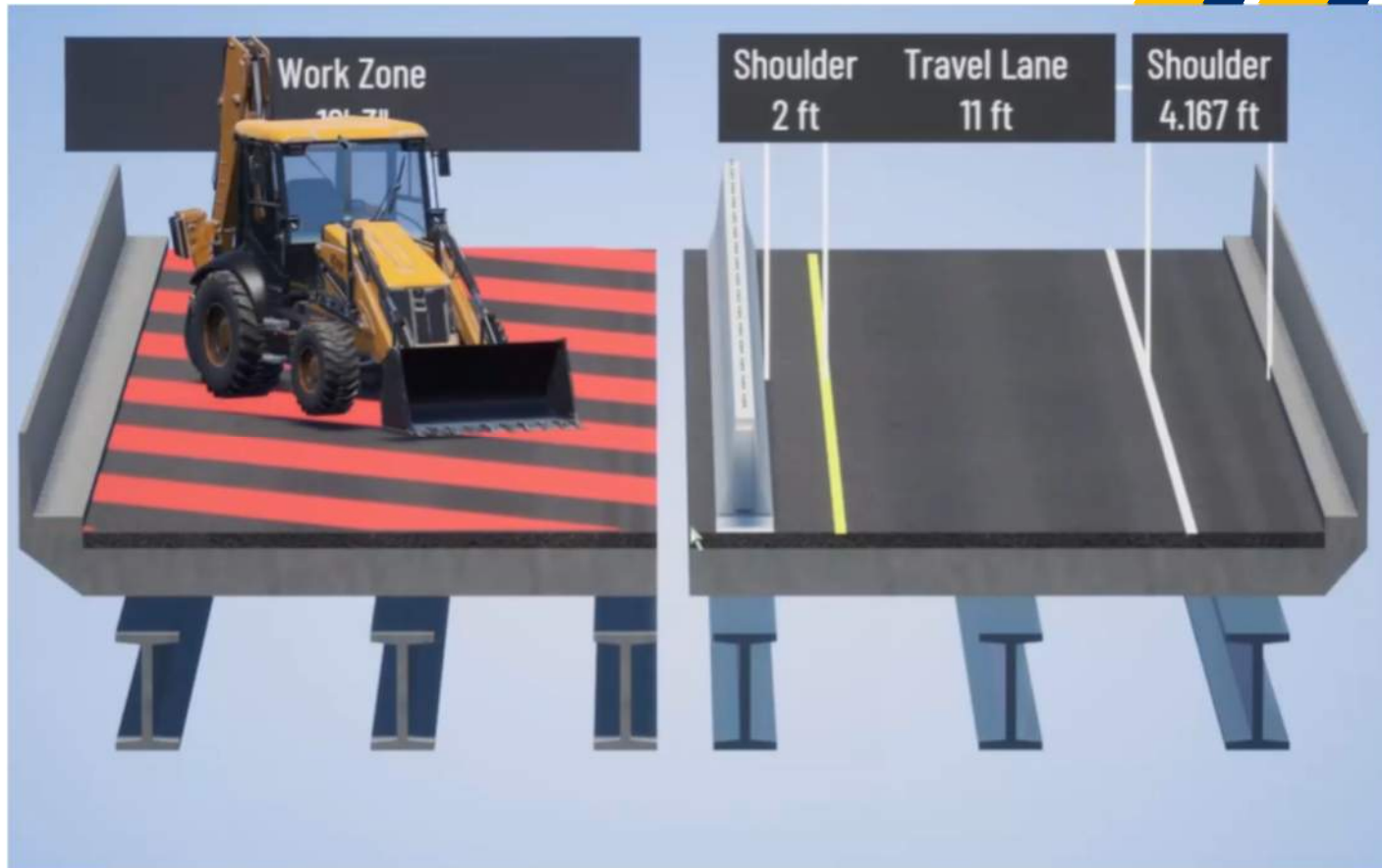
# MOT Shoulder Widths



# MOT Shoulder Widths

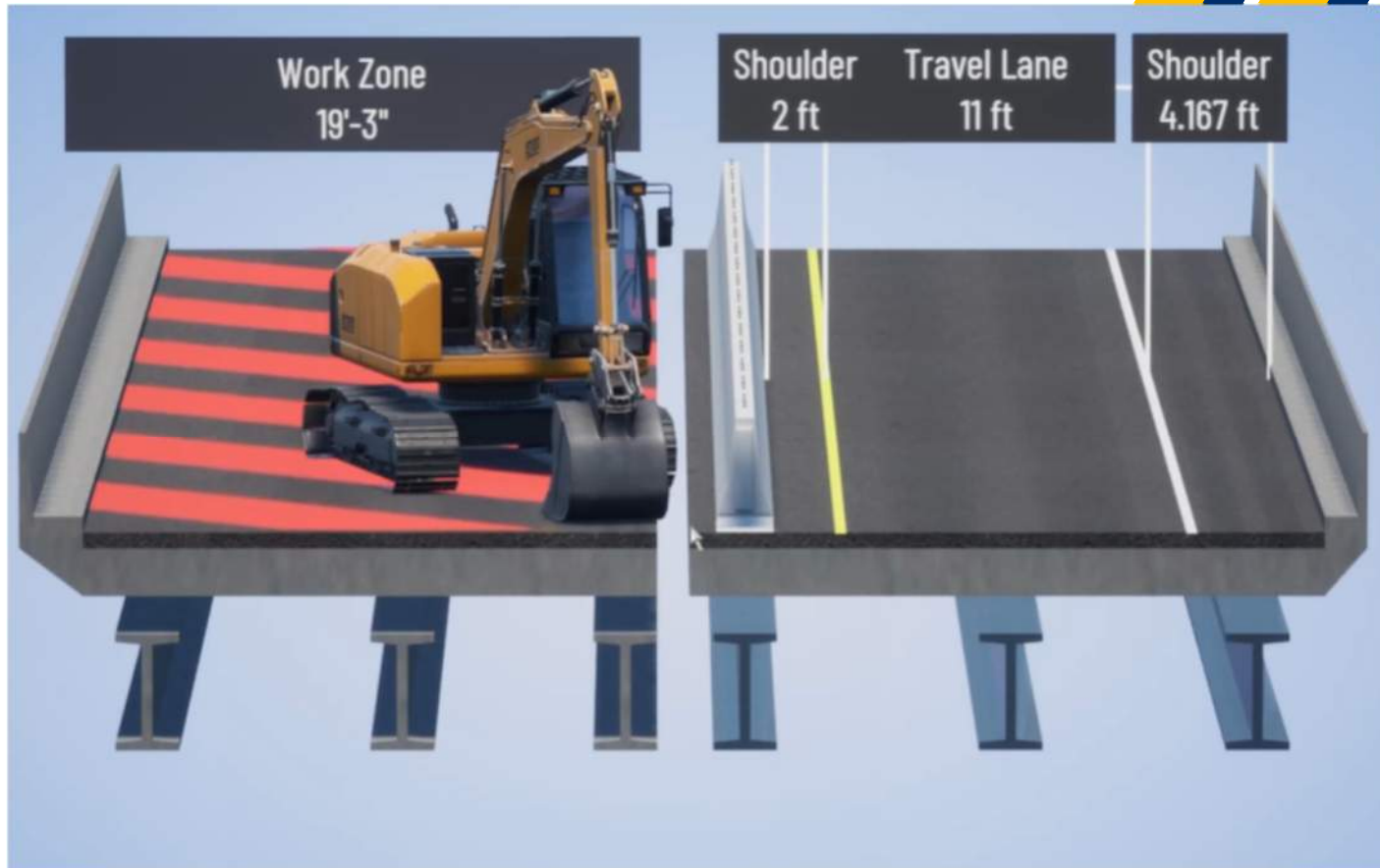


# MOT Shoulder Widths





# MOT Shoulder Widths



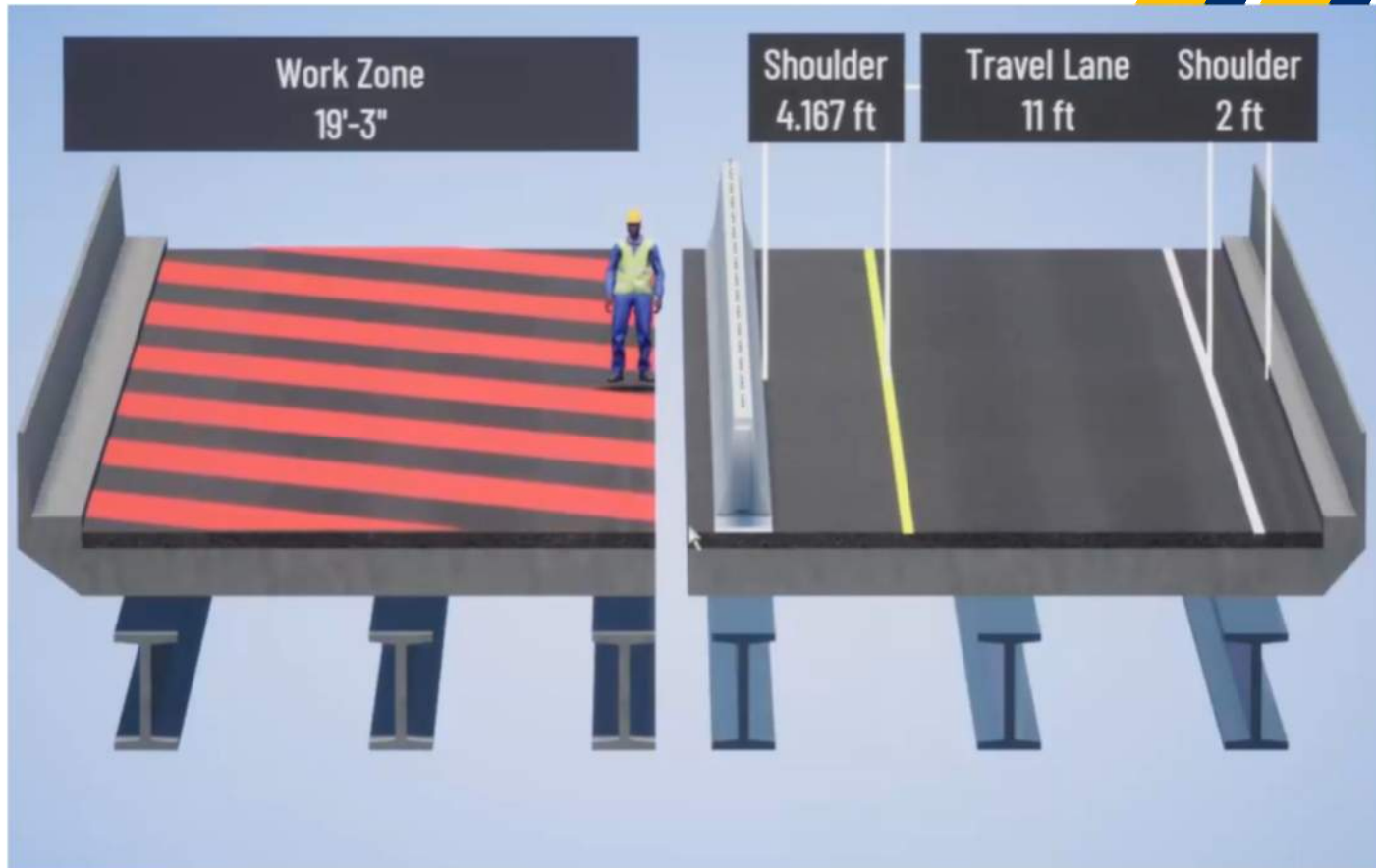
# MOT Shoulder Widths



# MOT Shoulder Widths



# MOT Shoulder Widths



# Progress

IN.GOV An official website of the Indiana State Government

Accessibility Settings Language Translation Governor Eric J. Holcomb



Indiana Department of Transportation

Search INDOT



## Bridge Design Aids

Doing Business with INDOT > Doing Business with INDOT > Bridge Design Aids

Bridge Design Aids (BDA) are a means to share bridge design information with bridge construction and design professionals throughout the state in a timely fashion. BDAs are not policy. They include a variety of guidance such as answers to commonly asked questions, "good practice" tips, and other topics of interest.

Our hope is that this effort will reduce confusion regarding the Department's preferences and lead to more uniform bridge plans throughout the state.

When BDA updates are published, notifications will be shared via the INDOT Design Consultants listserv. Subscribe [here](#).

BDA Number	Date	Subject
<a href="#">100-05</a>	12/20/2023	<a href="#">Bridge Sample Plans - Rehabilitation</a>
<a href="#">100-03</a>	Rev. 12/13/2023 (Prev. 05/10/2023)	<a href="#">Bridge Design Review Checklists</a>
<a href="#">404-01</a>	12/7/2022	<a href="#">Continuous Deck Pour - Prestressed Beams</a>
<a href="#">100-04</a>	7/1/2022	<a href="#">Reinforced Concrete Box Structures and Three-Sided Structures</a>
<a href="#">100-01</a>	Rev. 02/14/2022 (Prev. 1/22/2018)	<a href="#">Bridge Sample Plans - Replacement</a>
<a href="#">412-04</a>	09/08/2020	<a href="#">Embedded Galvanic Anodes</a>
<a href="#">100-02</a>	Rev. 05/20/2020 (Prev. 01/13/2020)	<a href="#">Bridge Sample Plans - Thin Deck Overlay</a>





# Progress



100-03

Rev. 12/13/2023  
(Prev. 05/10/2023)

Bridge Design Review Checklists



# Progress



## Bridge Replacement Stage 3 Checklist

INDOT Bridge Engineering Division

Version Date: 9/13/2023

Red text is new with this version date

Highlighted items marked as "Deficient" require a resubmittal of STG3. Other deficient items may also require resubmittals depending on severity.

REVIEW INFORMATION	
Des/Location	
Designer/Firm	
Submittal Date	
Reviewer/Firm	
Review Date	

Review columns are abbreviated as follows: Sufficient (S), Deficient (D), and Not Applicable (NA). Any items marked deficient at Stage 3 may require a resubmittal.

I. COMMUNICATION			
S	D	NA	
			TRANSMITTAL LETTER Lists documents submitted and provides explanation for any unusual circumstances (missing documents, unique considerations, etc.) <i>Reviewer Notes:</i>
			RESPONSE LETTER Addresses all previous comments and questions <i>Reviewer Notes:</i>
			CORRESPONDENCE FILE Includes information to explain design decisions and other correspondence relevant to the project <i>Reviewer Notes:</i>

Comments:



# Progress



## Bridge Replacement STG3 Checklist

4. OVERALL		
S	D	NA
		A) MAINTENANCE OF TRAFFIC
		<ul style="list-style-type: none"> <li>Level One Checklist for MOT with any Design Exceptions approved</li> <li>Transportation Management Plan (when applicable)</li> <li>District Traffic Coordination (Verified at Stage 3 via email note in Correspondence)</li> <li>IHCP Exceptions with requirements incorporated into the plans and provisions</li> <li>Is project constructable within MOT as detailed?</li> </ul>
		Reviewer Notes:
		B) ADA COMPLIANCE All sidewalks, trails comply with ADA requirements and properly documented
		Reviewer Notes:
		C) CONSTRUCTABILITY including temporary shoring, removal limits, existing structure and site condition conflicts, etc.
		Reviewer Notes:
		D) DESIGN PRACTICALITY
		Reviewer Notes:
		E) THERMAL MOVEMENTS have been accounted throughout the detail including but not limited to keyways, semi-integral end bents, ends of RCBA's at adjacent curbs, railings, and terminal joints.
		Reviewer Notes:

Comments:



# Progress



			E) THERMAL MOVEMENTS have been accounted throughout the detail including but not limited to keyways, semi-integral end bents, ends of RCBA's at adjacent curbs, railings, and terminal joints.
--	--	--	--

*Reviewer Notes:*



# Progress



EXPANSION JOINT SEALS	
LOCATION	ABUTMENT 1 & 2
NOMINAL MATERIAL WIDTH AT MEAN TEMPERATURE, 60°F	1"
LONGITUDINAL CONTRACTION MOVEMENT	-0.08"
LONGITUDINAL EXPANSION MOVEMENT	+0.07"
TOTAL LONGITUDINAL MOVEMENT	0.15"
TRANSVERSE CONTRACTION MOVEMENT	0"
TRANSVERSE EXPANSION MOVEMENT	0"
TOTAL TRANSVERSE MOVEMENT	0"
MINIMUM RECESS BELOW GRADE	1/4"

## NOTE:

Width of pre-compressed foam joint to be selected to accommodate above moments in coordination with Manufacturer's recommendations.

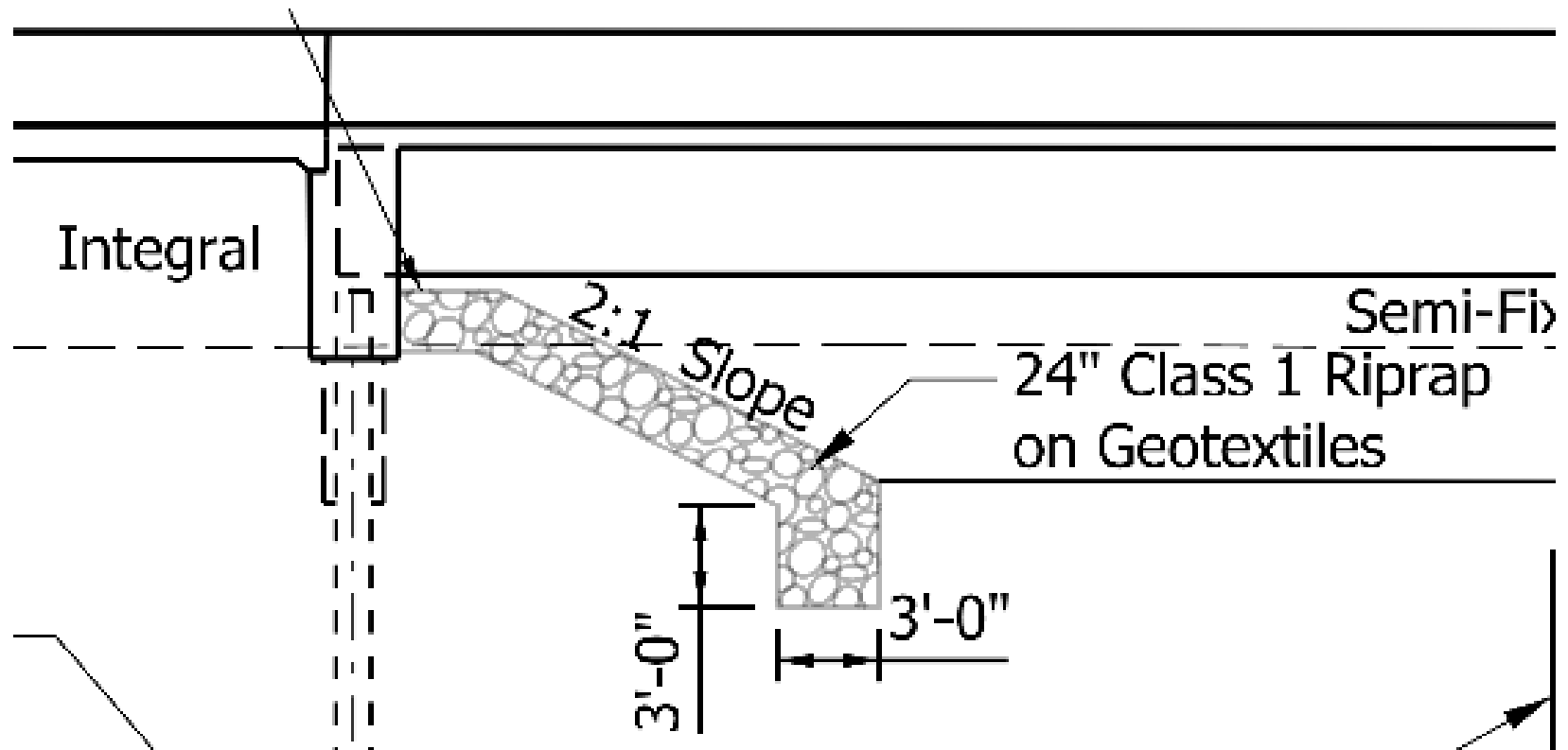


# Lessons Learned





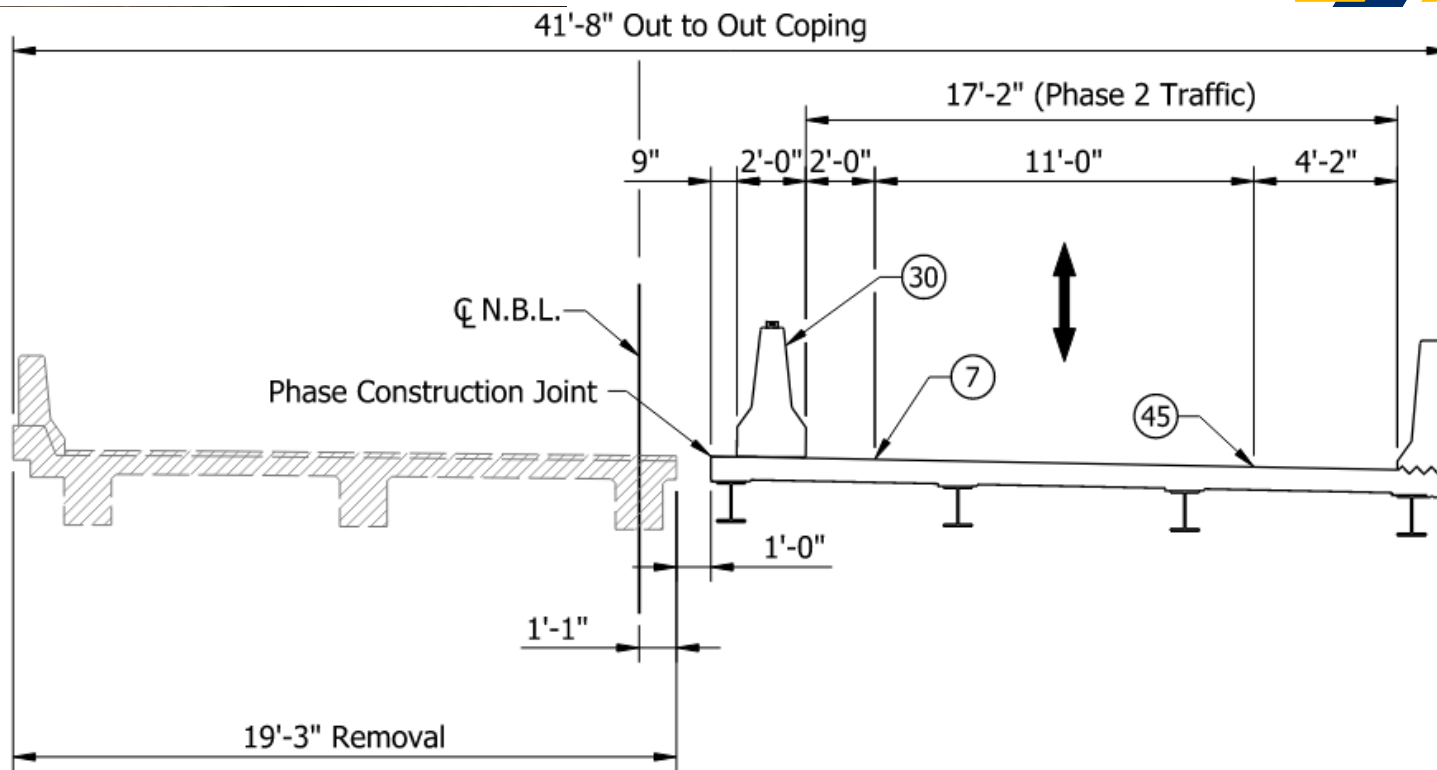
# Lessons Learned



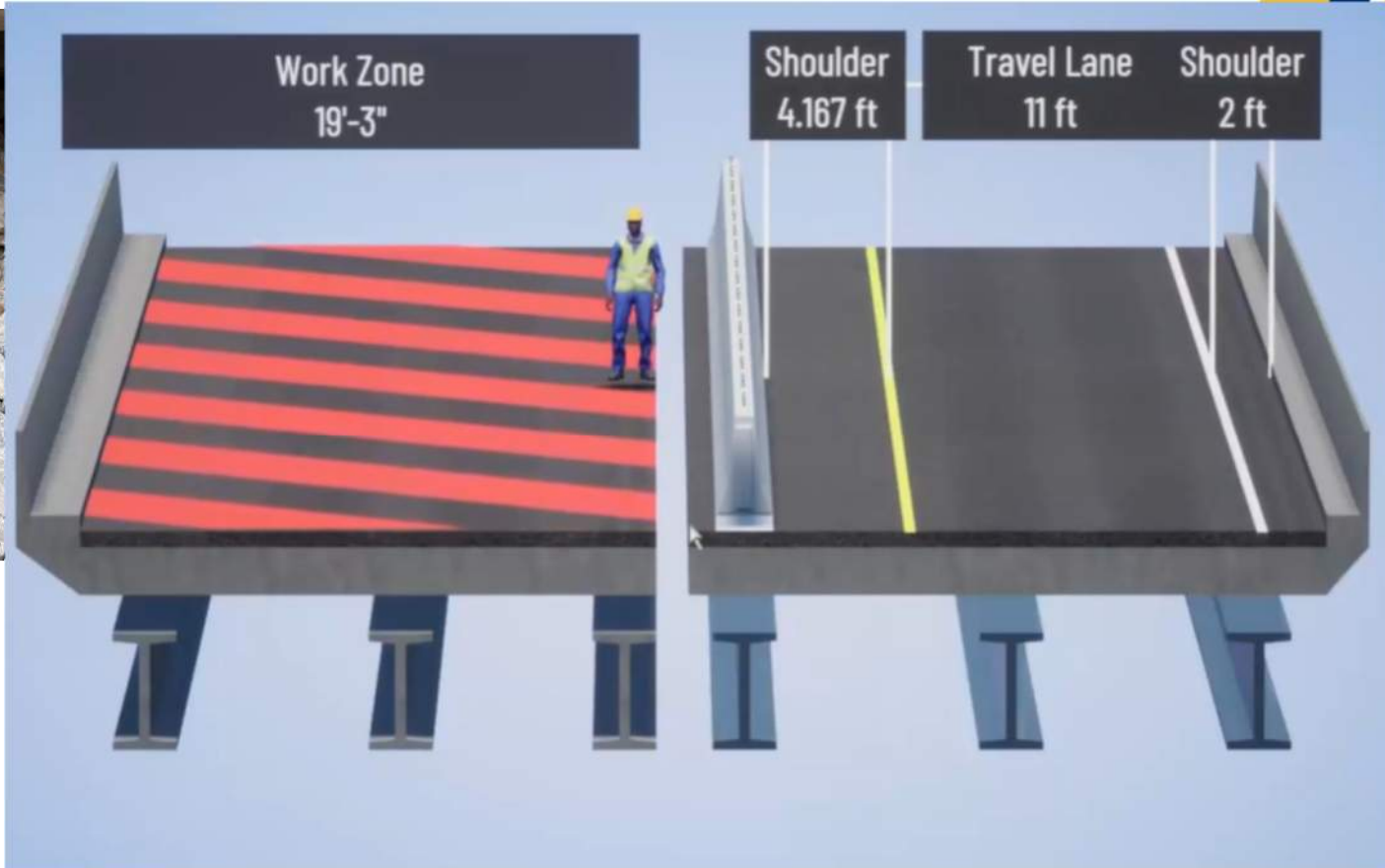
# Lessons Learned



# Lessons Learned



# Lessons Learned





# Lessons Learned

Work Zone

Shoulder

Travel Lane

Shoulder

1 ft

2 ft

## EXPANSION JOINT SEALS

LOCATION	ABUTMENT 1 & 2
NOMINAL MATERIAL WIDTH AT MEAN TEMPERATURE, 60°F	1"
LONGITUDINAL CONTRACTION MOVEMENT	-0.08"
LONGITUDINAL EXPANSION MOVEMENT	+0.07"
TOTAL LONGITUDINAL MOVEMENT	0.15"
TRANSVERSE CONTRACTION MOVEMENT	0"
TRANSVERSE EXPANSION MOVEMENT	0"
TOTAL TRANSVERSE MOVEMENT	0"
MINIMUM RECESS BELOW GRADE	1/4"

### NOTE:

Width of pre-compressed foam joint to be selected to accommodate above moments in coordination with Manufacturer's recommendations.



# Lessons Learned



EXPANSION JOINT SEALS	
LOCATION	ABUTMENT 1 & 2
NOMINAL MATERIAL WIDTH AT MEAN TEMPERATURE, 60°F	1"
LONGITUDINAL CONTRACTION MOVEMENT	-0.08"
LONGITUDINAL EXPANSION MOVEMENT	+0.07"
TOTAL LONGITUDINAL MOVEMENT	0.15"
TRANSVERSE CONTRACTION MOVEMENT	0"
TRANSVERSE EXPANSION MOVEMENT	0"
TOTAL TRANSVERSE MOVEMENT	0"
MINIMUM RECESS BELOW GRADE	1/4"

**NOTE:**  
Width of pre-compressed foam joint to be selected to accommodate above moments in coordination with Manufacturer's recommendations.



**INDIANA**  
**TRANSPORTATION TEAM**





# Questions?

