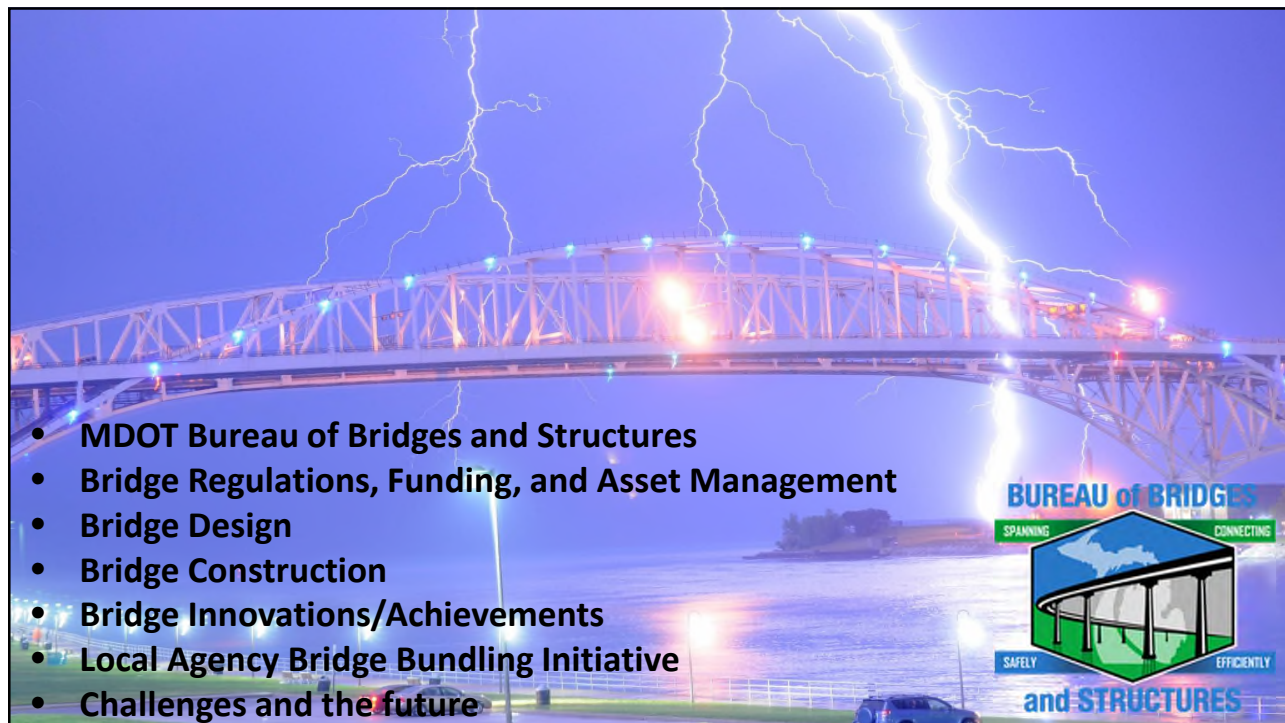


BUREAU of BRIDGES
 SPANNING CONNECTING
 SAFELY EFFICIENTLY
and STRUCTURES

House Transportation Appropriations Committee
 May 23, 2019
 Matthew J. Chynoweth, MDOT Chief Bridge Engineer

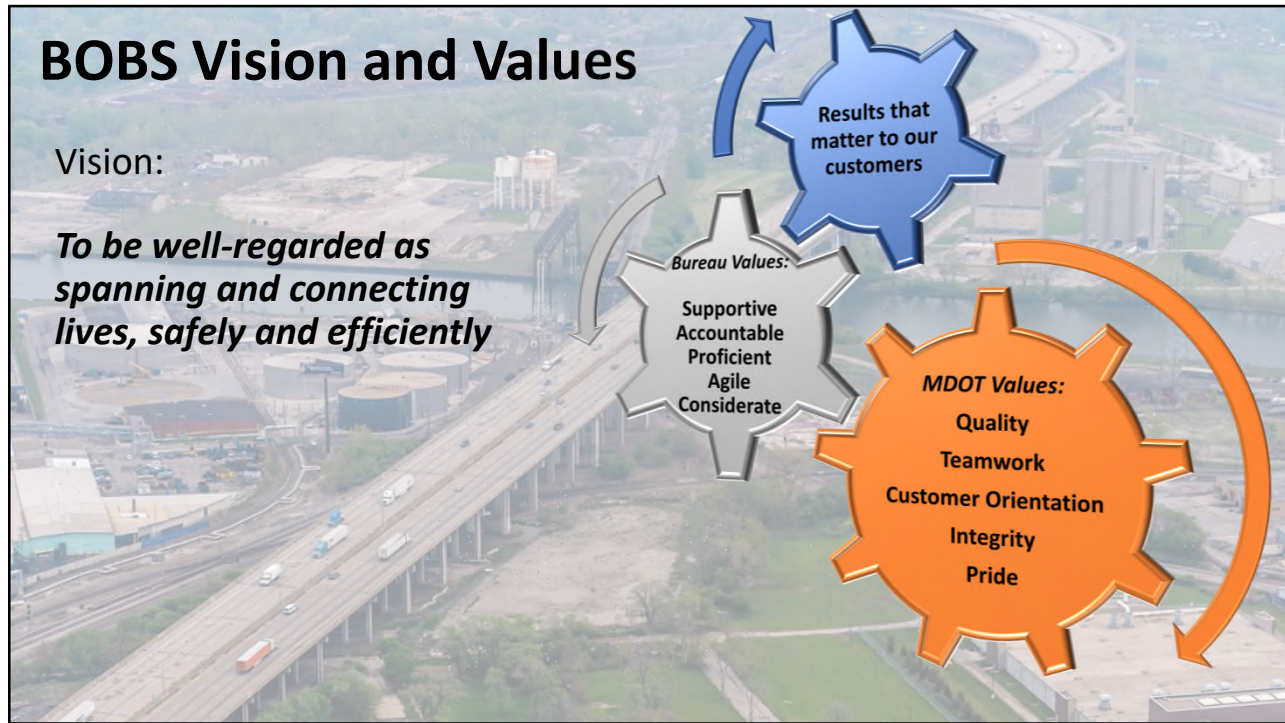
1



- MDOT Bureau of Bridges and Structures
- Bridge Regulations, Funding, and Asset Management
- Bridge Design
- Bridge Construction
- Bridge Innovations/Achievements
- Local Agency Bridge Bundling Initiative
- Challenges and the future

BUREAU of BRIDGES
 SPANNING CONNECTING
 SAFELY EFFICIENTLY
and STRUCTURES

2



3



4

Code of Federal Regulations:

§ 650.307 Bridge inspection organization.

(a) Each State transportation department must inspect, or cause to be inspected, all highway bridges located on public roads that are fully or partially located within the State's boundaries, except for bridges that are owned by Federal agencies.

(c) Each State transportation department or Federal agency must include a bridge inspection organization that is responsible for the following:

(1) Statewide or Federal agency-wide bridge inspection policies and procedures, quality assurance and quality control, and preparation and maintenance of a bridge inventory.

(2) Bridge inspections, reports, load ratings and other requirements of these standards.

5

Code of Federal Regulations:

§ 650.315 Inventory.

(a) Each State or Federal agency must prepare and maintain an inventory of all bridges subject to the NBIS. Certain Structure Inventory and Appraisal (SI&A) data must be collected and retained by the State or Federal agency for collection by the FHWA as requested. A tabulation of this data is contained in the SI&A sheet distributed by the FHWA as part of the "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges," (December 1995) together with subsequent interim changes or the most recent version. Report the data using FHWA established procedures as outlined in the "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges."

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Our State's Bridges:

	ALL BRIDGES			NHS BRIDGES ONLY		
	Count	Area	ADT	Count	Area	ADT
Local	6,633	18,229,259	17,305,522	226	2,469,926	4,780,655
MDOT	4,493	51,124,958	76,559,972	2,737	34,947,511	64,174,556
TOTAL	11,126	69,354,217	93,865,494	2,963	37,417,437	68,955,211

	MDOT	Local Agency
Total Bridge Count	40.4%	59.6%
Total Bridge Area	73.7%	26.3%
Total Bridge ADT	81.6%	18.4%
NHS Bridge Count	92.4%	7.6%
NHS Bridge Area	93.4%	6.6%
NHS Bridge ADT	93.1%	6.9%

7

Bridge and Structure Asset Valuations:

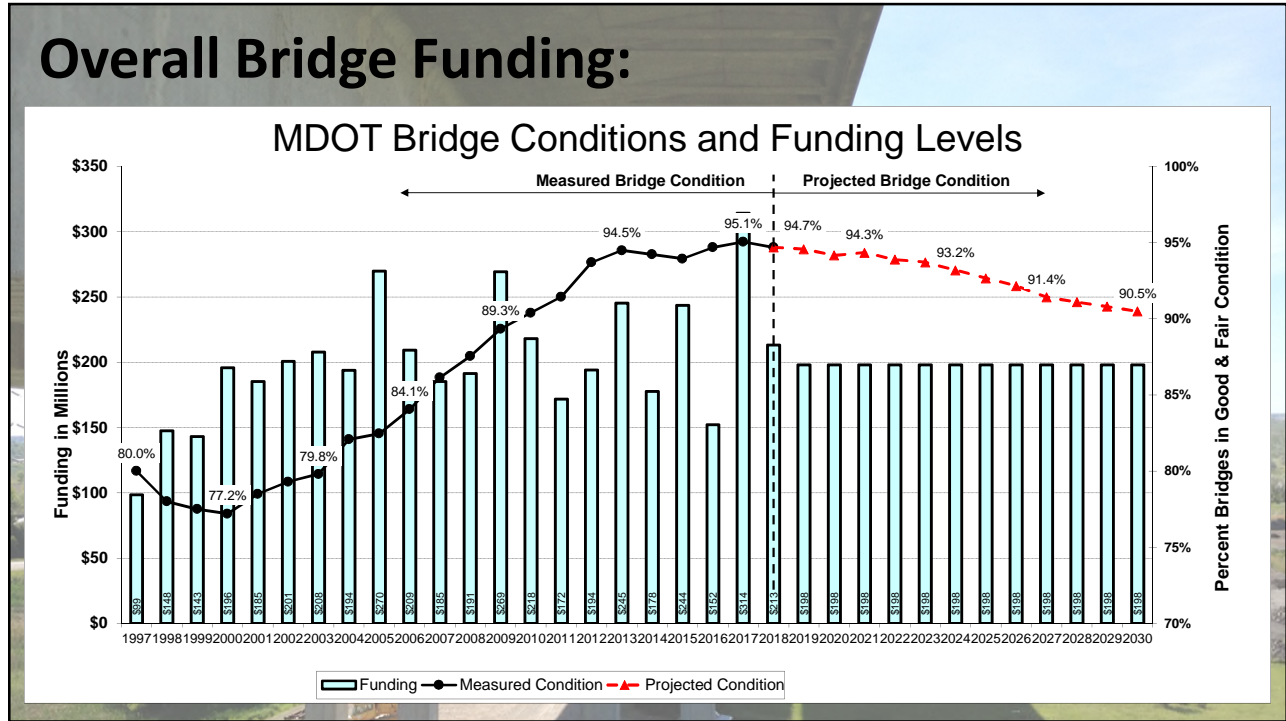
National Bridge Inventory:

- MDOT bridges = \$21 billion
- Bridge Authorities = \$1.2 billion
- Local Agency bridges = \$14.1 billion
- **Total = \$36.3 billion Michigan bridge asset value**

Ancillary Structure Asset	Quantity	Unit	Replacement Cost	Total
<i>Sign Cantilever</i>	815	each	\$125,000	\$101,875,000
<i>Communication Tower</i>	22	each	\$1,255,000	\$27,610,000
<i>Dynamic Message Sign (DMS) Support Structure</i>	264	each	\$85,000	\$22,440,000
<i>Environmental Sensor Station (ESS) Lattice Tower</i>	86	each	\$25,000	\$2,150,000
<i>Lighting Tower</i>	79	each	\$20,000	\$1,580,000
<i>Noise Barrier Wall</i>	347,533	ft	\$1,000	\$347,533,000
<i>Retaining Wall</i>	188,035	ft	\$10,000	\$1,880,350,000
<i>Spun Concrete Pole</i>	270	each	\$55,000	\$14,850,000
<i>Steel Strain Pole</i>	377	each	\$10,000	\$3,770,000
<i>Sign Tri-chord Truss</i>	511	each	\$200,000	\$102,200,000
<i>Culverts less than 10'</i>	51,000	each	\$50,000	\$2,550,000,000
Total				\$5,054,644,000

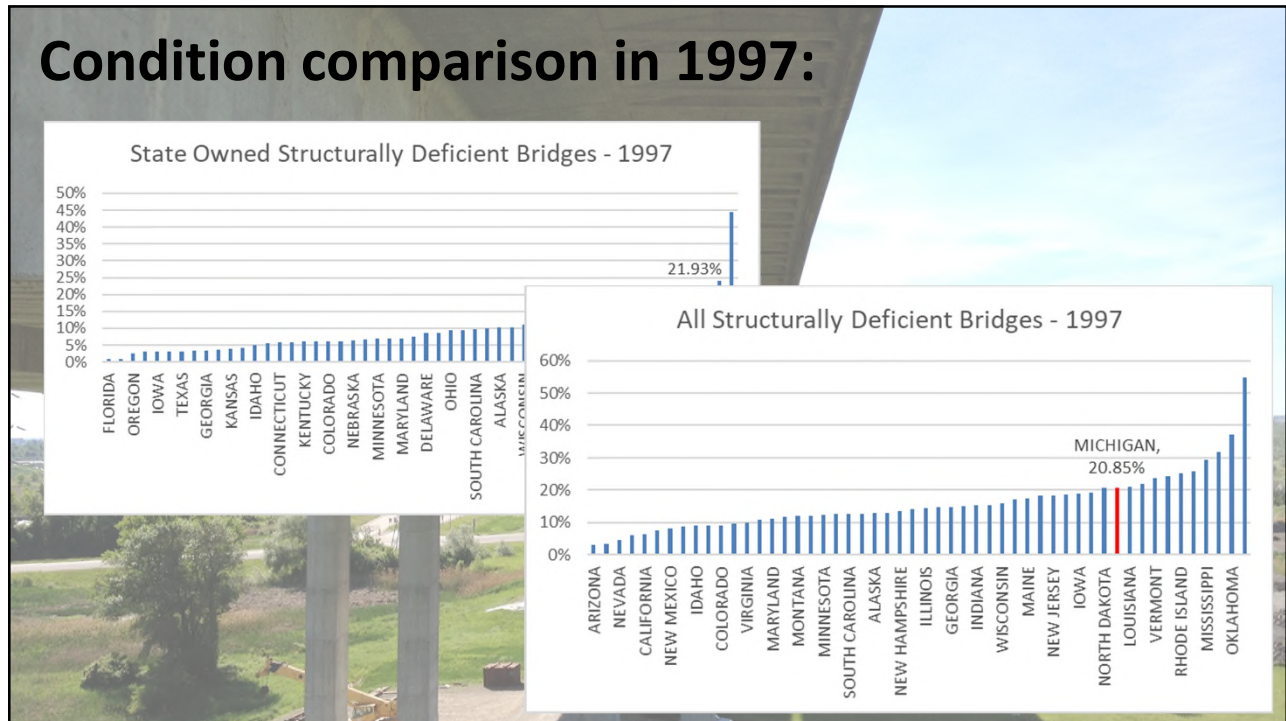
8

Overall Bridge Funding:



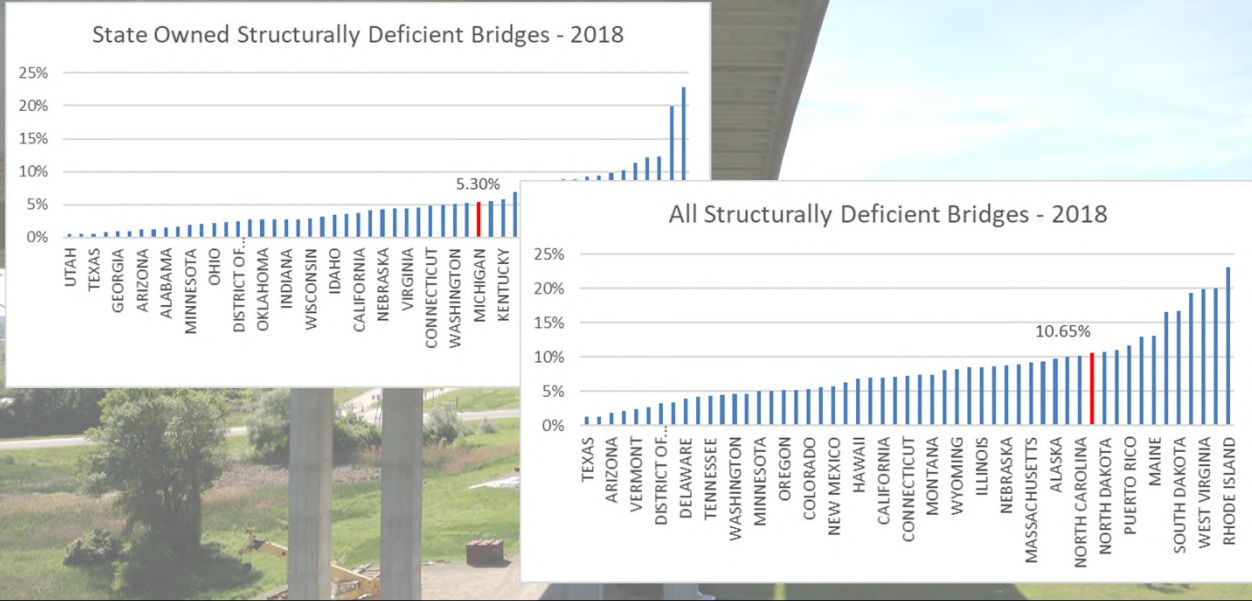
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Condition comparison in 1997:



10

Condition comparison in 2018:



11

Strategic Investments:

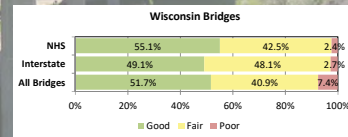
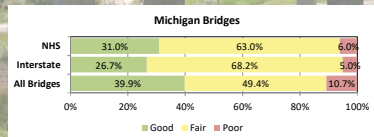
Bridge Conditions - MDOT Bridges - Percent Good/Fair/Poor			
Year	Good	Fair	Poor
2004	26.46%	56.90%	16.64%
2005	26.49%	56.89%	16.62%
2006	26.92%	57.80%	15.28%
2007	27.71%	59.05%	13.25%
2008	29.90%	58.43%	11.66%
2009	30.91%	58.78%	10.30%
2010	31.99%	58.74%	9.26%
2011	32.21%	59.67%	8.13%
2012	33.57%	60.39%	6.04%
2013	34.41%	60.24%	5.35%
2014	33.57%	60.79%	5.65%
2015	33.83%	60.23%	5.94%
2016	33.61%	61.35%	5.04%
2017	32.19%	62.87%	4.94%
2018	27.85%	66.73%	5.43%



12

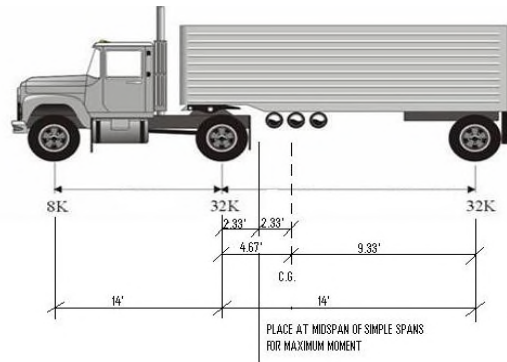
Comparison to other Great Lakes States:

State	Area (ft ²)	Total Cost (dollars)
Michigan	297,180	\$58,951,467
Minnesota	443,954	\$98,236,858
Ohio	840,559	\$143,863,151
Indiana	207,997	\$58,961,307
Illinois	466,803	\$80,039,793
Wisconsin	951,564	\$130,097,321



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Bridge Design



- National Design Truck weight = 36 tons
- MDOT design truck = 1.2 * 36 tons = 45 tons
- MDOT has been designing bridges for heavier truck loads since the 1970's
- Typically 5% - 10% additional construction cost

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Bridge Construction

- Accelerated Bridge Construction Projects
- Complex Bridge Construction Projects

15

US-131 over 3 Mile Road Bridge Slide



16



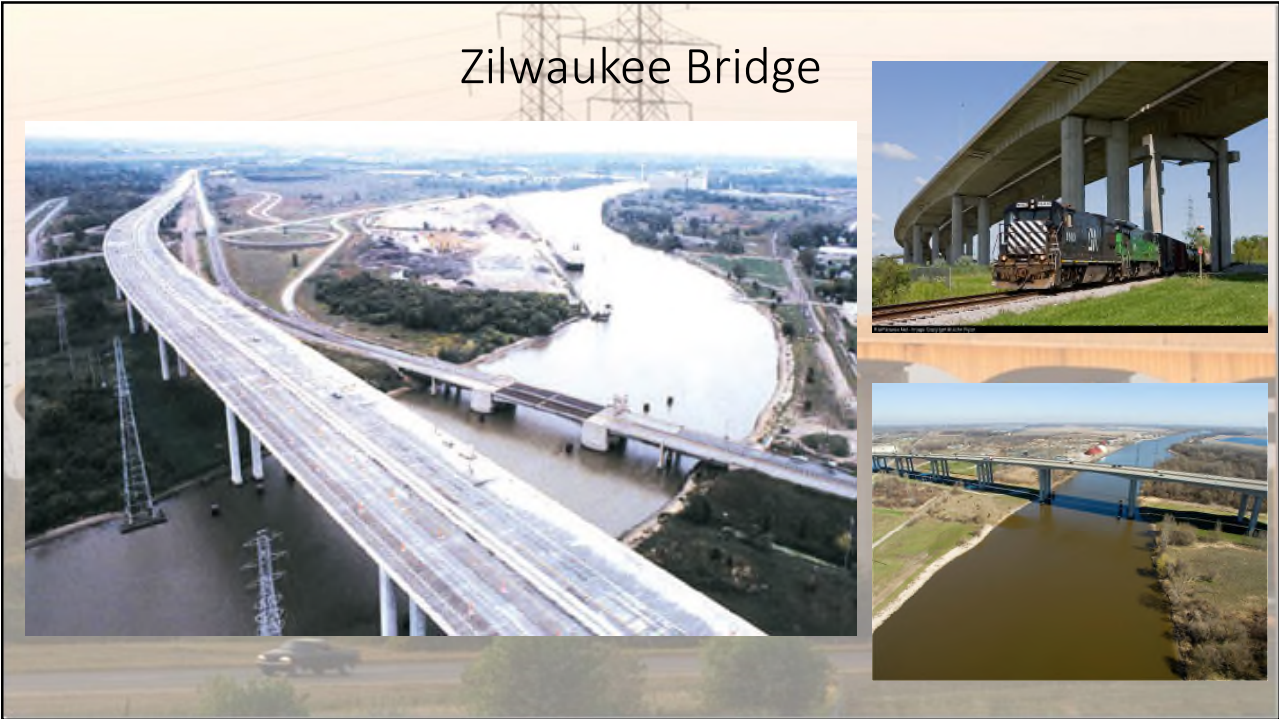
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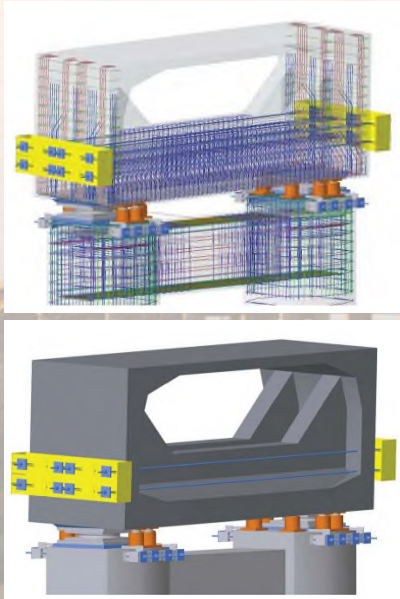


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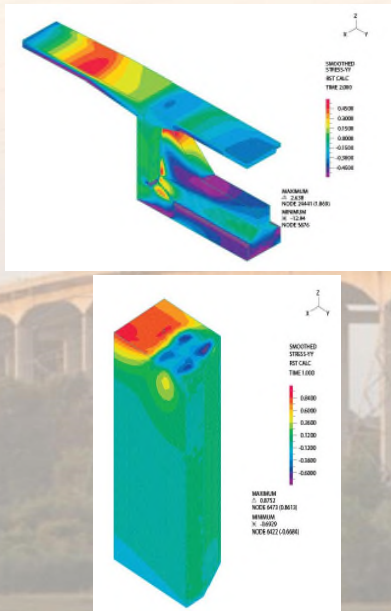
Zilwaukee Bridge



- Jack locations change the bearing location and designed load flow path
- Pier diaphragms are overstressed upon application of jacking
- Finite model analysis was used to determine additional compression needed in segments to not exceed principle tensile stresses during jacking

21

Zilwaukee Bridge



- Additional transverse post tensioning is needed near the centroid of the pier diaphragm
- Additional compression is also required at the top of the pier column to confine the tension tie that develops from the center of the jacking plates to the center of the column

22



23



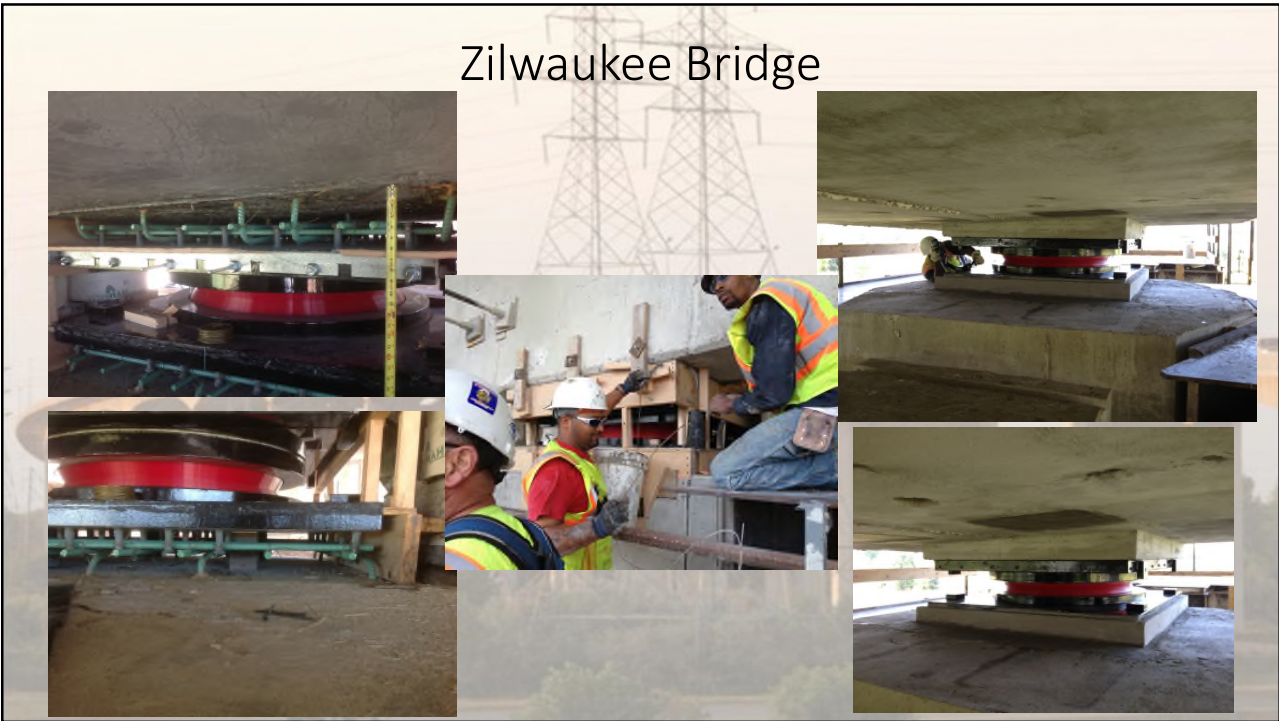
24

Zilwaukee Bridge



25

Zilwaukee Bridge



26

Zilwaukee Bridge



27

Zilwaukee Bridge



➤ Project statistics:

- Original negotiated contract cost = \$35,974,257
- Final contract cost = \$35,993,783
- Total net change amount = \$19,526
- Total net change = 0.05%
- Cored 1464 holes in the NB & SB structures, nicked 1 wire of a 12 strand post tensioning tendon near Pier 22S, which resulted in a 0.21% reduction in capacity at that location – negligible
- 300 RFIs and material submittals
- Expansion hinge lifts – 3 million lbs, 16 times
- Pier lifts – 10 million to 15 million lbs, 49 times
- 1.2 million lbs of structural steel (plates, PT bars, beams) needed to temporarily reinforce the structure for jacking

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Rouge River Bridge

29



Rouge River Bridge

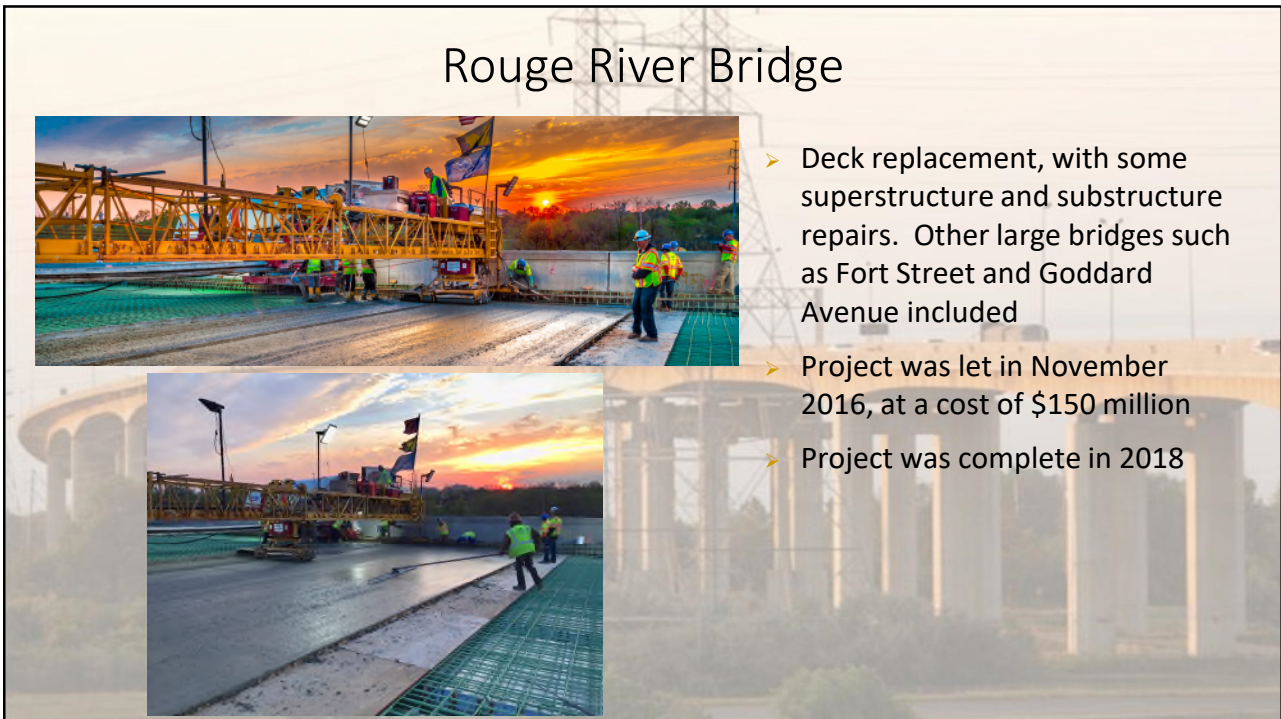
30

Rouge River Bridge



31

Rouge River Bridge



- Deck replacement, with some superstructure and substructure repairs. Other large bridges such as Fort Street and Goddard Avenue included
- Project was let in November 2016, at a cost of \$150 million
- Project was complete in 2018

32



US-2 over Cut River

33

Inspection and Load Rating

- Pack Rust
- Section Loss
- Localized Distortion
- Global Distortion

L10 TO L9, South Flange

222

1/2" Pack Rust

All 4 Areas

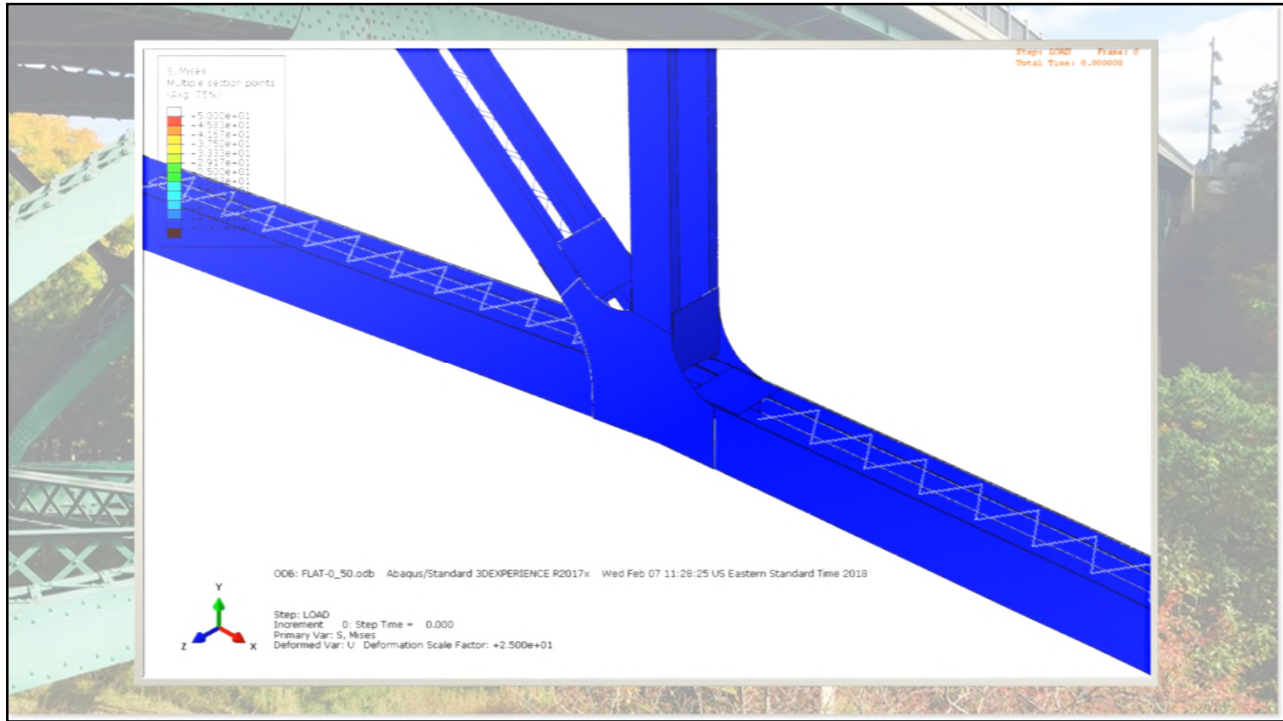
L8, South Flange, 2nd

2.3"

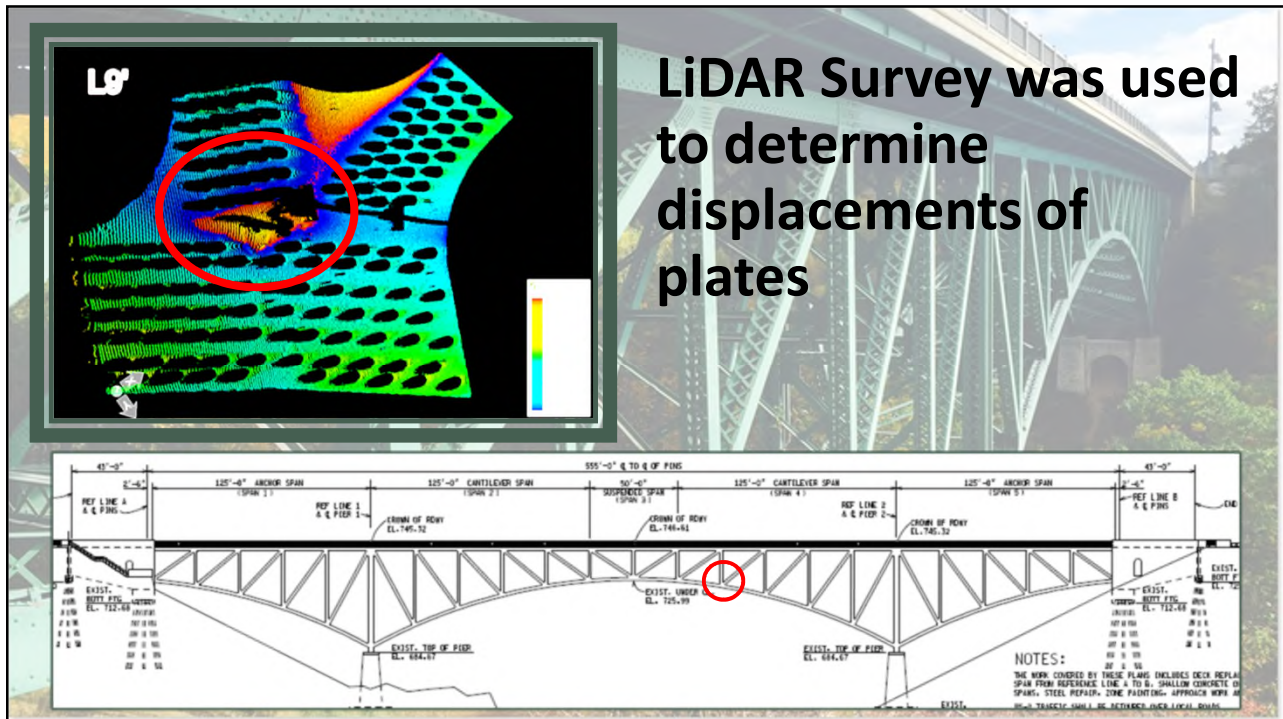
Looking EAST AT SOUTH FLANGE

L9, SOUTH FLANGE, NORTH FLOTT

34




35



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Steel Strengthening

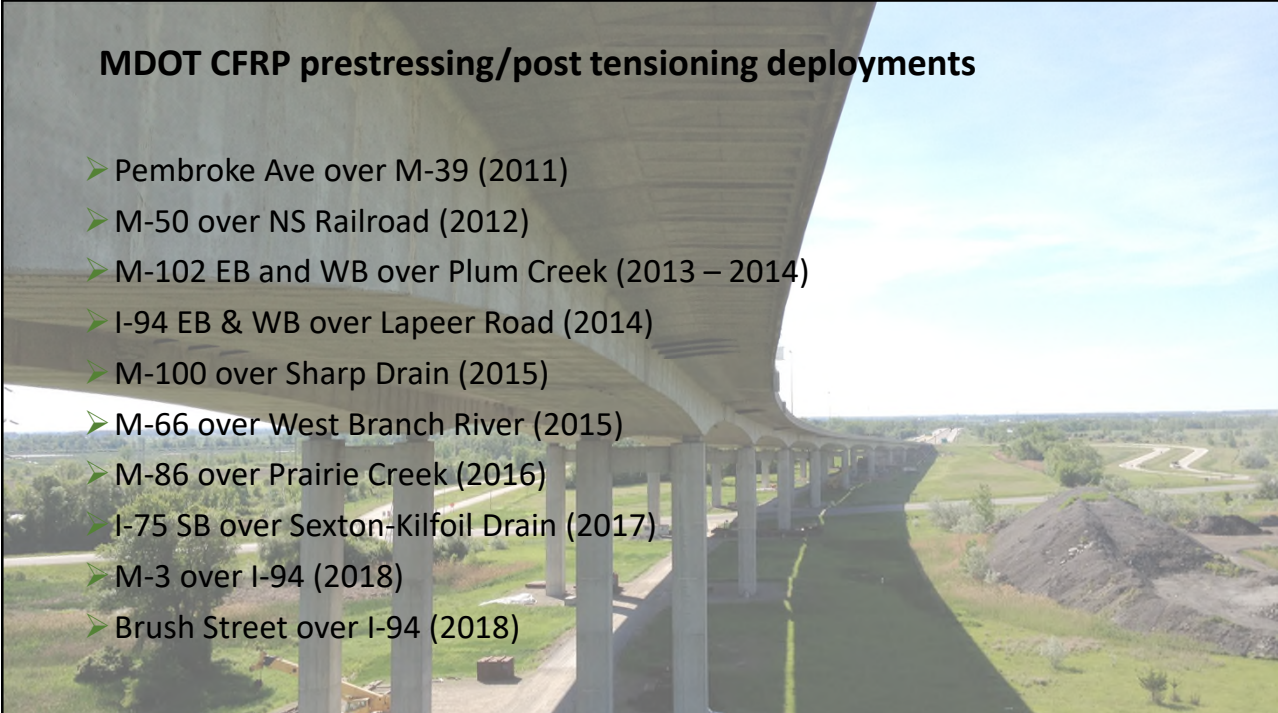
- 2017
 - Steel Repairs (Critical Locations)
 - \$1.9M
- 2018
 - Remaining Steel Repairs + Innovative Paint System
 - \$6.7M



37

MDOT CFRP prestressing/post tensioning deployments

- Pembroke Ave over M-39 (2011)
- M-50 over NS Railroad (2012)
- M-102 EB and WB over Plum Creek (2013 – 2014)
- I-94 EB & WB over Lapeer Road (2014)
- M-100 over Sharp Drain (2015)
- M-66 over West Branch River (2015)
- M-86 over Prairie Creek (2016)
- I-75 SB over Sexton-Kilfoil Drain (2017)
- M-3 over I-94 (2018)
- Brush Street over I-94 (2018)



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40



41



42

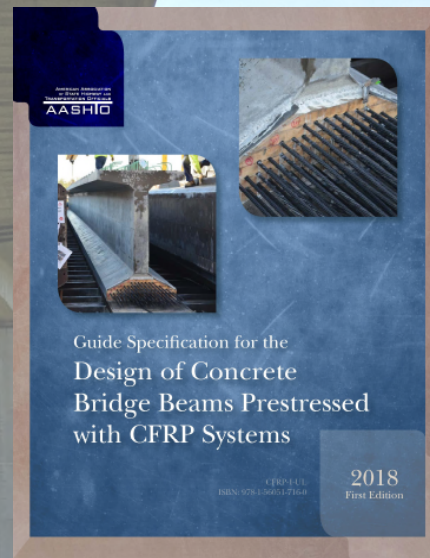
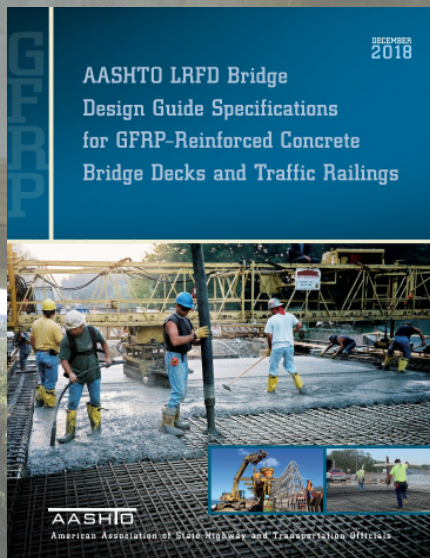
MDOT CFRP prestressing/post tensioning deployments

- CFRP fabrication facility opened in Michigan



43

National Influence



44

M-25 over Mill Creek Accelerated Bridge Construction



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400
LOCAL HIGHWAY
BRIDGES ARE
RATED IN
**SERIOUS
OR CRITICAL
CONDITION**

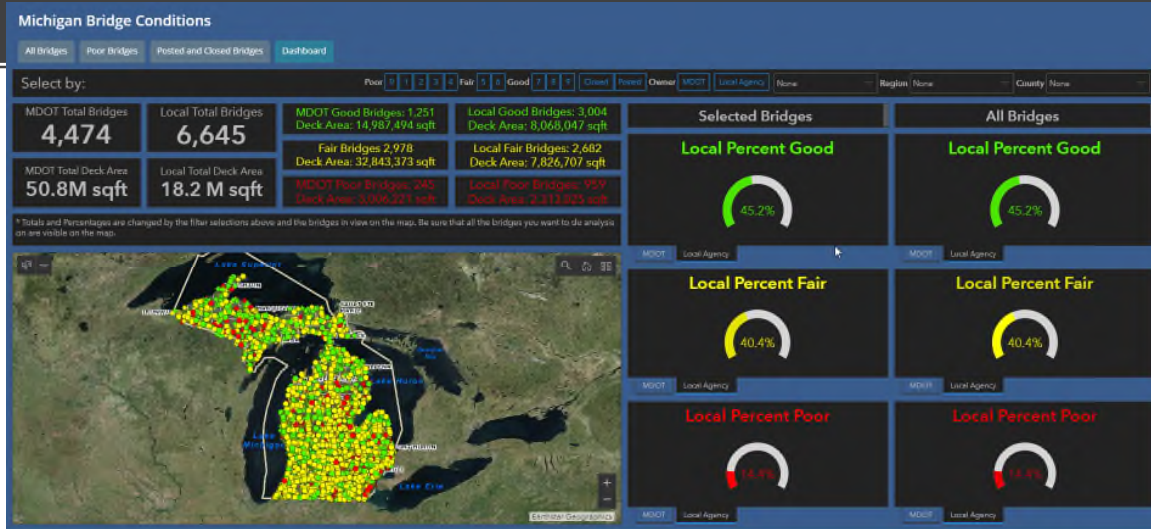
44
**LOCAL BRIDGES
ARE CURRENTLY
CLOSED**
DUE TO LOAD
OR CONDITION
CONCERNS

**244 LOCAL
BRIDGES
IN POOR
CONDITION**
ARE LOAD
RESTRICTED

Local Agency Bridge Bundling Initiative

46

Local Agency Bridge Bundling Initiative



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Local Agency Bridge Bundling Initiative

What is Bridge Bundling?

Grouping similar bridges contractually to enable efficient use of program resources, saving time and money on design and construction.

- 

Applicable to all project types and sizes
- 

Encourages standardization
- 

Increases economies of scale
- 

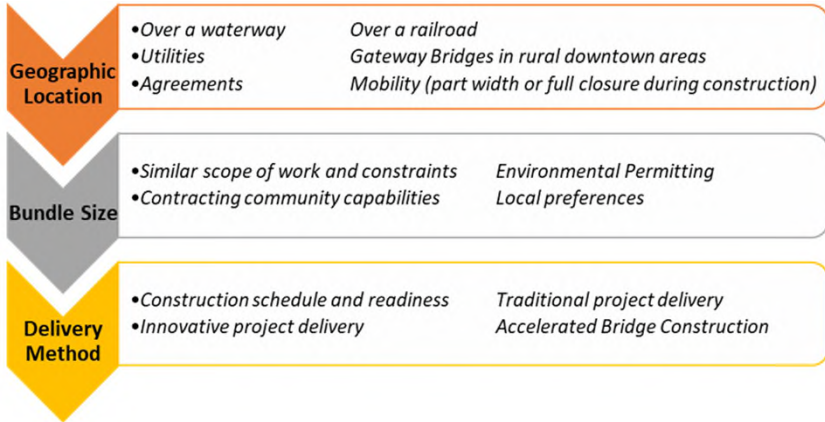
Reduces management time and construction administration
- 

Streamlines external coordination and permitting
- 

Achieves significant improvement to local bridge conditions statewide

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Local Agency Bridge Bundling Initiative



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Constant Challenges...



50

Constant Challenges...



51

Some difficult times...



52

The future

"The transportation system is invisible, until it is no longer there. We make that system happen"
 Kirk Steudle, former MDOT Director

"We are at our best, when we do our jobs, and no one notices"
 Rebecca Curtis, MDOT Deputy Chief Bridge Engineer

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Thank you for your time

Questions?

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