

**Overview of Missouri's  
Updated Load Posting Policy  
and the Implementation  
Project on the Existing  
Bridge Inventory**

2023 TEAM Conference Presentation

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# Topics for Discussion

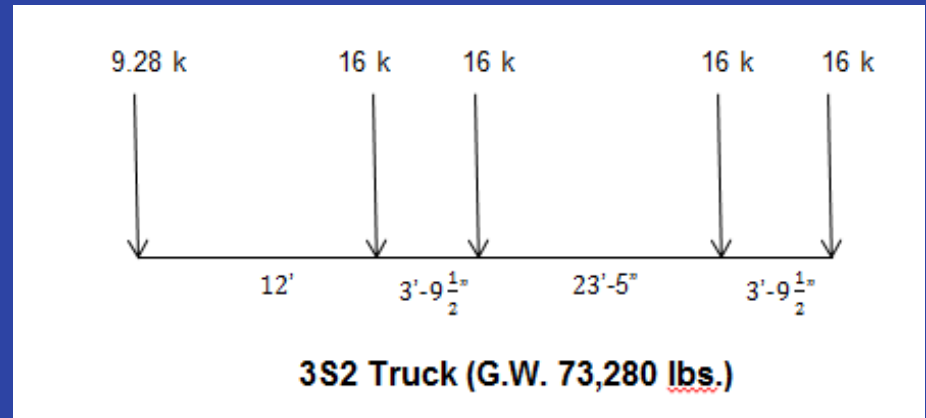
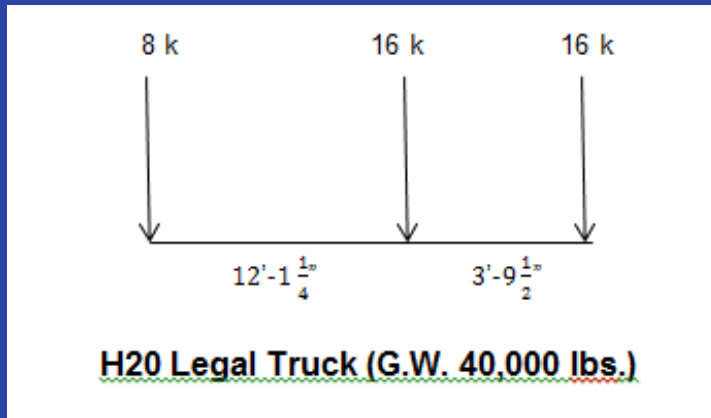
- Background Information
- New Load Posting Policy
- Load Rating Update Plan
- Consultant work Effort

# Background Information

- March 2019—Agreement Reached with FHWA to Revamp Load Rating/Posting Policy in MO.
- 2019-2020—Comprehensive Studies Completed
  - Statewide Legal Loads
  - Commercial Zone Legal Loads
  - FAST Act Emergency Vehicle Loads
- Studies used to Create New Load Rating Section in MoDOT's EPG
  - EPG 753.15—Load Rating Policy
  - Implemented in Summer of 2022

# New Load Posting Policy

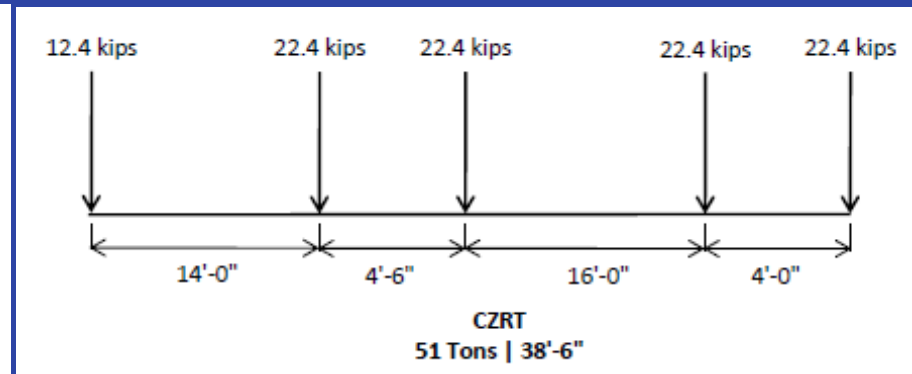
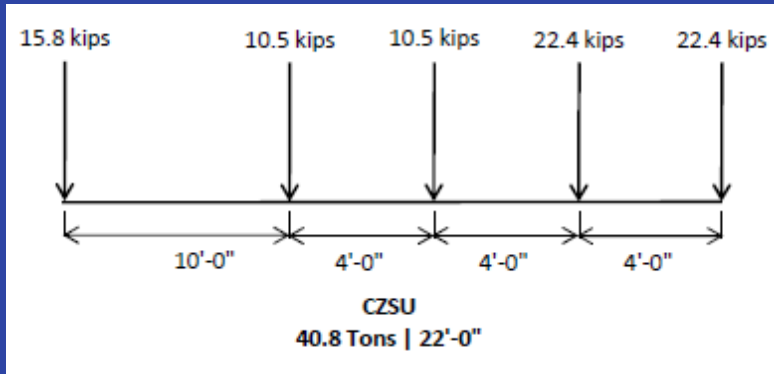
- Statewide Legal Load Models
- H20L—Single Unit      MO3S2—Semi-Trailer  
Post < 30 Tons (23)      Post < 45 Tons (40)



- Used Statewide on all Bridges to Determine if Posting is Needed for Normal Legal Loads.

# New Load Posting Policy

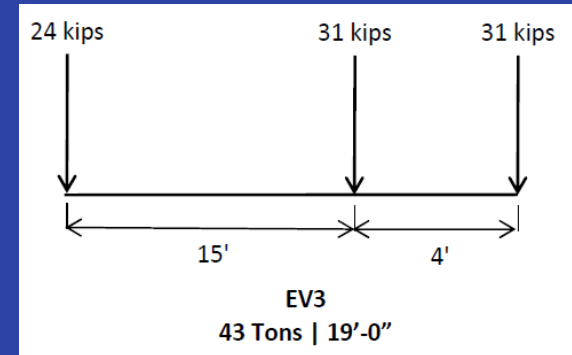
- Commercial Zone Legal Load Models
- CZSU—Single Unit      CZRT—Semi-Trailer  
Post < 45 Tons                      Post < 70 Tons



- Used only in Commercial Zone Areas to Determine Posting Needs when Normal Legal Load Models Show the Bridge is Okay.

# New Load Posting Policy

- Emergency Vehicle Legal Load Models
- EV3—Single Unit  
Post < 43 Tons
- GVW Only (no Axle Limits)
- Only Needs to be Checked Outside of Commercial Zone Area for Bridges okay for Normal Legal Loads.
- Only Required for Interstate Structures and ones that provide Reasonable Access (basically the ramps and interchanges).



# New Load Posting Policy

- Posting Determined using Load Factor Method
- Posting Level Calculated at 86% of the Operating Rating for all Vehicles but EV3.
- Posting Values use One-Lane or Two-Lane Ratings, based on Truck Traffic Volume.
- For EV3 only, Post at Operating Rating using Single Lane Values.
- Policy for LRFR will be Developed after a University Research Project is Completed.

# New Load Posting Policy

- Speed Restrictions are no Longer used.
- Only Gross Weight/Lane Restrictions are used.
- Posting Sign Simplification—Four Signs Cover all Scenarios.
- EPG Sign Section Update Coming Soon.





# Load Rating Update Plan

- December 22, 2022—MoDOT reached Agreement with FHWA on a Load Rating Update Plan for National Bridge Inventory Bridges in Missouri.
  - 10,387—MoDOT
  - 14,154—Local
- Plan is for a Ten Year Timeline—Potential for a 2-Year Extension if Certain Conditions are Met.
- Plan has Different Tasks Grouped into Activities with a Total of Nine Activities.

# Load Rating Update Plan

- Activity 1—Develop Tracking Database
  - Activities have Multiple Steps
  - Need to Track each Step During the Process
  - Allows for Easier Reporting to FHWA
  - Keeps Work Effort better Organized
  - Provides Opportunity to Identify Patterns/Trends in Data for Efficiency Opportunities
  - First Three Months
- Activity 2—Solicit for Consultant Part of the Work Effort (more later)

# Load Rating Update Plan

- Activity 3—Load Rating of Higher Priority Routine State Structures
  - 1,283 Structures Currently not Posted
  - Existing Data gives Indications for a Potential Posting Need
  - Normal Legal Loads—SHV's (H20L) or Combinations (MO3S2)
  - Commercial Zone Legal Loads (CZSU, CZRT)
  - Emergency Vehicle Legal Loads (EV3)
  - Major focus of 2023 Work Effort
  - Will also be part of 2024 Work Effort

# Load Rating Update Plan

- Activity 4—Load Rating of Lower Priority Routine State Structures
  - 5,657 Structures
  - Existing Data does not give any Indications for a Potential Posting Need
  - Some Work Effort will begin in 2023 with Activity 3 Structures
  - Major Focus will begin in 2024 as Activity 3 work winds down
  - Goal is to finish this Group by the end of 2026

# Load Rating Update Plan

- Activity 5—Load Rating of Large or Unusual State Structures
  - 270 Structures
  - Large Bridge Examples—Major Viaducts, Missouri/Mississippi River, Major Lakes, Trusses
  - Unusual Bridge Examples—Filled Arches, Open Spandrel Arches, Segmental, other ones that can't be easily Modeled in AASHTOWare.
  - Work will start in 2023 and Gradually Increase going into 2025
  - Steady work Effort from 2026 thru 2032

# Load Rating Update Plan

- Activity 6—Load Rating of State System Culvert Structures
  - 3,177 Structures
  - Load Rating Required when Fill is  $<6'$
  - Large Rating Effort was done on these about Ten Years ago, so most already have a modernized AASHTOWare Model
  - Need to Rerun Models and Update for New Trucks and Higher Posting Thresholds
  - Will be done by MoDOT Resources
  - Work Effort is Slotted for 2030 thru 2032

# Load Rating Update Plan

- Activity 7—Data Collection for Locally Owned Structures
  - 14,154 Structures
  - Primary Problem is the Lack of Plans.
  - May have a Partial set of Plans on some.
  - Probably have Enough Data in our files to do a Rating Analysis for 25% (~3,500).
  - Data is in a Variety of Formats ranging from Poor Quality to Good Quality.
  - Primary goal of this Effort is to have a High-Quality Information Sheet in a Consistent Format for all Structures, when Possible.

# Load Rating Update Plan



## Off-System Rating Data Sheet

1 of 4

Bridge: 01700291 Name: D. Koenig Date: 11/25/22  
 Federal ID: 12696 Year Built: 1997 # of Spans: 1  
 County: Audrain Feature Intersected: TRIB of LDNG BR  
 Route: CRD 133 Structure Length: 33.00

Is this Bridge Missing Data: NO

### Adjacent Precast RC Slab Beam (Oden) Bridge Rating Data

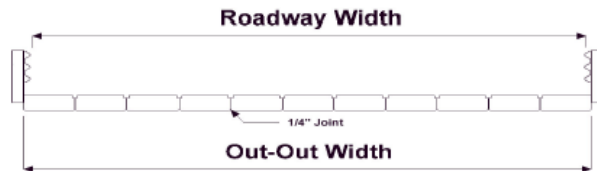
Bridge Description: 33'-Simple RC Slab Beam Span

Bridge Plans: Oden Enterprises Standard Plans (Railing type will vary)

#### Bridge Layout and Cross Section Geometry

Span #: 1	Deck Width Out to Out: 25.67 ft
Span Type: Simple	Left Curb Width: 3.50 Inches
Skew (LA or RA): 0	Right Curb Width: 3.50 Inches
Span Length (ft): 33.00	Roadway Width: 25.09 ft
# Girders: 9	Girder Spacing: 2.83 ft

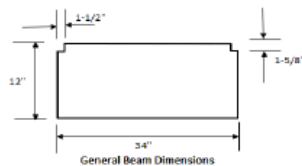
Comments: Oden rectangular slab beams are placed adjacent to each other. Beams are attached using a standard shear key detail. Shear key is grouted to get it level with roadway surface. Beams are detailed as having a 1/4" gap between them.



Representative Cross Section for Bridge Type  
(Number of Beams is Varied to get Desired Roadway Width)

#### Oden Beam Member Properties

Concrete Compressive Strength ( $f'_c$ ): 5000 psi  
 Reinforcing Steel Strength ( $f_y$ ): 60 ksi  
 Total Beam Length (End to End): 33.00 ft  
 Calculated C-I Bearing: 32.00 ft  
 Beam Width: 34.00 in  
 Beam Height: 12.00 in



## Off-System Rating Data Sheet

2 of 4

#### Reinforcement Data

##### Bottom Reinforcement (1" clear cover)

Bar Size A: #9  
 # of Bars A: 5  
 Bar Size B: #8  
 # of Bars B: 4

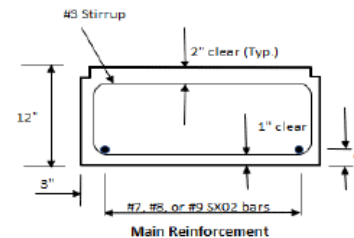
##### Stirrups (2" clear cover at beam ends)

Bar Size: #3  
 Spacing: 5 in (typ)

##### Top Reinforcement (2" clear cover)

Bar Size: #4  
 # of Bars: 3

Top steel is ignored in rating analysis.



Bar Size	d (in)
#7	1.8125
#8	1.8750
#9	1.9390

#### Other Information

##### Appurtenances

Enter a short description of the rail, curb, or barrier needed and include the basic dimensions.

Common local system W-beam railing. Five side mounted rail posts. Post start about 1' from the face of the abutment and are equally spaced. Posts are a tube that is approximately 6"x3" and about 3.5' tall. See roadway and profile photos.

##### Wearing Surface

Type: None Thickness: 0.00 in

##### Miscellaneous Weight

NA

##### Notes

Assuming a 3" future wearing surface as a standard practice for load rating analysis. Guardrail weight will be equally distributed to all girders. Posts are 12#/ft and W-beams are 15#/ft, which equates to 3#/ft per girder.



# Load Rating Update Plan



Roadway View of Bridge



Profile View of Bridge



Underside View of Bridge



# Load Rating Update Plan

- Datasheets will be Stored in the Media File for Each Structure over the Course of our Project.
- Large Field Data Collection Effort will be Needed.
- Plan is to use MoDOT Resources for this Effort.
- Initial Effort has Already Started and will Increase.
- Work Effort from 2023 thru 2027.
- If you are a Consultant that still has Plans for Older Local Structures, please let us know.
- We have already been Talking with some Consultants on Structures Built in the last 20 years.
- They are very Willing to Provide us with what they have, and we Very Much Appreciate that.

# Load Rating Update Plan

- Activity 8—Load Rating Analysis for Locally Owned Structures
  - Once the Data Collection is Complete, we need to do a Load Rating Analysis.
  - MoDOT Resources Currently do about 300 per Year and we are Assuming we will Maintain at that Level.
  - Consultant Resources will be Needed for the Remaining Structures.
  - Initial Consultant Effort is Estimated to start in Latter part of 2026 and Continue thru 2032.

# Load Rating Update Plan

- Activity 9—Update Load Rating Policy in our BIRM
  - There are Constant Proposals to Change Legal Weights on the National and State Levels.
  - Commercial Zone Boundaries get Changed every Two to Three Years.
  - This task is Primarily a Placeholder that we need to Keep up with these Changes as they Happen and get our Policies Updated to Incorporate them.

# Load Rating Update Plan

- Table shown below Provides a General Summary of the Load Rating Activities over the next Ten Years.

**General Activity Summary Table for Load Rating Plan of Corrective Action**

Load Rating Activity	Calendar Year										Totals
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
Activity 8: Nonstate	300	300	300	800	2,500	2,500	2,500	2,000	1,600	1,354	14,154
Activity 3: State High Priority Routine	750	533	0	0	0	0	0	0	0	0	1,283
Activity 4: State Low Priority Routine	500	1,500	2,000	1,657	0	0	0	0	0	0	5,657
Activity 5: State Large/Unusual	10	20	30	30	30	30	30	30	30	30	270
Activity 6: State Culverts	0	0	0	0	0	0	0	800	1,200	1,177	3,177
<b>Totals</b>	<b>1,560</b>	<b>2,353</b>	<b>2,330</b>	<b>2,487</b>	<b>2,530</b>	<b>2,530</b>	<b>2,530</b>	<b>2,830</b>	<b>2,830</b>	<b>2,561</b>	<b>24,541</b>

# Consultant Work Effort

- MoDOT has Limited Resources Available to work on this Effort.
- We will need a lot of Assistance from our Consultant Partners to Complete the work.
- Current STIP has two Projects in Anticipation of this Work Effort Starting on State Structures.
  - ST0009—\$2 million in FY23, anticipating \$5 million FY's 24 thru 26, and \$2 million in FY27.
  - ST0010—\$2 million in FY23, anticipating \$2 million FY's 24 thru 26, and \$3 million FY's 27 thru 32.
  - FY24 and beyond amounts are Subject to Commission Approval of Annual STIP.

# Consultant Work Effort

- Local Program funds will be used to Fund the Nonstate Work Effort
  - \$2.5 Million per year is Reserved for this Effort
- Nonstate Consultant work will be a Separate and Future Solicitation.
- Assuming no Last-Minute Issues, the Solicitations for ST0009 and ST0010 will be Posted on March 22.

# Consultant Work Effort

- Likely Consultant Contract Setup
  - Standard MoDOT Design Contract
  - Three Year time limit will be Used on these Contracts.
  - New Solicitation will be done after Initial Three-Year Period for Remaining Work.
  - Initial Agreement will Include Smaller Number of Structures to get the Effort Started Quicker.
  - Supplemental Agreements will be used for Additional Groups of Structures, as needed.
  - DBE goal has not been Determined as of 2/20/23.
  - Multiple Consultants will be Chosen for Each Project.



# Consultant Work Effort

- What do we Need?
  - Firms that are only Interested in the Large/Unusual Structures.
  - Firms that are only Interested in the Routine Structures.
  - Firms that are Interested in both Categories.
  - Firms may get Picked for both Categories.
  - Firms with a Capacity of doing a Smaller Number of Structures per year.
  - Firms with a Capacity of doing a Larger Number of Structures per year.

# Consultant Work Effort

- General Scope of Work?
  - Deliver a Completed Bridge Model in AASHTOWare, when Possible.
  - Consultants will need to License AASHTOWare.
  - Discounted License thru MoDOT Sponsorship.
  - Some Structures will have to be Modeled in other Software.
  - General Review—Good Existing Model
  - Complete Check—Existing Model
  - Develop Model—No Existing Model
  - Most Likely will be Focused on Developing Models based on Plans and MoDOT will Handle Incorporating Deterioration into the Models.

# Consultant Work Effort

- What will we Provide?
  - Existing Bridge Plans.
  - NBI Data as Needed.
  - Existing AASHTOWare Models, if Available.
  - Guidance Documents on Standardized Settings for Different Structure Types in AASHTOWare.
  - When Available, Rating Values for some Existing Vehicles for Comparison.

# Consultant Work Effort

- We look Forward to Getting this Project Started and hope that many of our Consultant Partners are Interested in Joining us on this Journey.
- **Questions??**