

Outline

- BOBS Organization Structure
- Bridge Type and Composition/Terminology
- Asset Management
- Bridge Maintenance
- Bridge Design Process
- Bridge Plans
- Road and Bridge Coordination
- Request for Action (RFA) Projects
- **Design in Construction**
 - Accelerated Bridge Construction (ABC)
 - Wrap up



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CONSTRUCTION SCHEDULES AND DESIGN ASSISTANCE

DESIGN IN CONSTRUCTION

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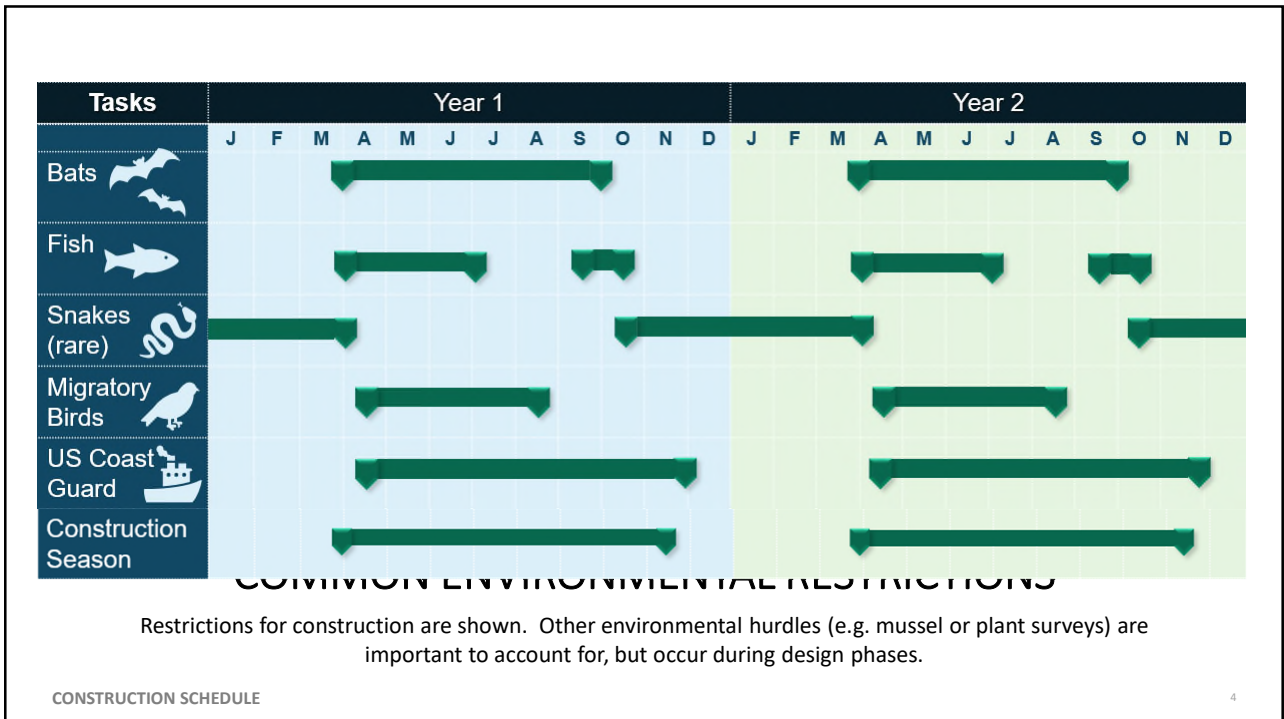


PROJECT SCHEDULES

- Environmental Restrictions
- Mobility/MOT Restrictions
- Contractor Task Durations

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MOT STAGING CONSIDERATIONS

- Full detour is usually shortest, cheapest, easiest design
- MOT influences design, duration, and cost
- Account for time to setup and remove TCB especially if specifying short duration work (e.g. weekend closure)

CONSTRUCTION SCHEDULE



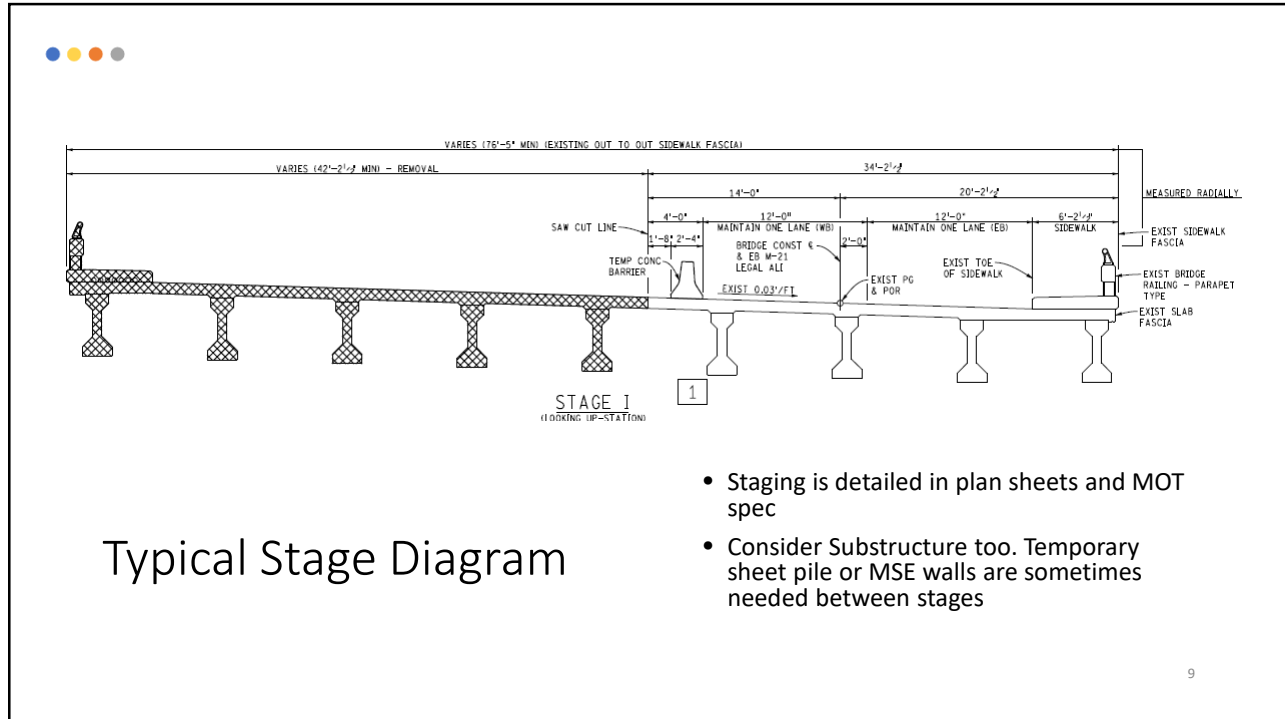
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Part-Width
Construction

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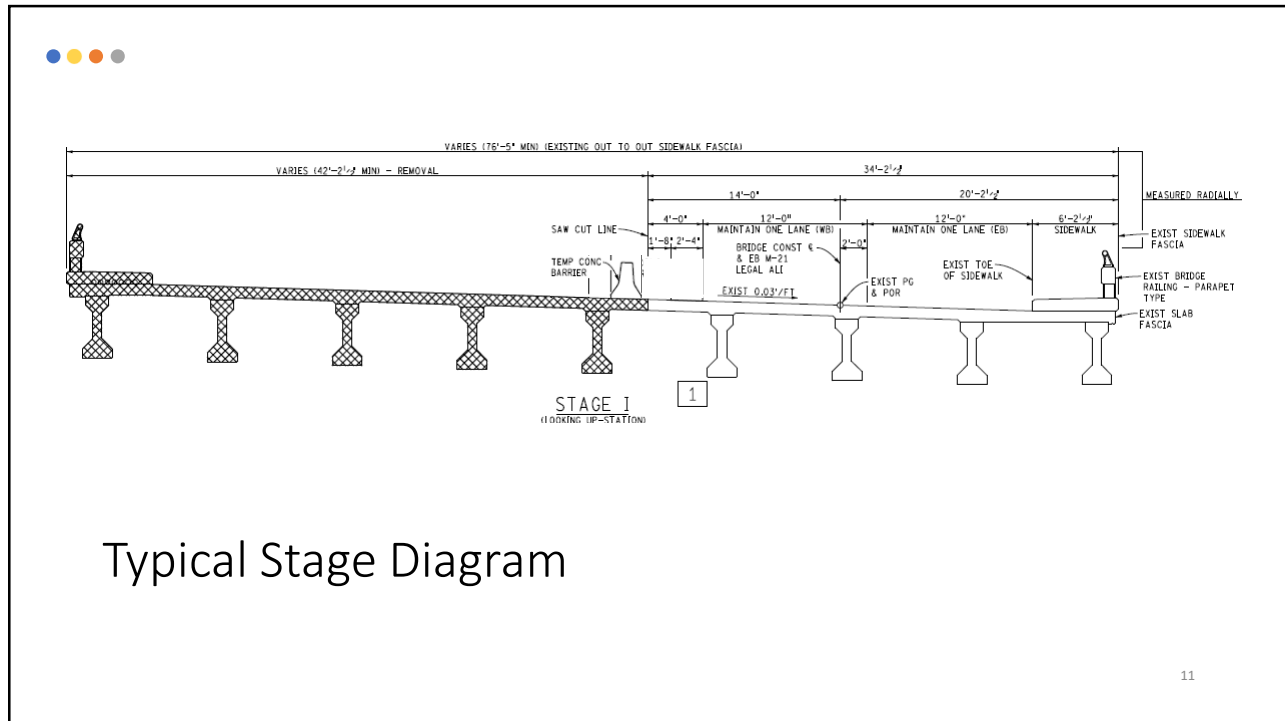
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MOT STAGING CONSIDERATIONS

- Beam spacing requirements (including bearing width)
- Deck overhang limitations
- Temporary barrier is needed
 - 26 inches min offset required
 - Limited deflection barrier use should be avoided
 - Bridge Design Manual 7.06.01

CONSTRUCTION SCHEDULE

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MOT STAGING CONSIDERATIONS

Temporary Concrete Barrier

- Use when workers will be up in the air
 - Structural steel repairs (bolted/welded)
 - Heat straightening
 - Bridge painting
- Use when there is a drop off
 - Staged construction
 - Joint repair

CONSTRUCTION SCHEDULE

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CONSTRUCTION SCHEDULE

MOT STAGING CONSIDERATIONS

Cost Estimating:

- Multiple mobilizations increases the cost of projects
- Minor traffic devices bids can be higher for multi-stage work and for work spread out over larger areas

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CONSTRUCTION DURATIONS

- Balance restrictions with actual work needs.
 - Some tasks can be accelerated
 - Some tasks can't be accelerated
 - Some tasks often require additional time depending on the circumstances


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ACCELERATING WORK

Typically these methods are chosen by the TSC with input from Construction oversight and Traffic and Safety. Specifications are usually written by the TSC.




Acceleration Techniques

- Various types of incentives
- See MDOT's Innovative Construction Contracting Guide for more information


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Liquidated Damages

3 documents are submitted for review. Must be final.




Progress Schedule

Must reference Liquidated Damages Specification.



MOT Spec

Must reference Liquidated Damages Specification.

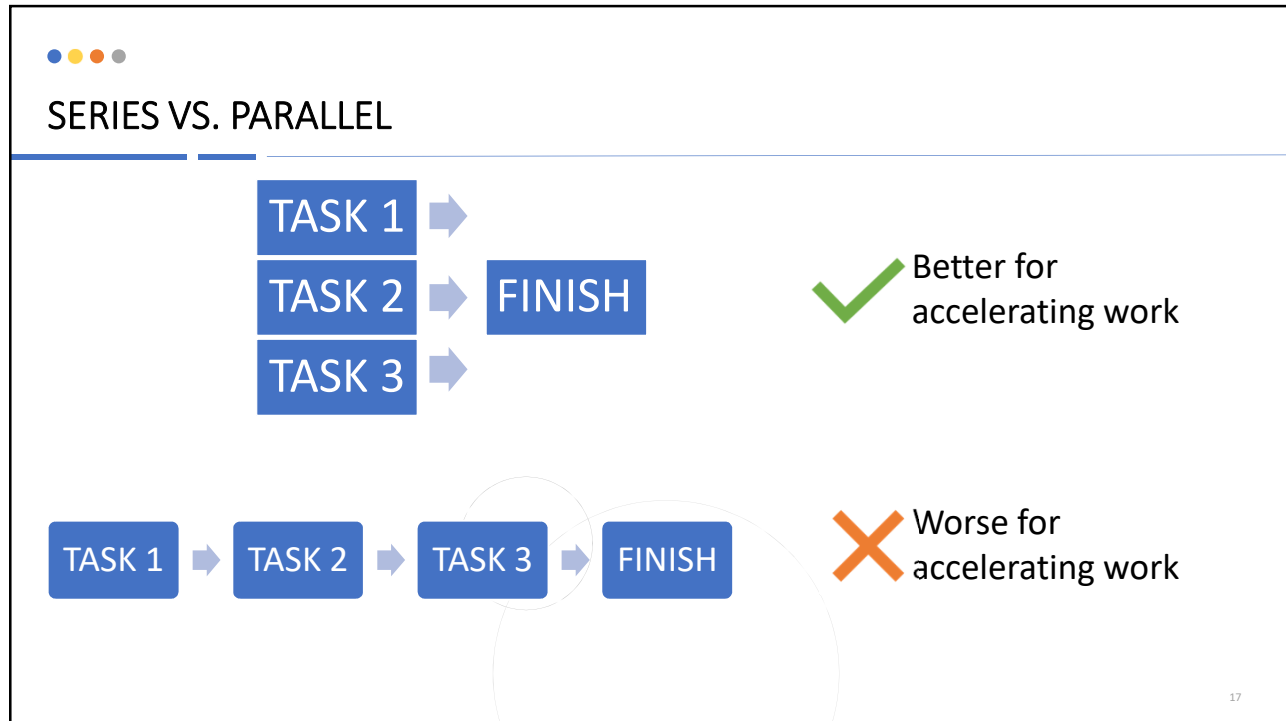


LD Specification

Defaults to 108.10 unless modified by SP. Usually written by TSC. Amounts determined by TSC.

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Non-Acceleration Items

Procurement Items


- Steel beams and girders
- Steel pile >14inches
- Concrete beams
- Mast arms & strain poles
- Lighting towers
- Bascule bridge components

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Non-Acceleration Items (Concrete)




Deck Concrete
7-day cure with wet burlap



Other Concrete
70% of 28-day concrete strength and 5 days



Temperature Limitation
Must be 40 degrees or use heating and housing specification




Surface Coating
Traffic control must allow for coating 28 days after concrete is poured.


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CONCRETE CURE





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Temperature Limitations



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CLEANING AND COATING

- Containment requirements
 - Allow time for containment setup-tear down
- Cure durations
 - Primer cure varies from 48-168 hours
- Temperature Limitations
 - Heating and Housing SP
- MOT must allow for returning to paint splices and field touchup

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TASK DURATION RESOURCES

- Road Design Manual Chapter 14
- MDOT Construction Manual
- Additional Resources
 - Past experience
 - Contractor engagement with MDOT permission
 - CFS also has a resource for CPM schedules
- For tight schedules and certain projects, designers must create CPM schedules

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CRITICAL PATH METHOD NETWORK

Design CPM required for:

- New Construction
- Major reconstruction with severe traffic disruptions
- Unique or experimental work
- More than 1 construction season
- Complex staging

CONSTRUCTION SCHEDULE



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Railroad Coordination

- Contractor can't start without:
 - Right of Entry Permit
 - Force account set-up
 - Flagger availability



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DESIGN ASSISTANCE DURING CONSTRUCTION

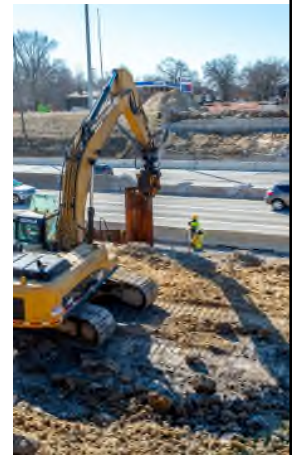
- Typically design assistance is done by the designer
- For consultant-designed projects this is a separate contract.



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CONTRACTOR SUBMITTAL REVIEW

- Example items requiring review
 - Structural Steel Shop Drawings
 - Concrete Girder Shop Drawings
 - SIP form Shop Drawings
 - Complex Erection
 - Cofferdam & Earth Retaining Piles
 - Demo Plans
 - Contractor Proposed Changes (e.g. temp supports)
 - Aesthetic Form liners
 - Special Concrete Forms



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Contractor Proposed Changes (VECP)

Contractors can propose alternatives to what is shown in the plans.

EXIST STRENER (17#)
PROPOSED 16 x 16 x 8 1/2 BEARING STEELERS (17#)
EXIST FLOOR BEAM W16x50 (17#)
EXIST BEARING (17#)
EXIST 2x COVER PLATE (TOP AND BOTTOM) (17#)
EXIST PIER COLUMN (17#)
EXIST PIER COLUMN (17#)
EXIST 4x16x100 TEMPORARY SUPPORT (17#)
EXIST 4x16x100 TEMPORARY SUPPORT (17#)
SEE DETAIL A

NOTES:
 THE WIDTH OF THE TEMPORARY SUPPORT IS BASED ON THE FOLLOWING LOADS:
 1,200 TO 1,500 VERTICAL DEAD LOAD EACH SUPPORT = 210 TONS

ELEVATION
 WEST HALF OF PIER 3 SHOWN - LOOKING SOUTH
 OTHER LOCATIONS SIMILAR. PROVIDE TOP AND BOTTOM
 PORTIONS OF PIER NOT SHOWN FOR CLARITY.

NOTES:
 WHEN NOT SHOWN, ASSUME THAT THE BEARING PLATE IS PLACED ON THE FLOOR BEAM. CONTRACTOR MAY WELD TO THE FLOOR PLATE AT THE END OF THE COVER PLATE.

NOTES:
 DRILL THREE HOLES FOR 1/2" DIA. ALL-THREAD BARS (17#) & PLACES EACH COLUMN

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RESOLVING FIELD QUESTIONS

- Unexpected field conditions
- Issues with fit-up for fabricated pieces
- Unclear plans or unclear/conflicting notes
- Other

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SHOP DRAWING REVIEW

Notes on the shop drawing process

Review Times

- The Standard Specifications no longer specify a review time.
- Usually ASAP
- 2020 Spec Book will provide more information

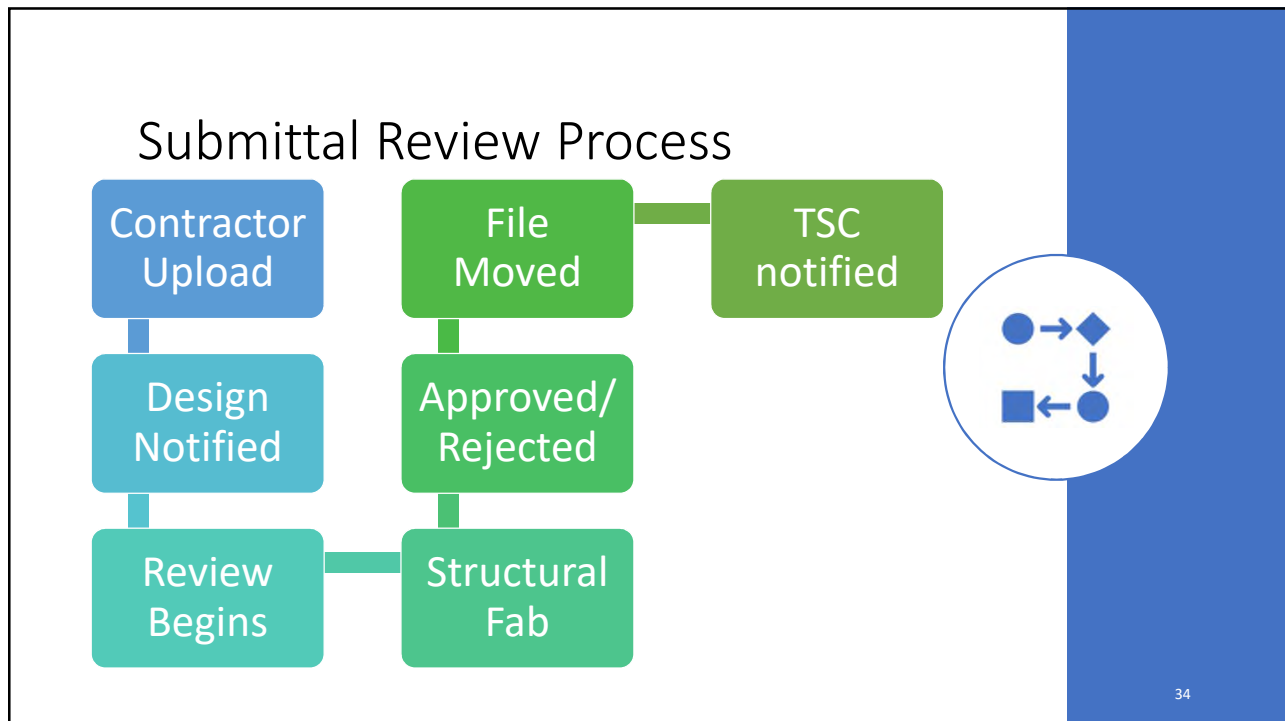
Review Application

- The shop drawing review process should apply to any discipline within MDOT

Importance

- Shop drawings are important for reference in any rehab projects

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STRUCTURAL FAB UNIT

Submit the following:

- Fabrication Notification
- Request for Information
- Shop Drawings
- Nonconformance Reports
- Weld Procedure Specifications (WPS)
- Pile Welding QC Plans
- Field Welding Plans
- Heat Straightening Plans
- Final Highway Structure Inspection Request



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STRUCTURA

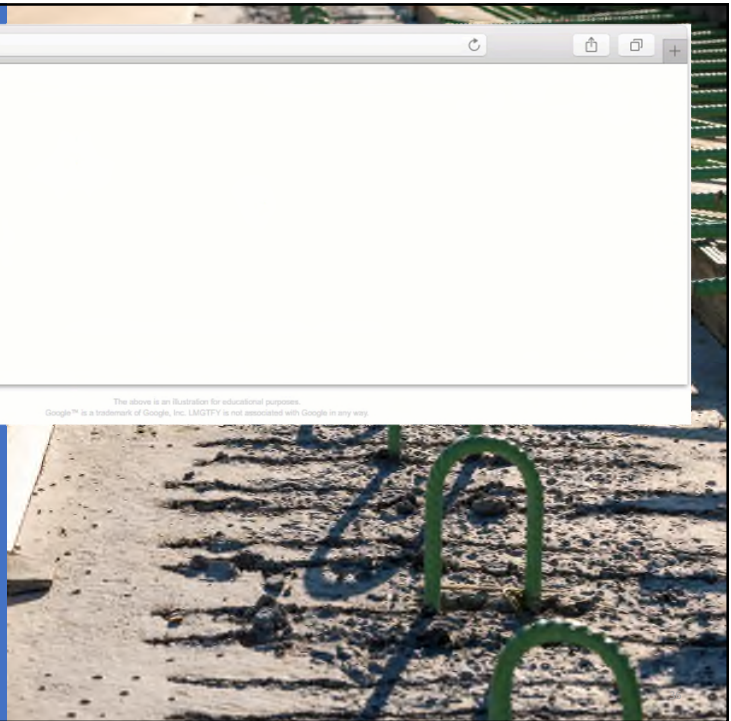
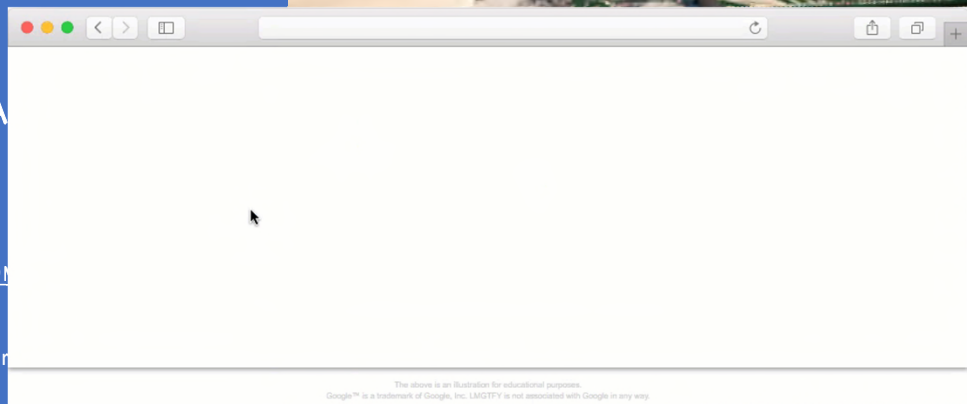
Resource Email:

MDOT-
StructuralFabrication@M

Website:

Google "MDOT Structur
Links for

- Shop Drawing Review Process
- Elastomeric Bearing Guidance
- RFI Process
- (and more!)



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Resources on structural fab

Elastomeric Bearing Guidance Document

Introduction

The purpose of this document is to provide Michigan Department of Transportation (MDOT) designers, inspectors, and consultants with guidance on elastomeric bearing pads. It provides a single source for ASHTO and MDOT policy information related to the design, fabrication, material, and testing of elastomeric bearings (plain and reinforced) used on MDOT projects. Information presented in this document is taken from the following references:

- ASHTO LRFD Bridge Design Specifications, 7th Edition w/2015 Interims (ASHTO Design);
- ASHTO LRFD Bridge Construction Specifications, 3rd Edition w/2015 Interims (ASHTO Construction);
- ASHTO M 251 Standard Specifications for Plain and Reinforced Elastomeric Bridge Bearings, 2013 Ed. (ASHTO M 251);
- MDOT Bridge Design Manual (MDOT BDM); and
- MDOT 2013 Standard Specifications for Construction (Including 1253001(A) – Elnak) (MDOT SSC).

Design Methods

ASHTO Design allows elastomeric bearings to be designed based on one of two methods, these methods along with their respective use criteria are provided below:

- Method A (ASHTO Design subsection 14.7.4):
 - Applicable to the design of plain elastomeric pads;
 - Applicable to the design of steel-reinforced elastomeric bearings if all of the following are true:
 - The shape factor (S) for an interior layer of elastomer divided by the total number of interior layers is less than:
 - 22 for square/rectangular bearings with 2 or fewer interior layers;
 - 20 for square/rectangular bearings with 3 or more interior layers; and
 - 14 for circular or nearly square bearings.
 - The primary rotation is about the axis of the bearing parallel to the transverse axis of the bridge;
 - Total thickness of the bearing is less than or equal to 8"; and
 - The plan area of the bearing is less than 1,000 square inches.
- Method B (ASHTO Design subsection 14.7.5):
 - Applicable to the design of steel-reinforced elastomeric bearings only;
 - Must be used for all steel-reinforced elastomeric bearings if any of the following is true:
 - Total thickness of the bearing is greater than 8"; or
 - The plan area of the bearing is 1,000 square inches or greater.

MDOT SHOP DRAWING STAMPS

The first stamp is stamped "Review and Resubmit". The Contractor would be working off their own set if they began fabricating and the Structural Fabrication Unit would notify the Engineer immediately and recommend fabrication wait until other drawings are stamped approved.

Figure 1. Description of MDOT's shop drawing stamps. The Coordinator's work area (e.g. Bridge Design, Xxxx Region, or Xxxx TSO) is shown on the bottom of the stamp.

Figure 2. Description of MDOT's consultant shop drawing stamps when shop drawing coordination is delegated to them by MDOT's Bridge Design PRA. The consultant's company name is shown on the bottom of the stamp.

Changes to the approved shop drawings during the fabrication process by the Contractor and omissions or errors discovered during fabrication require resubmittal of the shop drawings for MDOT review and approval immediately if the changes will affect how the element is fabricated, whereas minor changes must be reviewed and approved prior to shipping. Shop drawings must be revised and submitted for MDOT review and approval if an approved BR is incorporated into the project. Approved

Heat Straightening Program

Description

The Michigan Department of Transportation's (MDOT) Heat Straightening Program is managed by the Operations Field Services Division, Structural Fabrication Unit and was developed for approved heat straightening contractors and new contractors that are interested in becoming approved by MDOT to heat straighten damaged structural steel. Contractors must be approved by MDOT prior to the Project letting to be qualified to bid on MDOT projects that have heat straightening work. This document is broken down into the following sections:

1. Heat Straightening
2. MDOT Specifications
3. Contractor Responsibilities
4. Contractor Evaluation Process

Heat Straightening

In general, heat straightening is a process where steel is restrained from moving, heated in a specific pattern, and cooled. If the process is correctly performed, the steel will thermally "relax" and move in the desired direction while not adversely affecting the microstructure and mechanical properties of the steel. The heat straightening process is repeated until the member is in the desired geometry. It is very important that the heating temperature, heating pattern, restraining force, cooling methods, and number of damage-healing cycles adhere to the specifications recommended by the research performed by the below agencies to prevent adverse changes to the mechanical properties of the steel. MDOT's specifications have been developed through research funded by the Federal Highway Administration (FHWA) and National Cooperative Highway Research Program (NCHRP). Listed below are the references used by MDOT for developing project specifications for heat straightening work:

1. Heat Straightening Repairs of Damaged Steel Bridges, A Technical Guide and Manual of Practice, FHWA-R-99-004, October 1998.
2. National Cooperative Highway Research Program (NCHRP) Report 404, Heat Straightening Repair of Damaged Steel Bridge Girders: Fatigue and Fracture Performance, Report 404, 2006.

MDOT Specifications

Project specifications for heat straightening can be found in the following document:

1. Subsection 715.5.0 of the MDOT's 2012 Standard Specifications for Construction (as modified by 2015.01.01.01, [Entry to the 2012 Standard Specifications](#)).
2. [TSP-113A.01, Special Provision for Heat Straightening Damaged Structural Steel](#)

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Key Points

- Bridge construction schedules are influenced by several external factors including NEPA guidelines and mobility concerns.
- Accommodating these constraints can greatly influence the project design, duration, and cost. The design PM must account for these.
- Design involvement in construction makes sure the design intent is implemented in the field.
- The Structural Fabrication Unit can assist with fabrication reviews and questions.

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