

2015 Bridge Design Manual

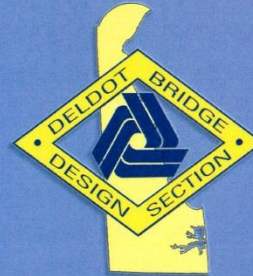
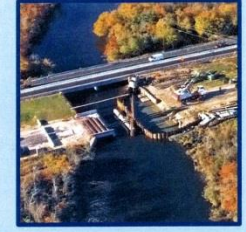
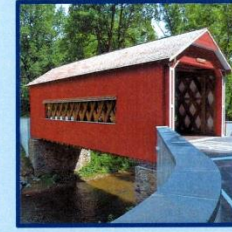
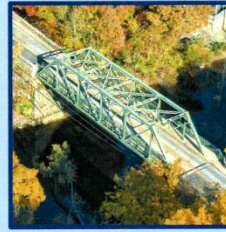
Delaware Department of Transportation
2016 Winter Workshop

February 15, 2016



Overview

- Timeline
- Approach
- Layout
- Future Updates



Delaware Department of Transportation

BRIDGE DESIGN MANUAL

2015 EDITION



Timeline

- August 2012: Project initiation
 - SAFETEA-LU Funding
- Fall 2012: TGM Outlining Approach and TOC
 - Literature Review
- Fall 2012 to Winter 2015: Biweekly Conference Calls
 - Section 100 and 200 Development
 - Multiple Reviews of Each Section
 - “Break” During Summer 2014
- March/April 2015: Peer Review
 - In-House, Consultants, Industry



Timeline

- Winter 2015 to Summer 2015: Section 300 Development
- ***November 1, 2015: New BDM Formally Adopted!***
- November 2015: Full Day Training
- 2016: In-House Training



Approach

– Start From Scratch

- Address Known Issues
- Check Against Previous BDM

– Use Filters for Content

- Structure design practices specific to the State of Delaware
- Delaware Preferences and interpretation of AASHTO Specifications necessary to provide consistent structure designs
- The minimum criteria and information necessary to produce documents for the fair procurement of construction services
- “90% Rule”



Approach

- Identify Likes/Dislikes of Other DOT BDM's
- Establish Hierarchy of Manuals
- Future Manual Updates



Layout

- Divided Into 3 Main Sections
 - Section 100 – Policy and Procedures
 - Section 200 – Modifications to AASHTO LRFD Bridge Design Specifications
 - Section 300 – Typical Bridge Details
 - **Note – Not Standard Construction Details**
- Electronic Version
 - References Hyperlinked



Layout

– Section 101 Introduction

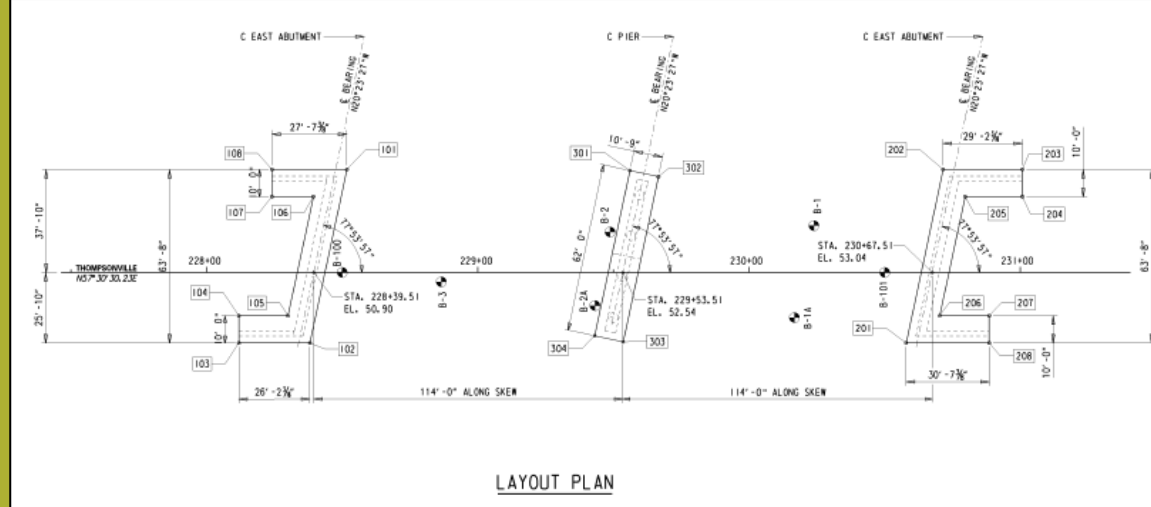
- Applicable scope and limitations of manual
 - May not apply to long-span, complex-curved, and high clearance structures
 - Allows for justifiable Design Variances with approval
- Notable New/Important Points
 - Governing documents and hierarchy (101.4)
 - 2014 AASHTO LRFD Bridge Design Specifications, 7th Edition (101.4.2)
 - Nomenclature used throughout manual (101.4.1)
 - Future updates (101.4.6)
 - FHWA Coordination (101.6)



Layout

– Section 102 Bridge Design Submission Requirements

- Provide minimum standards for plan presentation and sequence
- Standardize report and submission requirements and chronology
- Reinforce quality control requirements for bridge projects
- Notable New/Important Points
 - **Lay-out Plan (102.1.3.3)**
 - **Other Plans – MSE Walls, Rebar Lists, Soil Borings(102.1.3.4)**
 - **Design Exceptions vs. Design Variances (102.5.4)**
 - Figures 102-1 through 102-4
 - **Chronology of submissions (102.5.5)**
 - **TS&L Submissions (102.6.5)**



Layout

– Section 103 Bridge Geometry and Structure Type Selection

- To establish policies and procedures for identifying DelDOT preferences for the geometric layout and selection of structures types for standard bridges in Delaware.
- Notable New/Important Points
 - **Minimum Bridge Width Criteria (103.3.2, Table 103-1)**
 - **Median gap between parallel structures, DGM 2-7 (103.3.3)**
 - **Delaware Clear Zone Concept for pipes and culverts(103.3.4.2.1)**
 - **Constructability – future redecking, future widening, hauling permits, MOT requirements, inspectability (103.5)**
 - **Bridge rehab vs replacement (103.8)**
 - Decision matrix (Table 103-2)
 - Rehabs to be designed for current code
 - **Accelerated Bridge Construction (103.9)**



Layout

– Section 104 Hydrology and Hydraulics

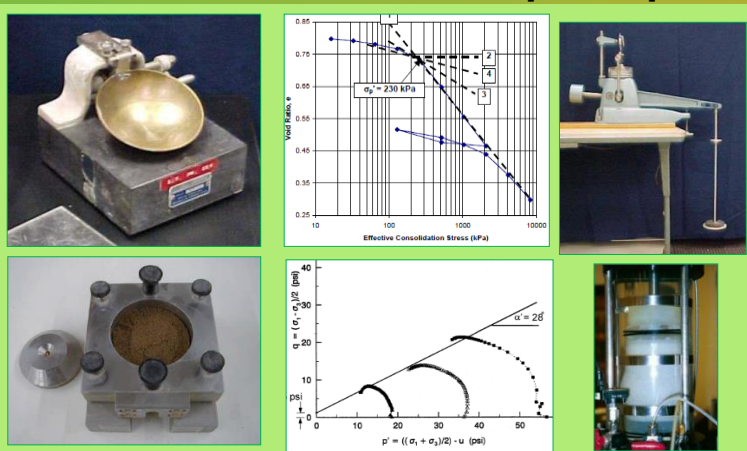
- Develop an H&H analysis to ensure the structure provides a safe level of service to the public while minimizing or avoiding impacts to the natural channel and environment
- Notable New/Important Points
 - **Field Hydraulic Assessment Checklist (104.1.4)**
 - **Topographic survey requirements (104.1.5)**
 - **Environmental considerations (104.3.1.4)**
 - **Tidal hydraulics (104.3.4)**
 - **Sea level rise (104.3.4.6)**
 - **Scour evaluation (104.4)**
 - **Stream diversions (104.5)**
 - **Hydrologic and Hydraulic Report (104.6, Appendix 104-4)**



Layout

– Section 105 Geotechnical Investigations

- Provide guidance regarding subsurface investigation: number and depth of borings, in-situ and laboratory testing, groundwater monitoring
- Notable New/Important Points
 - **Subsurface investigations (105.3)**
 - **Quantity and locations of structural borings (105.4.1.1)**
 - **Foundation Report (105.6)**
 - Concise report option for smaller less complex structures



Layout

– Section 106 Final Design Considerations – Superstructure

- Establish Department policies and procedures for the final design and detailing of superstructure elements for new, replacement of, and rehabilitation of typical Delaware bridges.
- Notable New/Important Points
 - **Bridge deck design (106.4)**
 - **Bridge barriers and railings (106.5)**
 - **Bridge joints (106.6)**
 - Prefer jointless bridges
 - **Steel girder and prestressed concrete requirements (106.8 and 106.9, respectively)**



Layout

– Section 107 Final Design Considerations – Substructure

- Provide guidance regarding Geotechnical and Structural design of Bridge Substructures
- Notable New/Important Points
 - **Foundation design (107.3)**
 - Shallow foundations vs deep foundations, acceptable deep foundation types, design requirements
 - **Abutment design (107.4)**
 - Various types of abutments including semi-integral and integral
 - **Pier design (107.5)**
 - **Retaining wall design (107.6)**
 - **Culvert design (107.7)**



Layout

– Section 108 Bridge Load Rating

- Provide bridge load ratings for bridges that are consistent with AASHTO LRFD Bridge Design Specification, The Manual for Bridge Evaluation(MBE), and DelDOT Bridge Design Manual
- Notable New/Important Points
 - **Federal requirements (108.2)**
 - **Load rating specifications – 2013 Manual for Bridge Evaluation (108.4)**
 - **Load rating process (108.5, Figure 108-1)**
 - **Quality assurance procedures (108.8)**
 - **Load rating requirements (108.9)**
 - **Load rating procedures (108.10)**
 - Analytical steps and methods



Layout

– Section 109 Bridge Preservation Strategies

- Provide guidance on defining the scope and limits of Preventative Maintenance and Rehabilitation work to meet project objectives
- Standardize design decisions related to integrating new and existing structures
- Outline DelDOT preferred methods and materials for Bridge Preservation Strategies
- Notable New/Important Points
 - **Material testing and evaluation options (109.2)**
 - **Publications and industry standards referenced are located on the Design Resource Center website**
 - **Concrete deck repair evaluation matrix (109.3, Table 109-3)**
 - **Substructures: $<10\%$ increase in loading = no evaluation (109.12)**



Layout

– Section 110 Ancillary Structures

- Provide DelDOT preferences on final design and detailing of ancillary structures
- Notable New/Important Points
 - **New section in BDM**
 - **Overhead sign structures (110.3)**
 - **Sound barrier walls (110.4)**

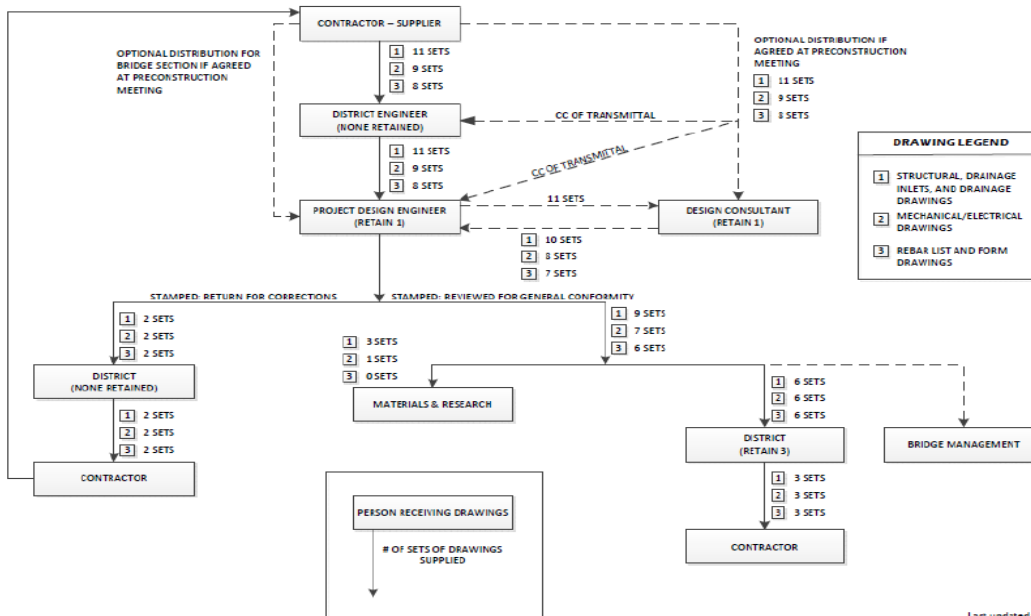


Layout

– Section 111 Construction Coordination

- Provide the expectations and processes required during the construction phase of a bridge design project
- Notable New/Important Points
 - Working drawing review procedures (111.1.2)
 - Contractor requests for information (111.2)

WORKING DRAWING SUBMITTAL PROCESS

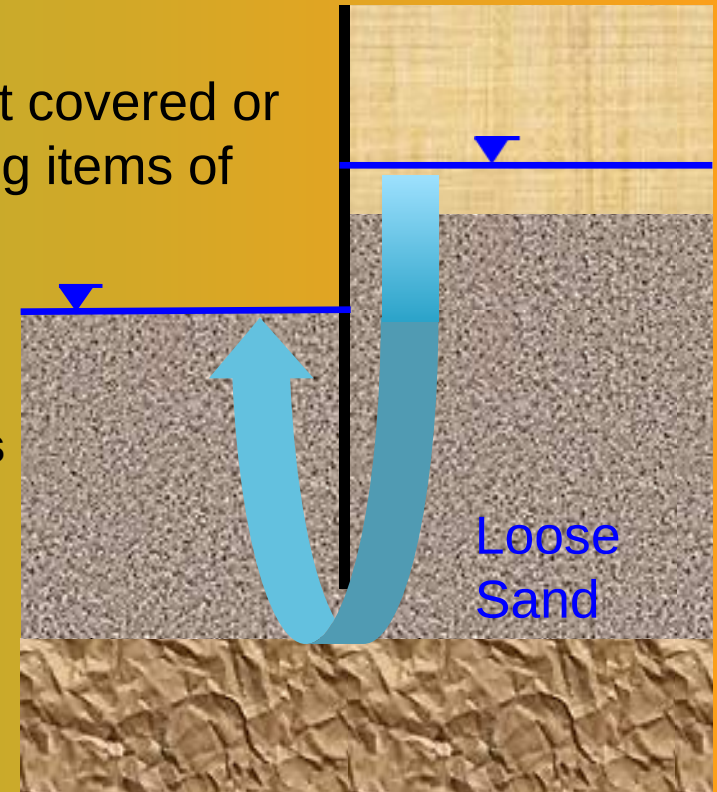


Last updated: 10/31/2014

Layout

– Section 200 Preferences to AASHTO LRFD Manual

- Define Department's preferences and modifications to AASHTO LRFD Bridge Design Manual
- Include or expand on design aspects not covered or marginally covered by AASHTO including items of special interest in Delaware
- Notable New/Important Points
 - **Jacking forces (203.4.3.1)**
 - **Camber of prestressed concrete beams (205.7.3.6.4D)**
 - **Running sands (210.4.7D)**
 - **Modifications to account for downdrag (210.7.1.6.2)**



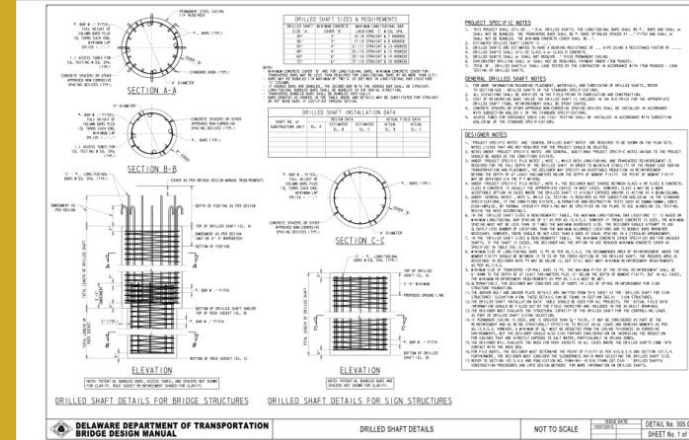
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– Section 300 Typical Bridge Design Details

- Provide consistency in the use and application of details which are typically utilized in the development of Delaware bridge design projects

○ ***The details depicted in Section 300 of the BDM are not to be considered as “Standard Construction Details” or “Model Plans.” Furthermore, Section 300 details must be duplicated on the Contract Documents (with modifications made as necessary to make the detail project-specific). A friendly reminder of this can be found on the INDEX OF TYPICAL BRIDGE DESIGN DETAILS sheet.***

- Notable New/Important Points
 - **Entire section is new**



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