PENNDOT'S MASH STATUS and DM-4 UPDATE

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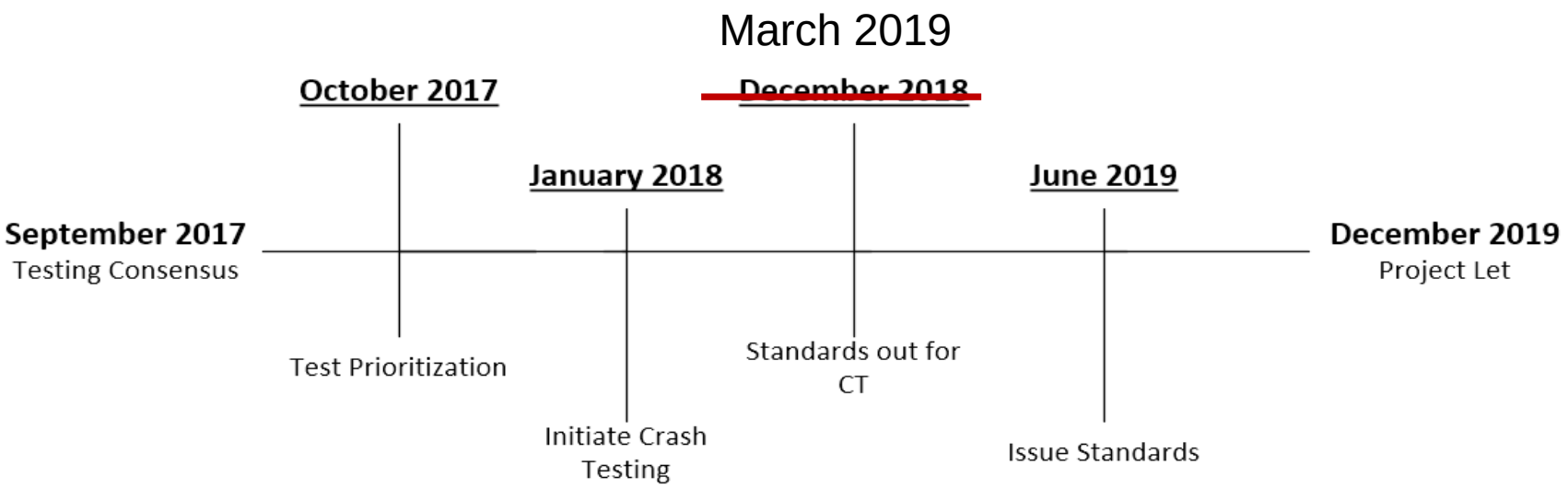
MASH (Bridge) Timeline



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Minimum MASH Test Level

a)Interstate, BPN 1, limited access highways and major bridges

TL-5 45 inches

b)NHS, BPN 2

TL- 5 42 inches

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Minimum MASH Test Level

c) Non-NHS ADTT > 2000, BPN 3

TL-5 42 inches

d) BPN 4

TL-5 42 inches, except

a) Allow TL-4 or TL-3 based on sight distance need but must provide calculations to support lower TL.

b) allow TL-3 32 inch barrier structure mounted guiderail on culverts and arch type structures

Minimum MASH Test Level

e) Locals - TL-5 42” min exceptions similar to BPN 4

f) TL-5 42 inches as standard for all roadways (lower heights per design exception)

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Minimum MASH Test Level

- NOTE: TL-5 42 inch tall barrier **WILL NOT** meet current MASH TL-5 requirements if a future overlay is provided.

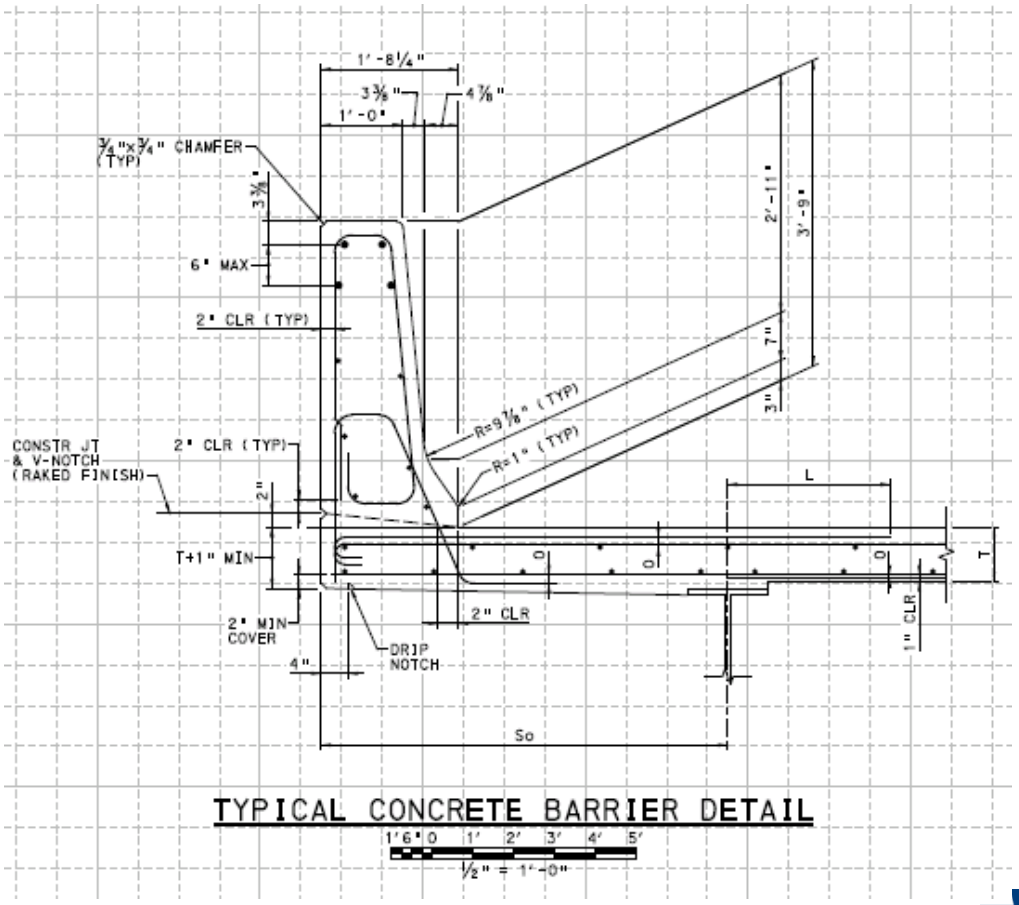
Issue to be addressed at time of overlay placement.

MASH Updates

- Various solid concrete barriers on BD-601M (TL-3 thru TL-5) and vertical wall barriers on BD-618M(TL-3 and TL-5)have been evaluated by professional engineering justification(TTI).

- Letter sent to FHWA for Approval.

MASH Updates



F shape barrier

45”, 42” and 32”

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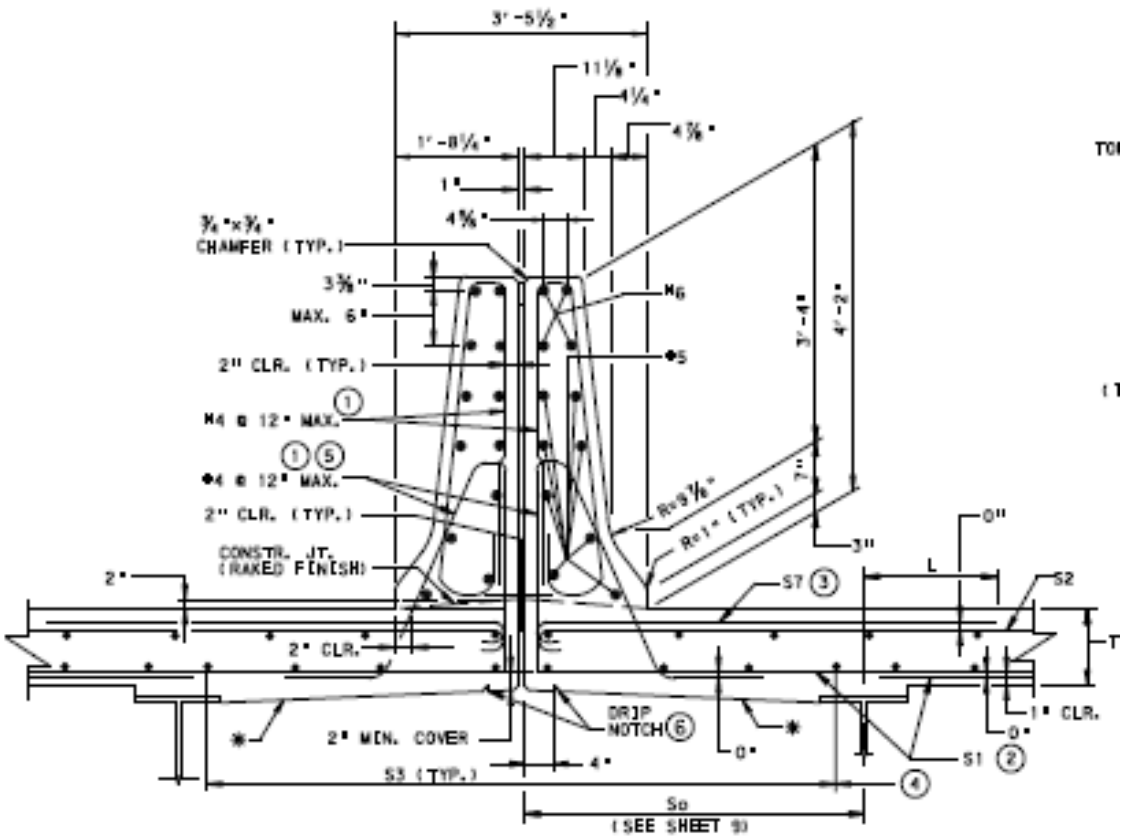
MASH Updates



SPLIT CONCRETE GLARE SCREEN
MEDIAN BARRIER DETAIL

(SEE BC-788M FOR OPEN JOINT DETAIL)

TO BE USED WHEN CONCRETE GLARE SCREEN IS SPECIFIED IN APPROACH ROADWAY.

FOR DECK TOP REINFORCEMENT MAT: TRANSVERSE BARS SHOWN

Split Glare Screen Median 50” and 32”

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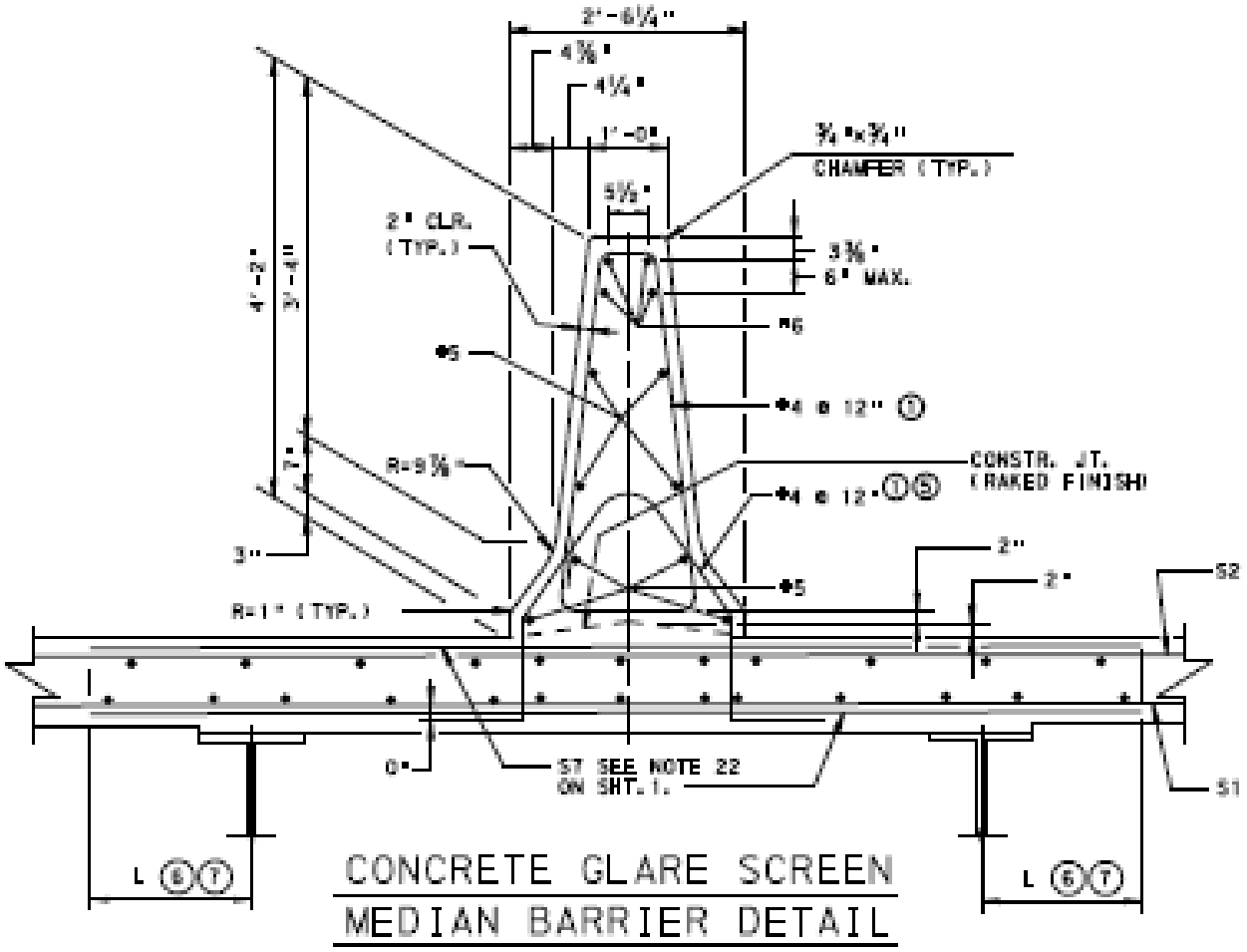
MASH Updates



CONCRETE GLARE SCREEN
MEDIAN BARRIER DETAIL

Glare Screen
Median
50″ and 32″

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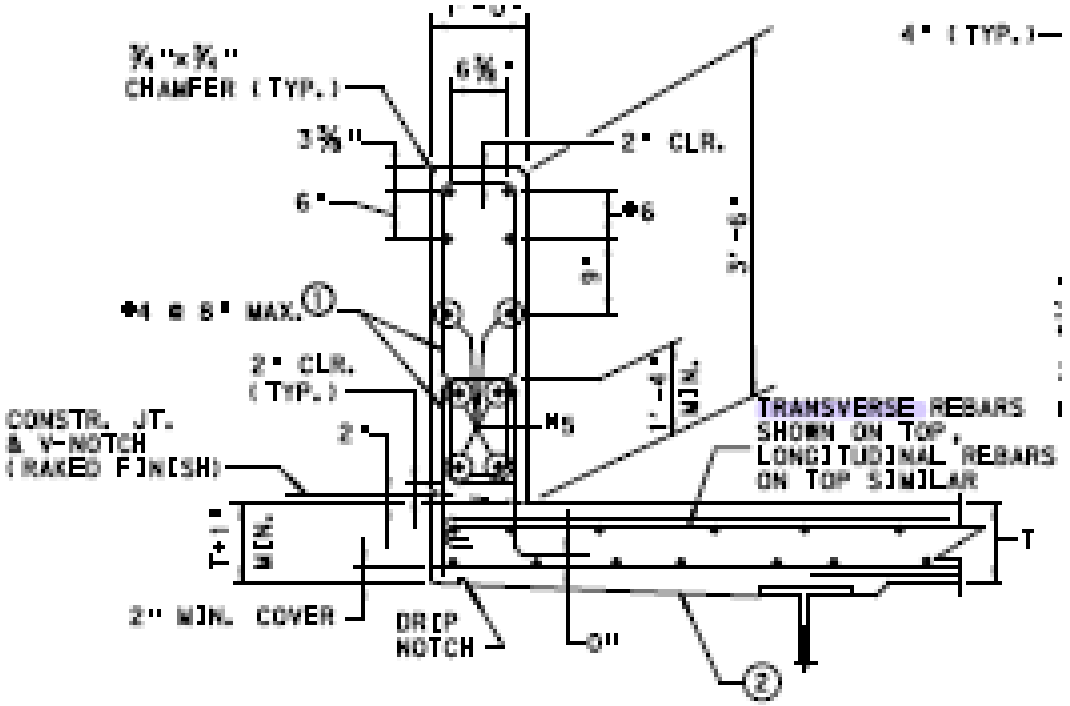
MASH Updates



TYPICAL VERTICAL WALL
BARRIER DETAIL - TL5

(FOR REINFORCEMENT IN DECK
SLAB, SEE BD-601M)

Vertical Wall Barrier

42” and 32”

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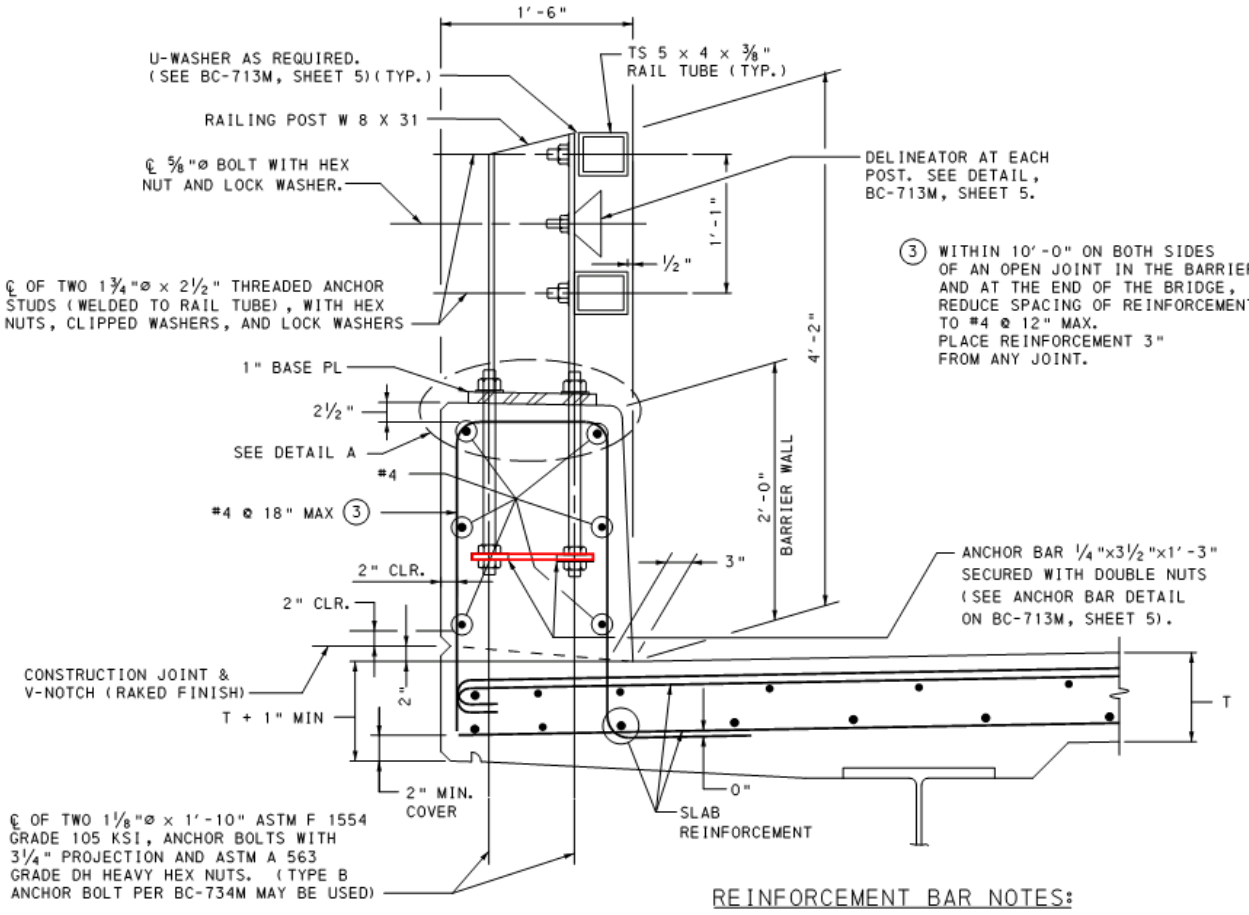
MASH Updates

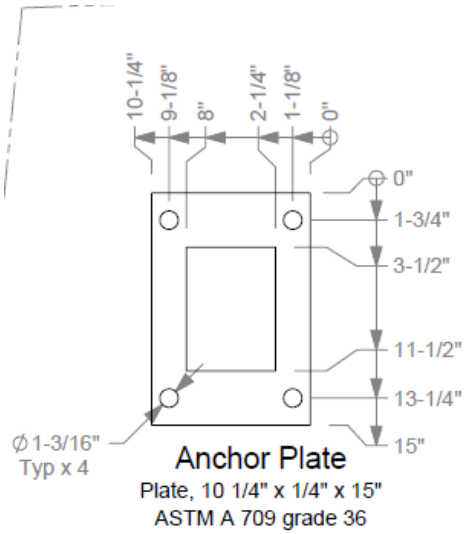
- PA bridge barrier was tested by TTI in 2018 and passed for MASH TL-5

- PA Type 10M barrier was tested by TTI in March 2019 and passed for MASH TL-4.

- PA HT barrier will be deleted.

MASH Updates





PA Bridge Barrier

(anchor plate, not bars for MASH)

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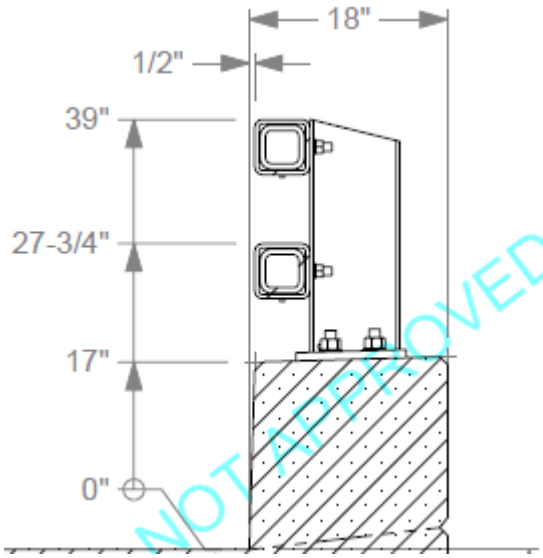
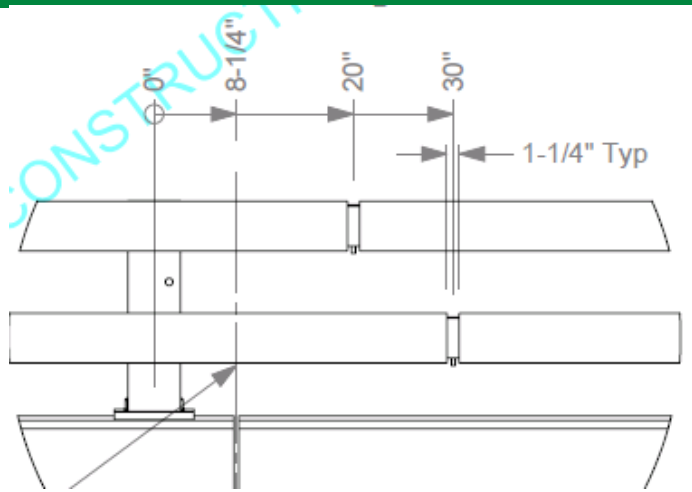
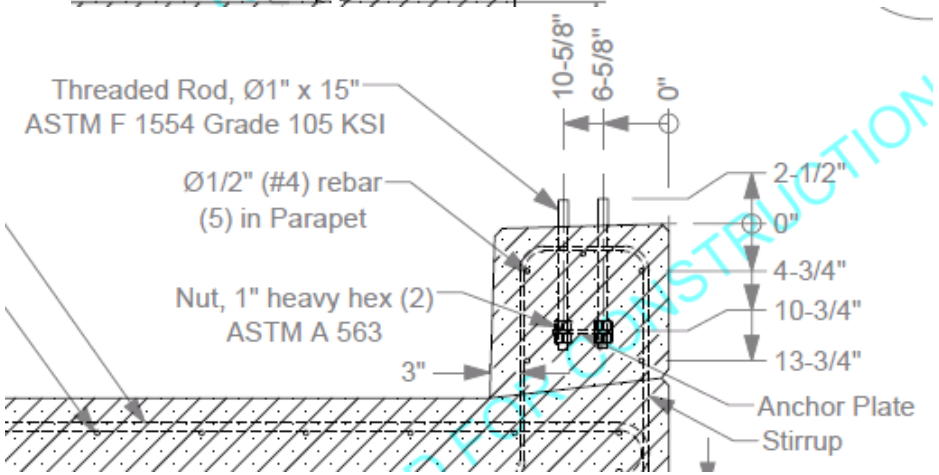
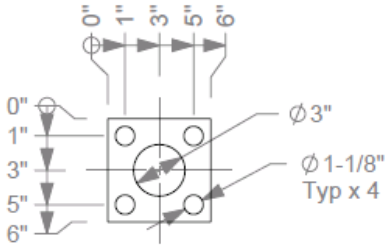
MASH Updates









Anchor Plate
Plate, 6" x 1/4" x 6"
ASTM A 709 grade 36

10M Bridge Barrier

(39” high for MASH)

NOT APPROVED FOR CONSTRUCTION

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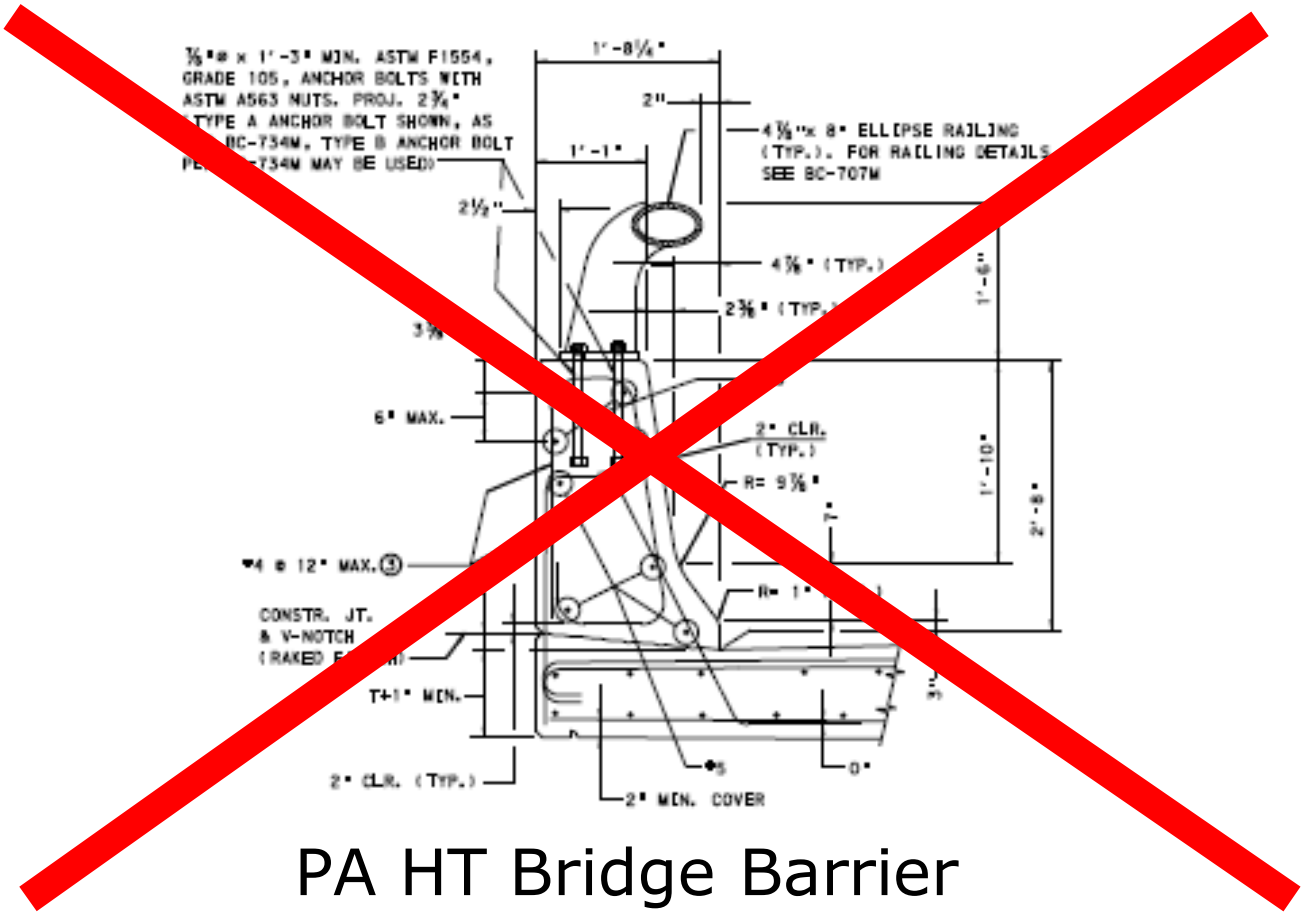
MASH Updates



PA HT Bridge Barrier

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MASH Updates

- PA structure mounted guiderail was tested by TTI on July 25, 2019 for pickup truck and failed. It needs to be retested.

MASH Updates

- Transition details move to RC-50M. BC-739M will be terminated.

- DM-2 Appendix A also provides transition details

MASH Updates

- Originally, were going with the 10-degree flare with W-Beam as it was previously crash tested and included in standards (RC-50M,Sheets 1 to 3)
- TTI was not ready to make a determination, as only the pickup truck was crash tested, stated that a test for the passenger car must also be performed
- TTI stated that too many details changed from what was originally tested
- The retest could need up to 10 crash tests
- Too cost prohibitive

MASH Updates

- Started revisiting a Thrie Beam transition as an option.
- Midwest Roadside Safety Facility (MwRSF) at University of Nebraska completed crash tests with a car and pickup truck for a Thrie Beam Transition to Concrete Buttress that is MASH TL-3 compliant.

MASH Updates

- Three sets of conceptual plans have been developed (Thrie Beam to concrete barrier, Thrie Beam to PA bridge barrier and Thrie Beam to PA Type 10M barrier).
  - Sent to TTI for an estimate for engineering opinion.

- Will be out for CT review if TTI provides a positive opinion.

MASH Updates

- At a recent AASHTO meeting, a resolution was passed that will ask FHWA to extend the compliance dates for devices that are not yet MASH compliant. No official response has been received yet.
- Regardless, neither transition is going to meet the 12/31/2019 deadline.
  - The Thrie Beam transition is scheduled to be released in March 2020.
  - No close timeframe for the W-beam with 10-degree flare transition yet.

BOTTOM LINE

- Number of bridge barriers available for use based on needed TL level and site

- Transitions are in a state of transition until testing or certification is completed. Hope to have something by March 2020.
  - What to do between January and March?
  - Stay tuned!

DM-4 2019 Highlights

- New DM-4 will incorporate 8th Edition of AASHTO 2017

- LRFD for Sign Structures

Chapter Changes

Chapter 1

- New article on guidance for bridge bundling of non-complex projects
- New notes and title block req’ts
- Scour information table requirement on plans (Stay awake until Chapter 7!)

DM-4 2019 Highlights

Chapter 2

- "Bridge in a Backpack" only allowed as alternate on D-B (due to patented system)
- GRS-IBS finally listed for small bridges (now that we're looking at using it on bigger spans!)
- P/T P/S bulb T's and K-frames added to large span structures

Chapter 3

- New article for Dept. Force project policy (3.6.11)

DM-4 2019 Highlights

Chapter 4

- Added Items 8-ABC, and 9-Bridge Barrier to economic consideration article
- Updated list of LCC factors

Chapter 5

- Note to check orientation of bars on staged slab bridges
- New article on PPC Overlay, Comparison of Overlays
- New policy on Pipe Rehabilitation Strategies

DM-4 2019 Highlights

Chapter 6

- No changes (See Geotech Pubs)

Chapter 7

- Extreme Weather Vulnerability Study for flood history
- Scour information table
- New article on Interdisciplinary Approach to Waterway Opening and Scour Analysis. Including Geotech coordination on scour depth

DM-4 2019 Highlights

(c) Scour information for each substructure unit as illustrated below.

	ABUT. 1	PIER X [3]	ABUT. 2
BOTTOM OF FOOTING ELEVATION			
TOP OF ROCK ELEVATION [1]			
SCOUR DESIGN ELEVATION [2]			

[1] *If applicable*

[2] *The final scour elevations are to be provided to the District Geotechnical Engineer for review, comment and concurrence after the borings are completed. The District Geotechnical Section can include Central Office Geotechnical Group for applicable projects (complex projects, district support), if desired.*

[3] *Provide a column for each pier, if applicable.*

Figure 7.1.2-1 – Sample format for Scour Information table

DM-4 2019 Highlights

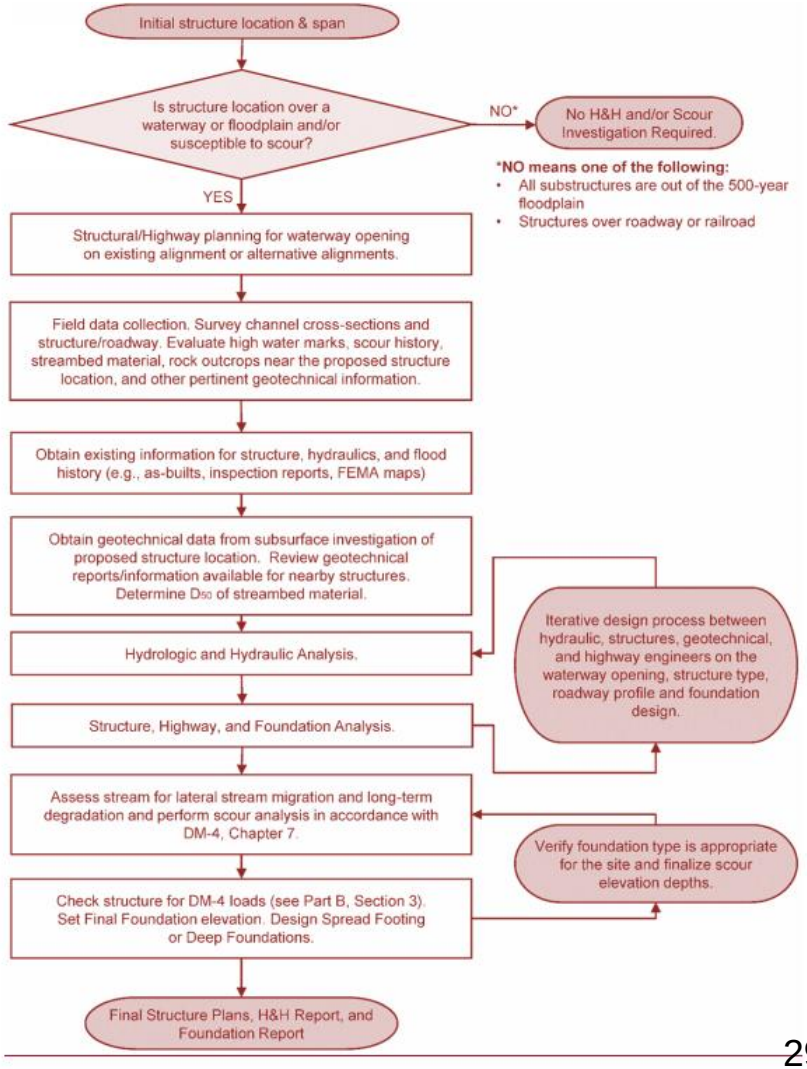

Figure 7.1.3-1 – Interdisciplinary Process for Hydraulic Assessment and Scour Determination for New Structures and Structure Replacement Projects

(See new DM-4 to actually read content)

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Section Changes

Sections 1, 2, 4, 7, 8, 12, 15

- No significant changes

Section 3

- New permit load – P2016-13 – based on research by PSU
- Wind factor=1.0. Gust speed= 3 seconds (AASHTO)

DM-4 2019 Highlights

Section 5

- TOTAL REWRITE!! based on new AASHTO rewrite
- B and D regions
- Strut and Tie for D regions
- New debonding requirements based on AASHTO
  - Stay tuned! ***May*** be revisions. TBD
- No more 40 ksi steel. Added 100 ksi (except decks)
- Adopted AASHTO article for Anchors
  - new certified installer, inspector requirements on the horizon
- Crosswalk to help

DM-4 2019 Highlights

Section 6

- ASTM A325 and A490 ➔ ASTM F3125 Grade A325 and Grade A490
- All Grade A325 now f_t=120 ksi (no more 105)
- AASHTO simplified bolted splice design adopted
- Bolt holes for Ø$\geq$1”=d+1/8”

DM-4 2019 Highlights

Section 9

- Additional ¼” to deck for mechanical grinding
- New articles related to staged construction
- Corrosion-resistant alloy steel reinforcement added to deck protection systems
- Dual deck protection system approval
  - Interstates-DBE
  - All other projects-CBE

DM-4 2019 Highlights

Section 10

- RMR and E_m equations and tables for spread footings in rock (AASHTO 2010)
- Settlement monitoring plan for rockfill embankments >40’
- Downdrag load factor modifications
- Friction factors for pipe piles in glacial till

DM-4 2019 Highlights

Section 10 (cont'd)

- Adopted AASHTO
  - resistance factors for driven piles and drilled shafts
  - side resistance article for drilled shafts
  - "Considerations for Footings on Slopes"
  - BIG CHANGES!!!!
- New micropiles criteria, geotechnical resistance factors

DM-4 Highlights

C10.9.3.5.4

The following shall supplement AC10.9.3.5.4.

Proof load testing is a non-standard practice and should only be used in cases where measurable savings can be shown. The past experiences of the Department indicate that the savings, if any, from modification of the as-designed micropile details is negligible when compared to the costs of the proof load tests.

The test pile for verification load testing shall be a production pile. Selection of the location for a test pile should be a vertical pile and not in the first row of piles for abutments or on the outside perimeter of piles for piers where possible. Load testing of a micropile in compression involves the test pile and two reaction piles. Per ASTM D1143 the reaction piles shall be eight feet from the test pile. Therefore, the designer shall lay out the pile pattern to accommodate the test pile and reaction piles.

DM-4 Highlights

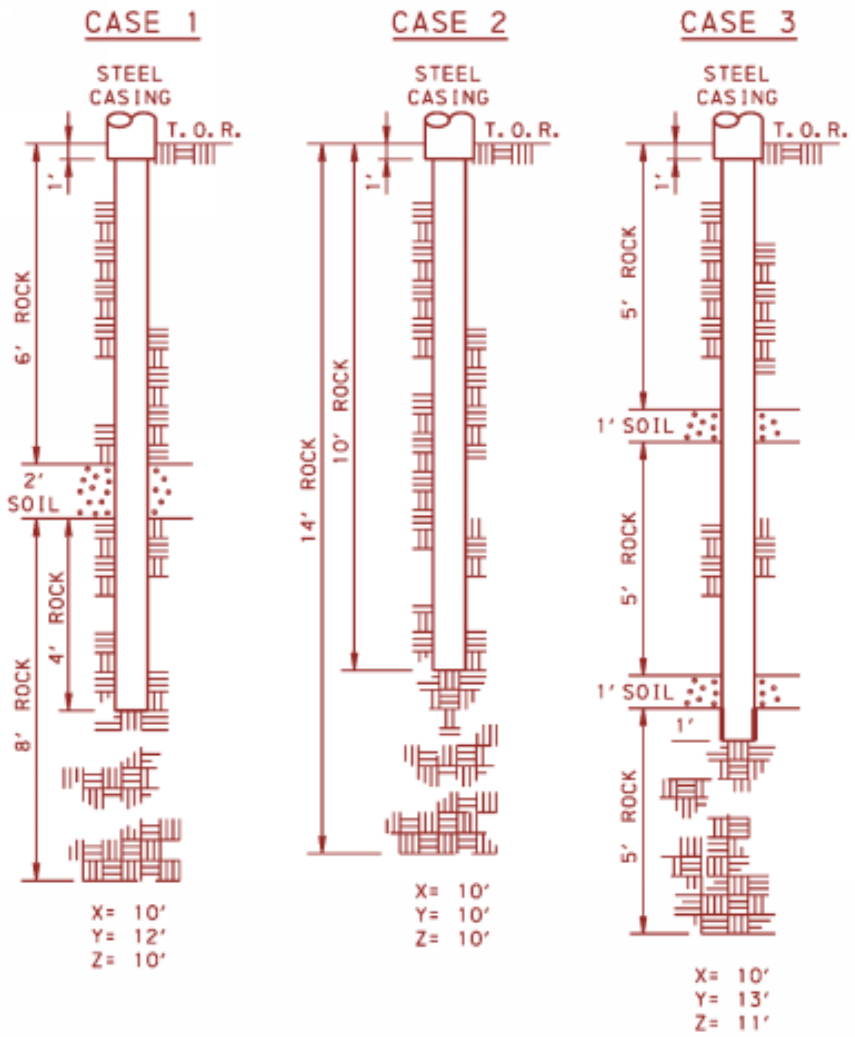

Figure C10.9.1.9P-1 – Example development of micropile values X, Y, and Z for different subsurface conditions

X = minimum rock length (for seamed rock)

Y = minimum bond length

Z = total rock socket length (can equal X if solid rock condition, but may not if rock is seamed)

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DM-4 2019 Highlights

Section 11

- DBE approval required for integral abutments in karst
- Crack control serviceability for anchored wall facing
- Two restrictions on MSE Wall use
  - cannot be used for heights greater than 35 ft. when extensible reinforcement is used
  - cannot be used when the soil strap design length passes the staged construction line.
- Increased the maximum allowable height
  - T-Walls with level backfill - 50 ft.
  - U-Walls and Rett-Walls - 40 ft.

DM-4 Highlights

Section 13

- MASH 2016– See first half of this presentation

Section 14

- Deleted AASHTO article on disc bearings
- Warning on tooth dam binding for bridges on short radius
- Language clarification on beam seat slope
- Reminder to include test pads in quantity on plans, if needed

DM-4 Highlights

14.7.6.3.9d.1.1P Direction Parallel to Longitudinal Axis of Beam

The beam seat in the direction parallel to the longitudinal axis of the beam may be constructed to a maximum slope of 1%. ~~Any remaining differential slope between the beam seat and the bottom of beam bearing area must be accommodated for in the design of the bearing pad or by modifying the bottom of beam bearing area~~When the slope of the bottom of beam in the direction parallel to the longitudinal axis of the beam, S_L, cannot be accommodated for in the design of the bearing pad in conjunction with a maximum beam seat slope of 1%, the beam seat shall be constructed level in the direction parallel to the longitudinal axis of the beam and the bottom of beam bearing area shall be modified in accordance with D14.7.6.3.9d.2.1P.

DM-4 Highlights

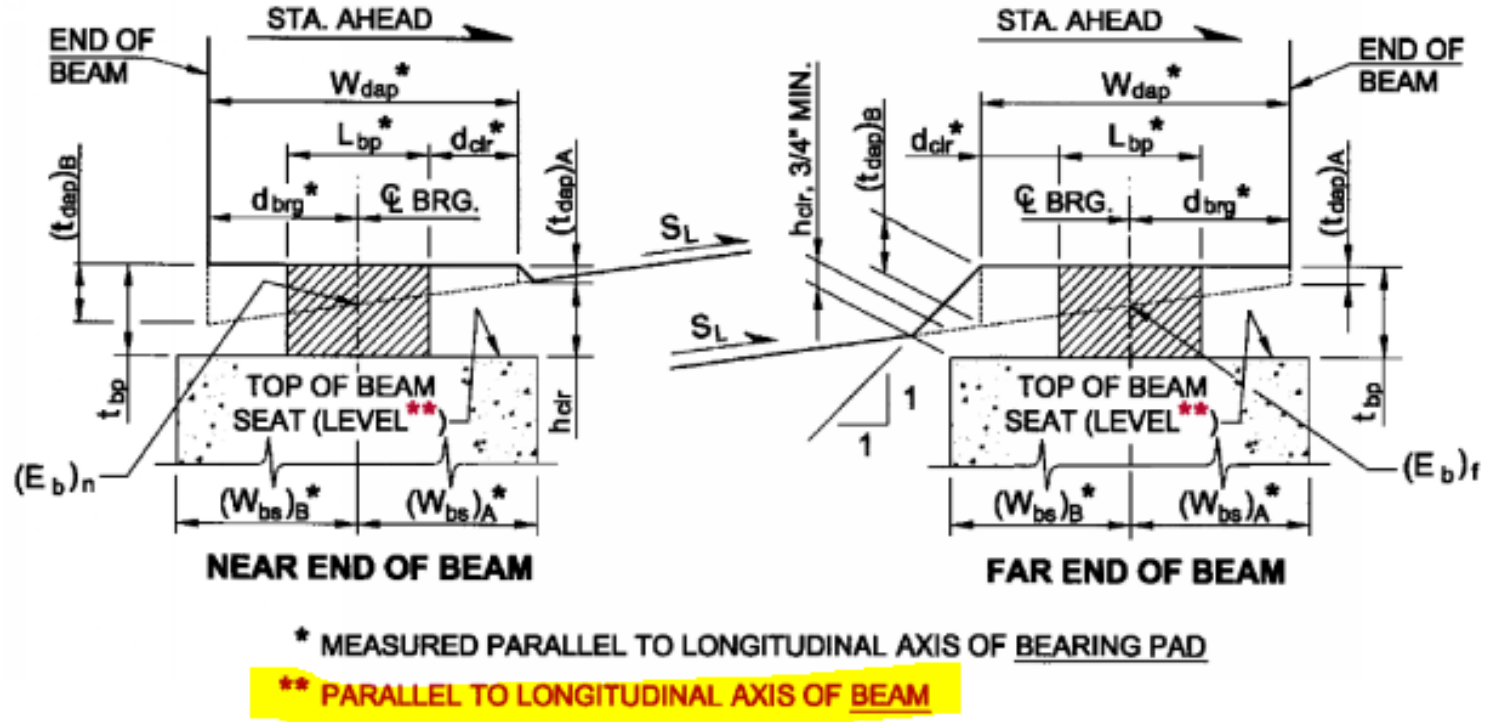

Figure 14.7.6.3.9d.2.4P-1 – Typical P/S Concrete Beam Dap Detail (Viewed Parallel to Longitudinal Beam Axis)

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DM-4 Highlights

BD's and BC's

- Technically part of DM-4, but not covered today
- Stay tuned for updates/new Standards—due out Spring 2020 (approx.)

Questions??

Thank you

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