Broadway over I-44: "There's Nothing Normal About This Project"

by

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Tom Lohman, Horner & Shifrin

Dan Shane, HR Green

March 16, 2023

EDSI Engineering Design Source, Inc.

TSi geotechnical, inc.

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PROJECT LOCATION

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SUMMARY

- Bridge replacement over I-44… or is it over I-70?
  - Eastbound or westbound?

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SUMMARY

- Bridge replacement over I-44… or is it over I-70?
  - Eastbound or westbound?
- Includes off ramp from express lanes.
  - Southbound?
- **Focus on Bridges**
- Scheduled for Spring 2021

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Existing Bridge Conditions

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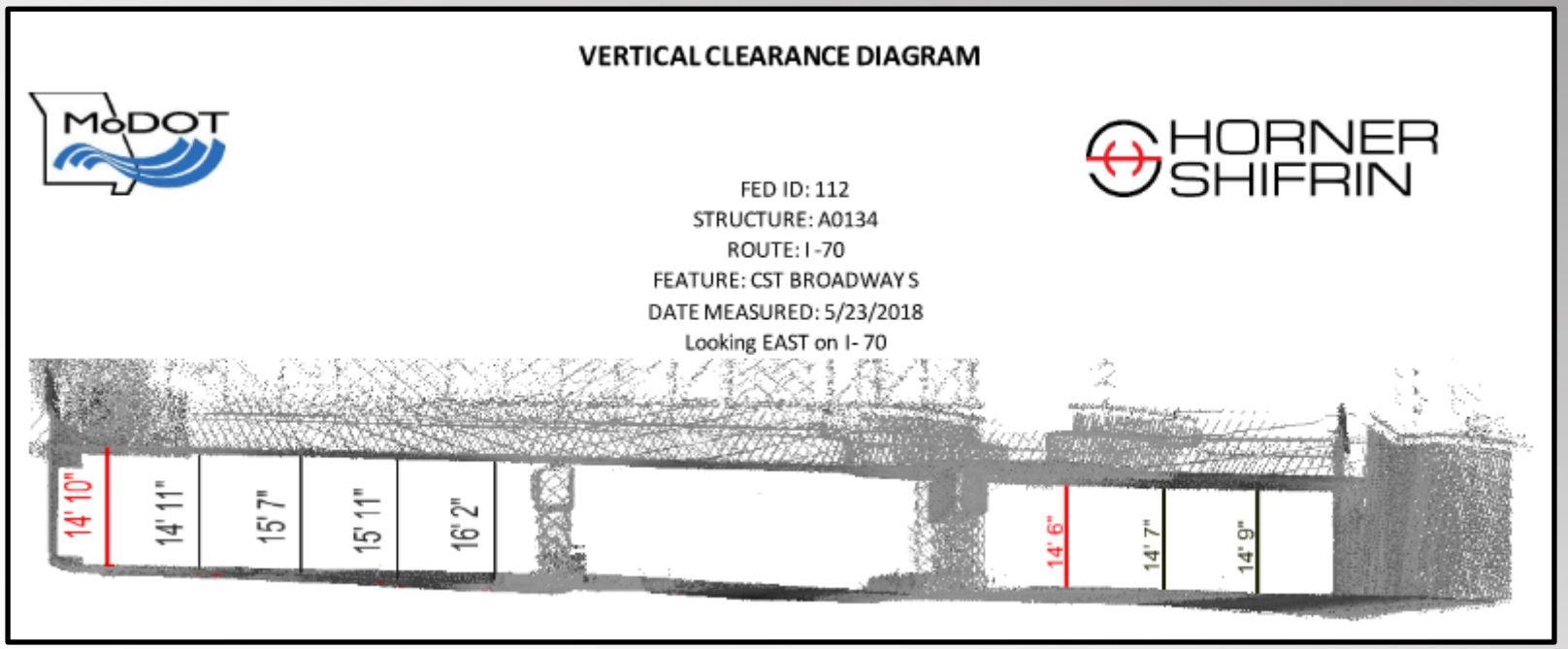
EXISTING VERTICAL CLEARANCE



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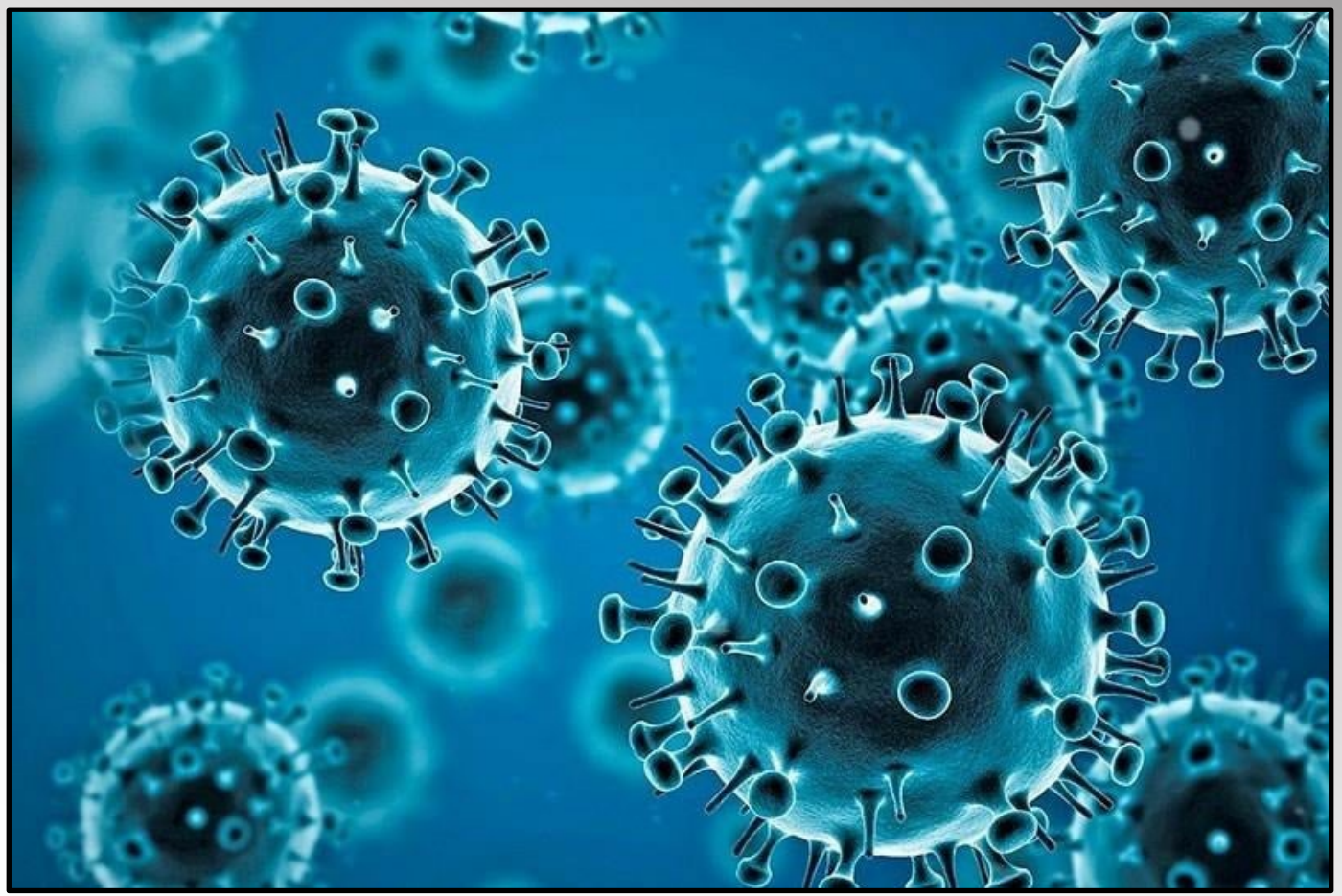
Let's Begin Project Delivery!



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Remove the bridge?

- Public perception
  - Barrier to downtown
- **Focus on Bridges**
  - Deadline of 2024

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Construction Timeline

- Bridge Demolition – Winter 2022
- Ground Improvements – Spring 2022
- MSE Walls – Summer 2022
- Substructure – Fall 2022
- Beams & Deck – Winter 2023
- Project Completion – Summer 2023

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Existing Bridges

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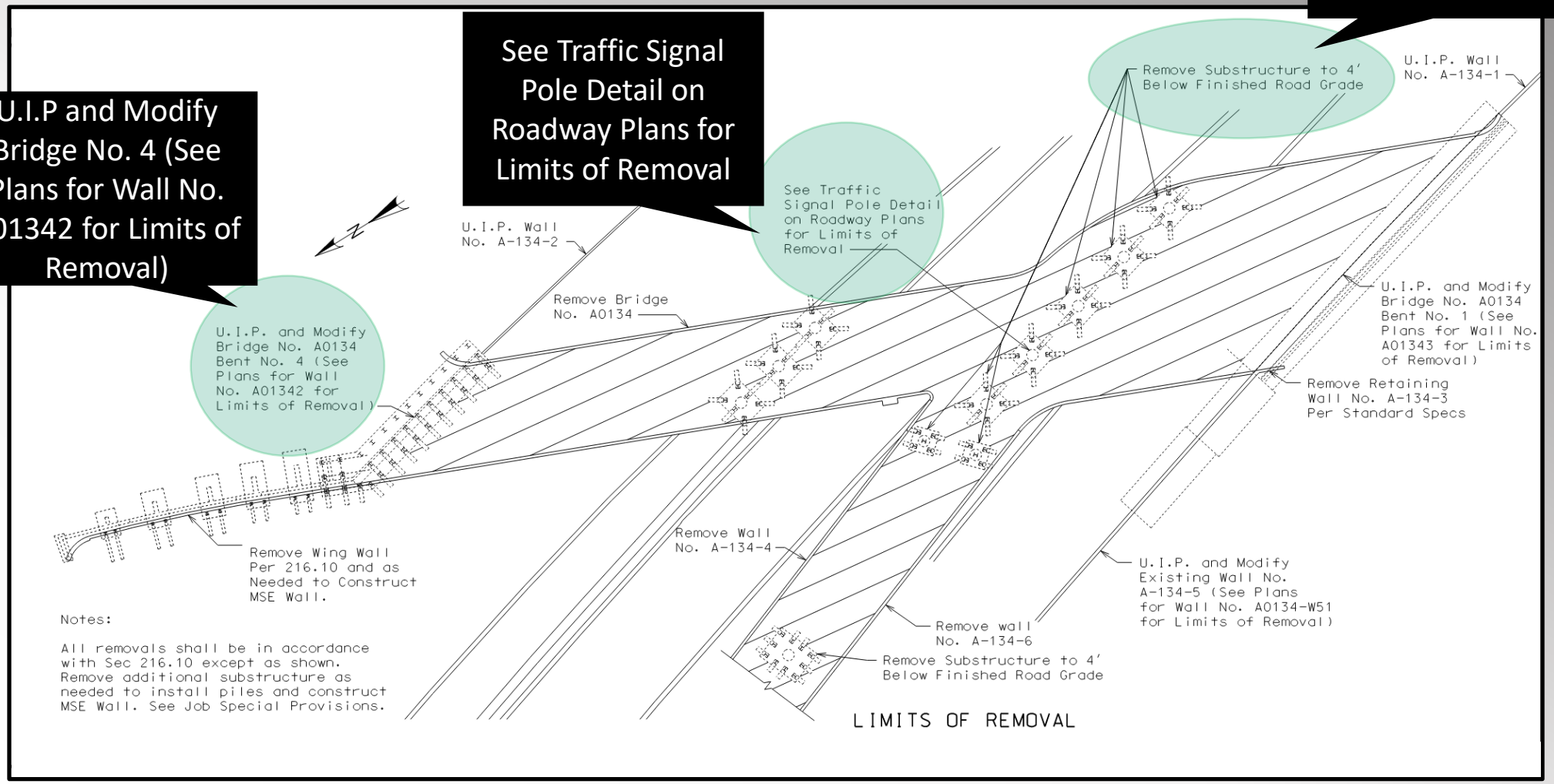
BRIDGES – LIMITS OF REMOVAL

Remove Substructure to 4' Below Finished Road Grade

See Traffic Signal Pole Detail on Roadway Plans for Limits of Removal

U.I.P and Modify Bridge No. 4 (See Plans for Wall No. A01342 for Limits of Removal)



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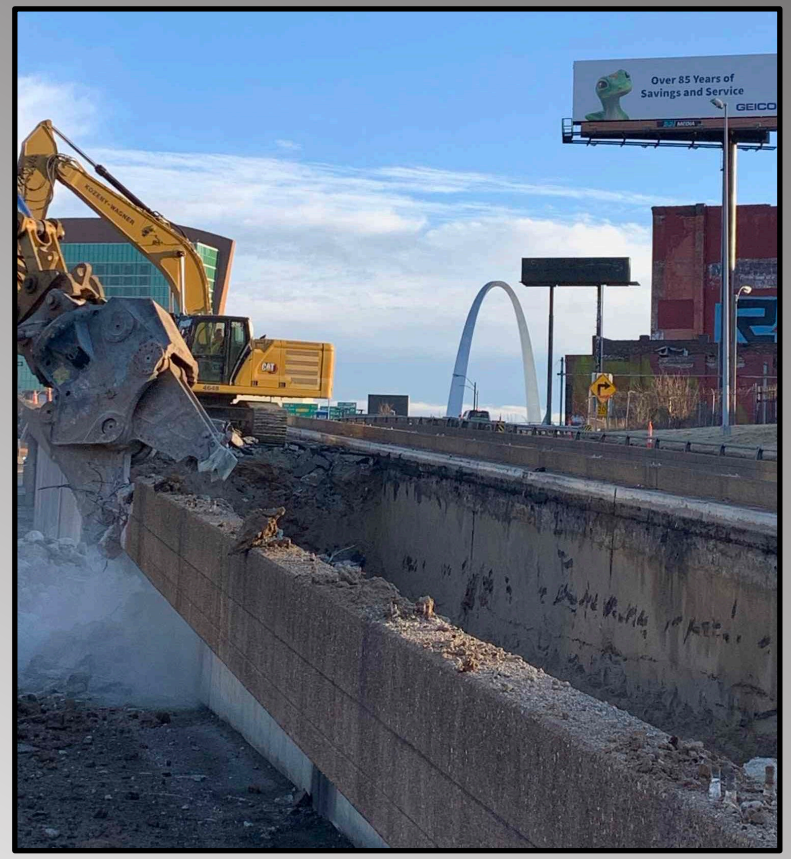
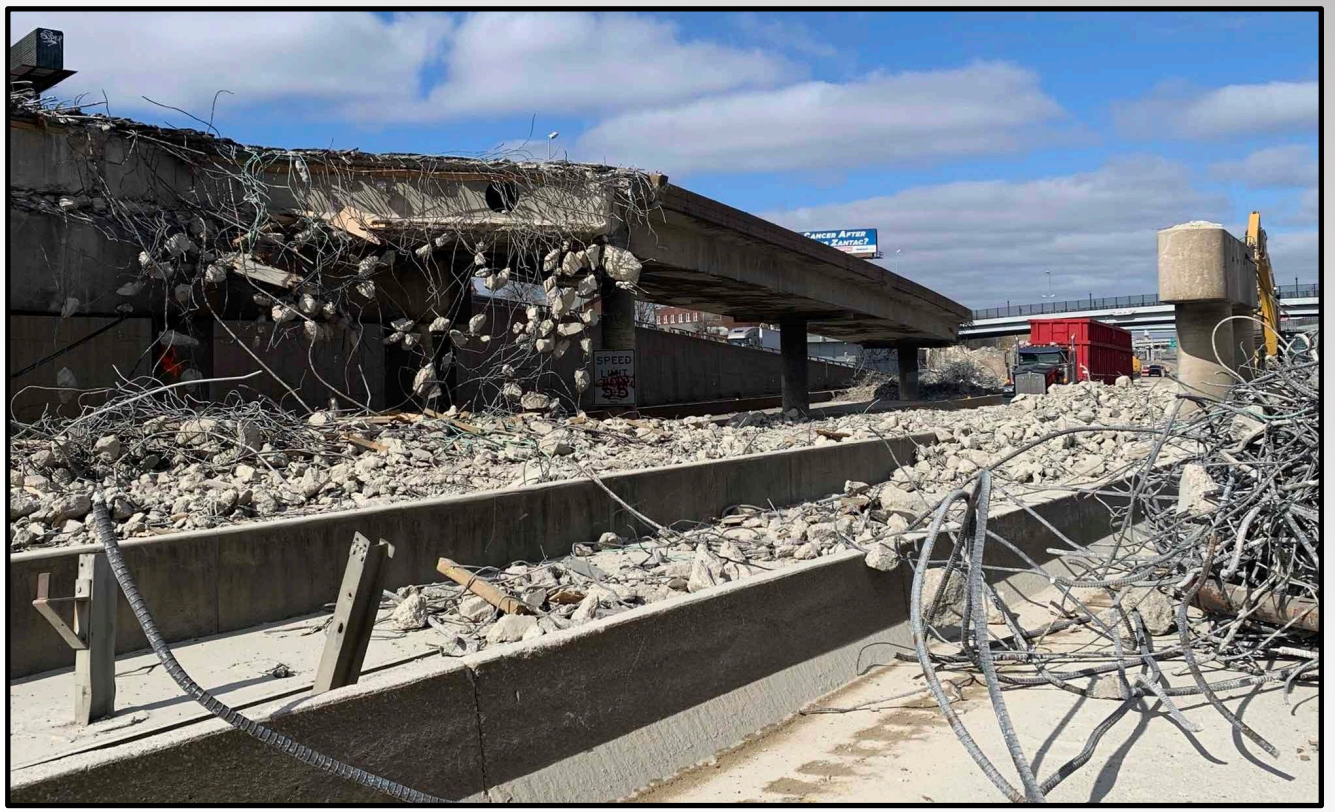
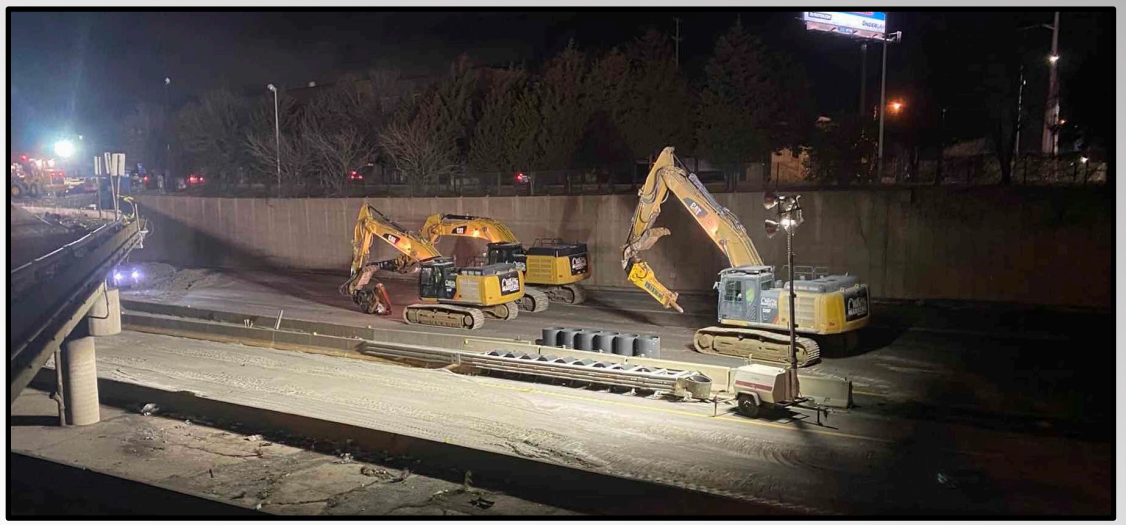
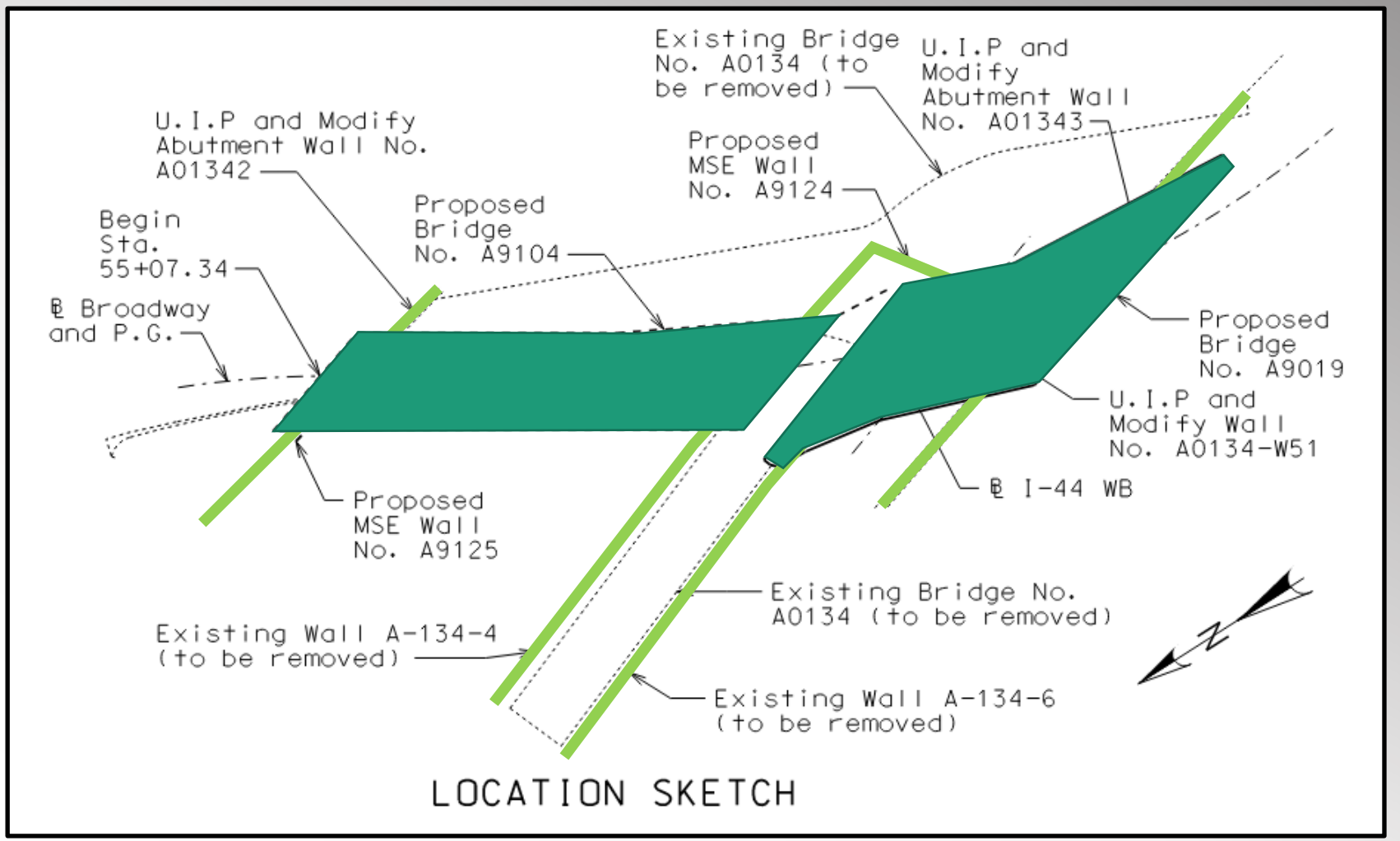
Bridges – Removal







BRIDGES



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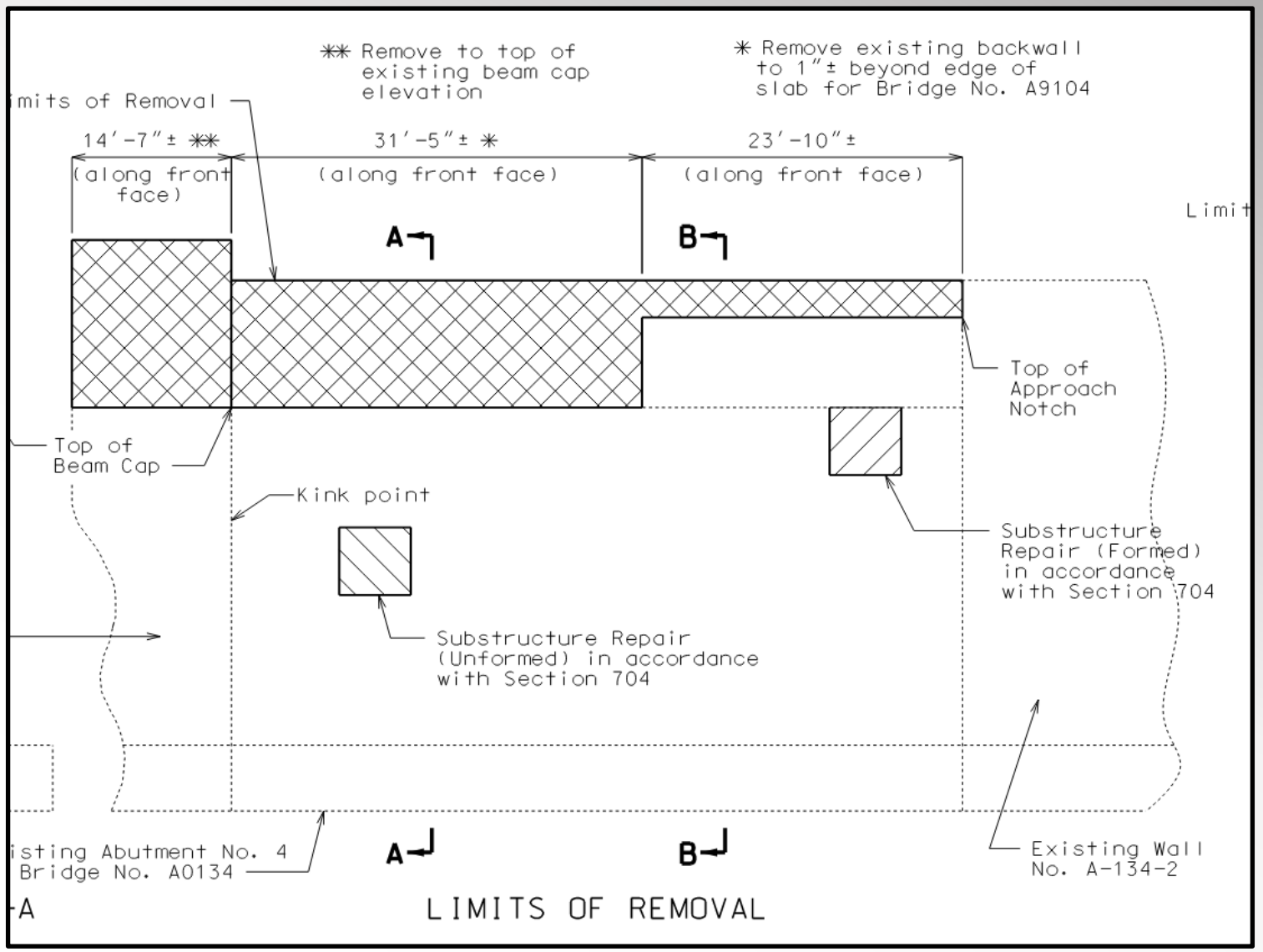
WALLS



- Retain fill at end bents
- Re-use and repair
- Extend with MSE wall

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WALLS

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WALLS – MSE WALL CORNER

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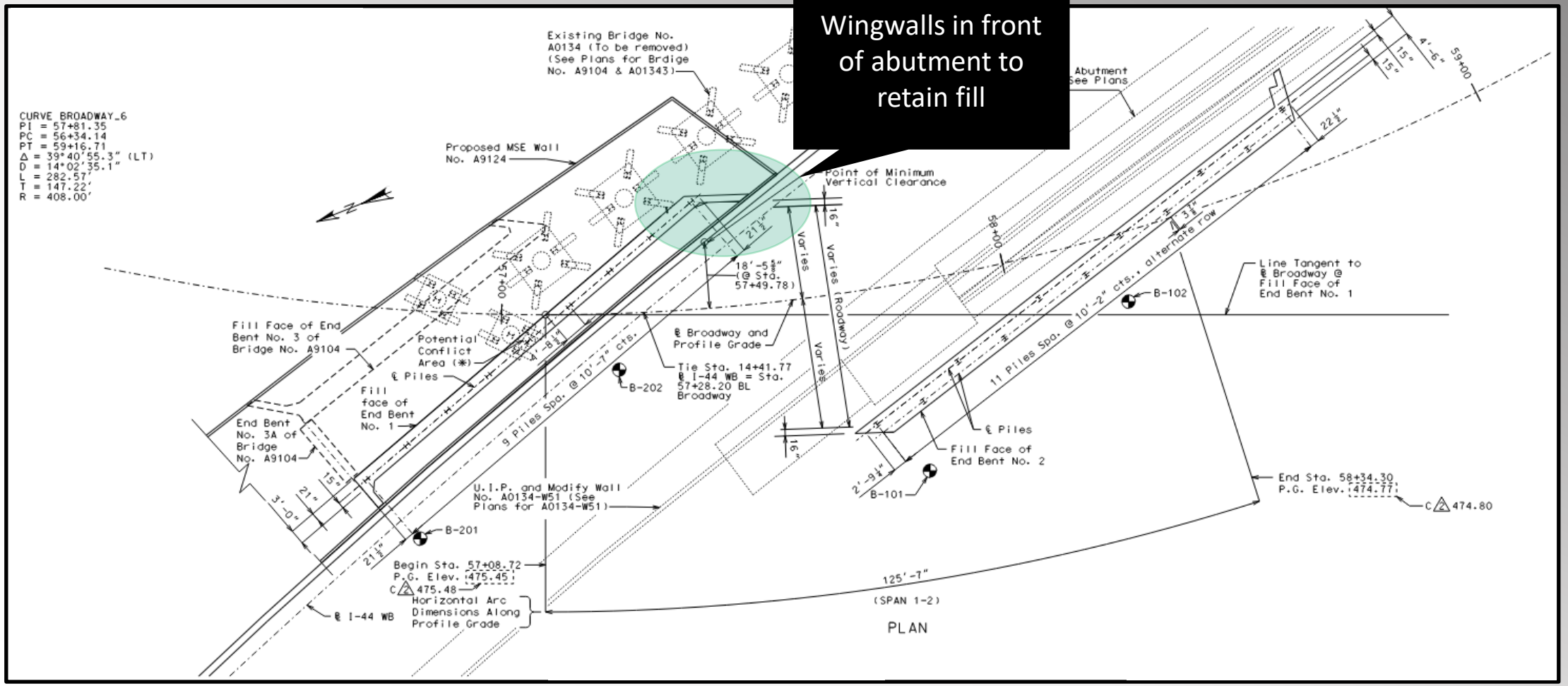

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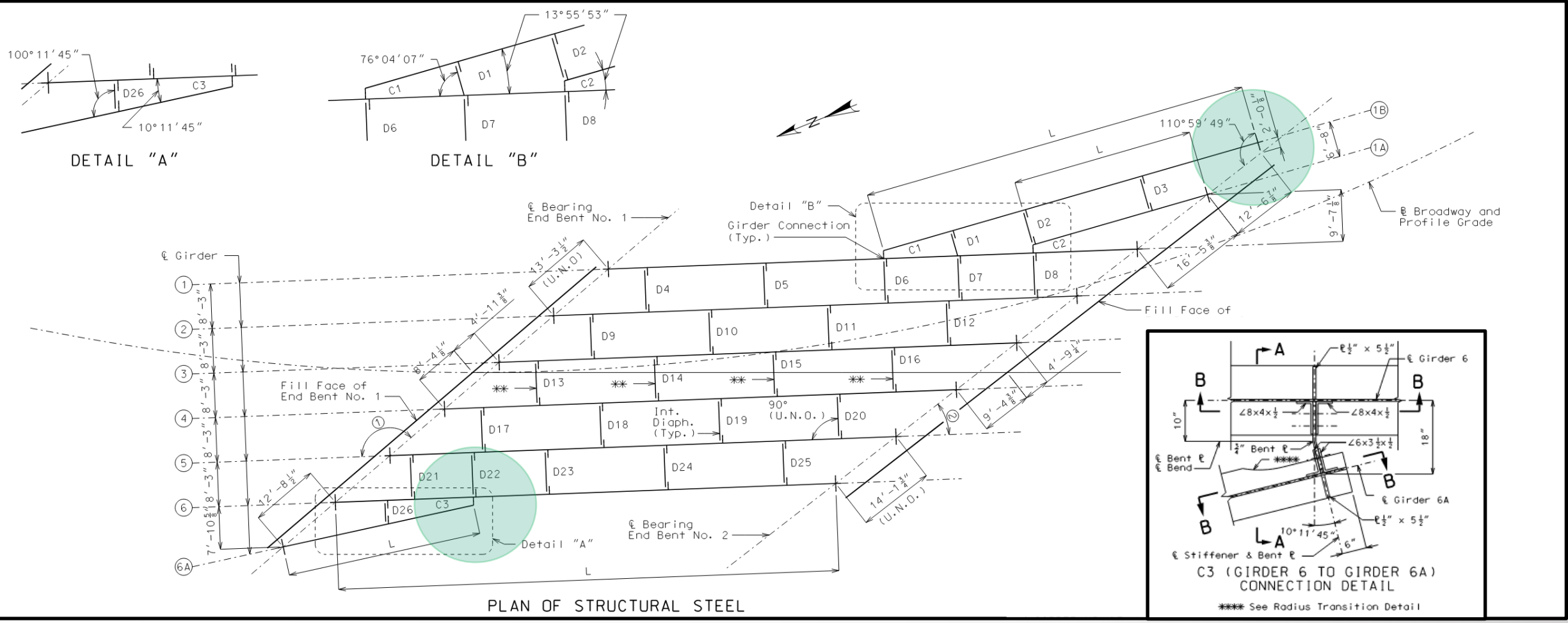
A9019 – Girder Framing



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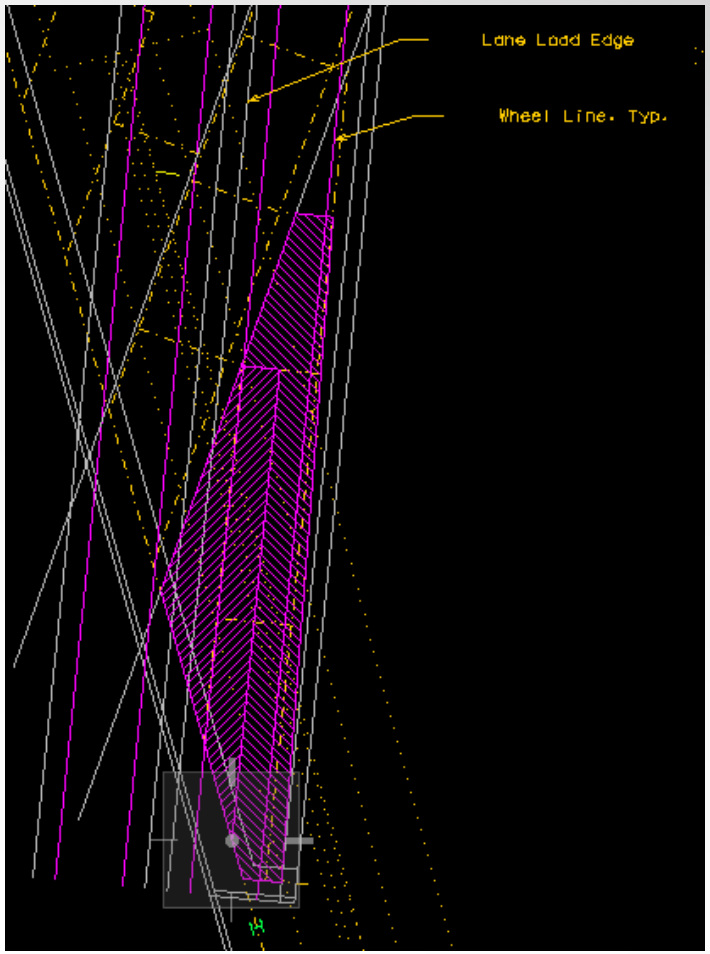
A9019 – Girder Design



- Girder Line Analysis
  - Merlin-DASH
  - Assumptions on Live Load Distribution for flared girders
- Independent Influence Surface Analysis
  - LARSA 4D
  - Generally lower design forces
  - Isolated spots with higher design forces

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A9019 – Girders – Bent 1

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A9019 – Auxiliary Girder

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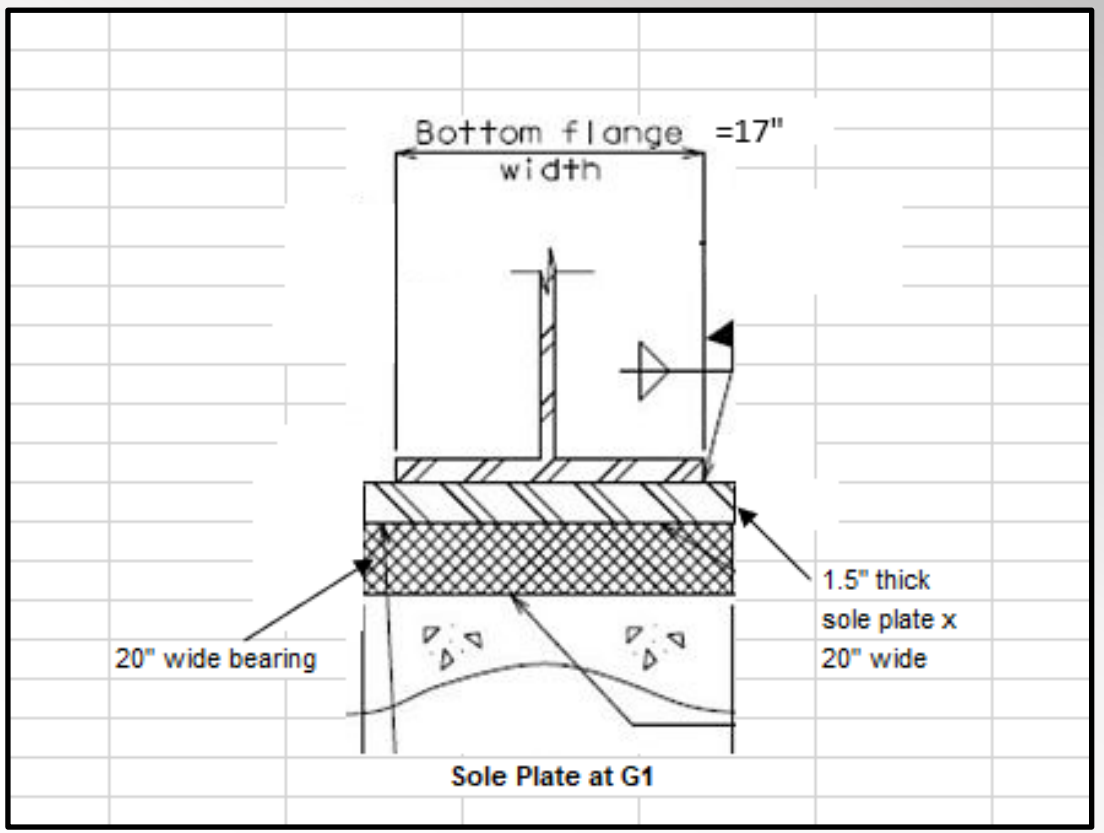
A9019 – BEARING



- G1 longer, has auxiliary girders
  - Required larger bearing
  - Added sole plate rather than increase flange

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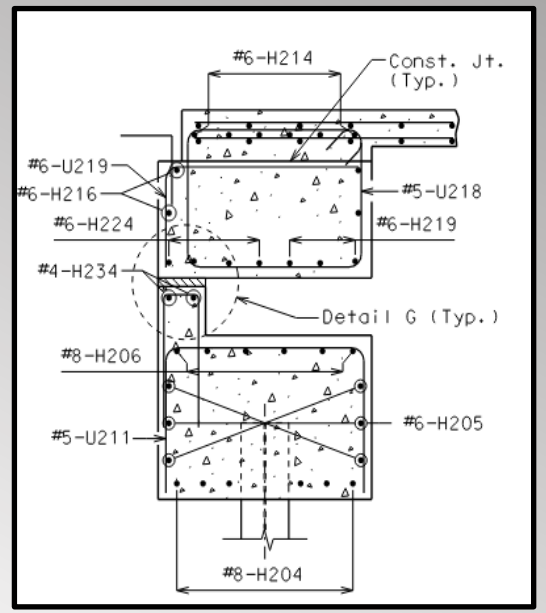
A9019 – Bent 2 Semi-Integral

- 50 degree skew
- Bend to reduce girder length



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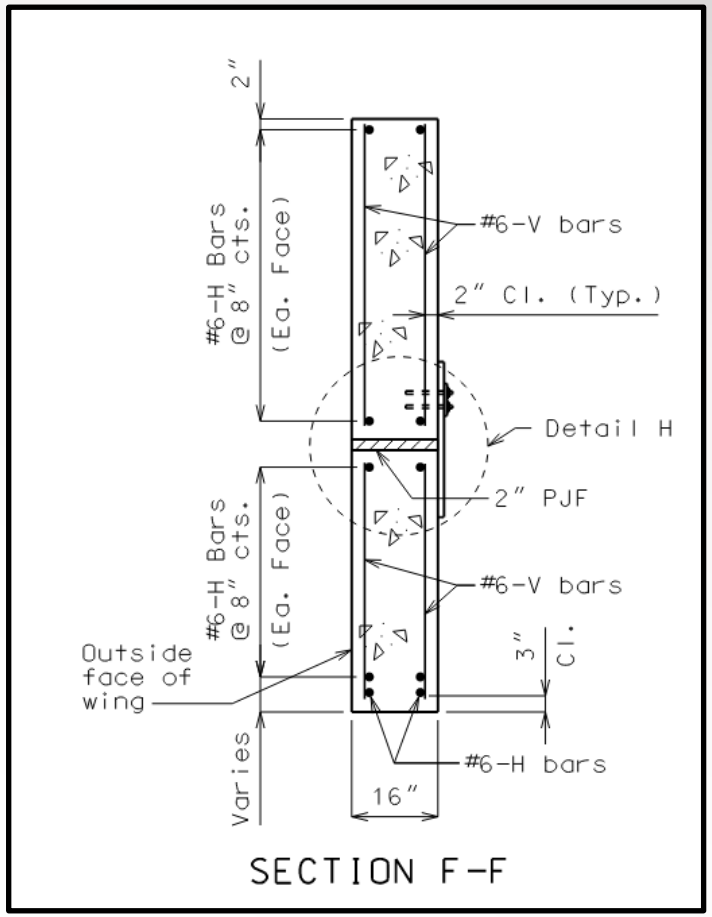
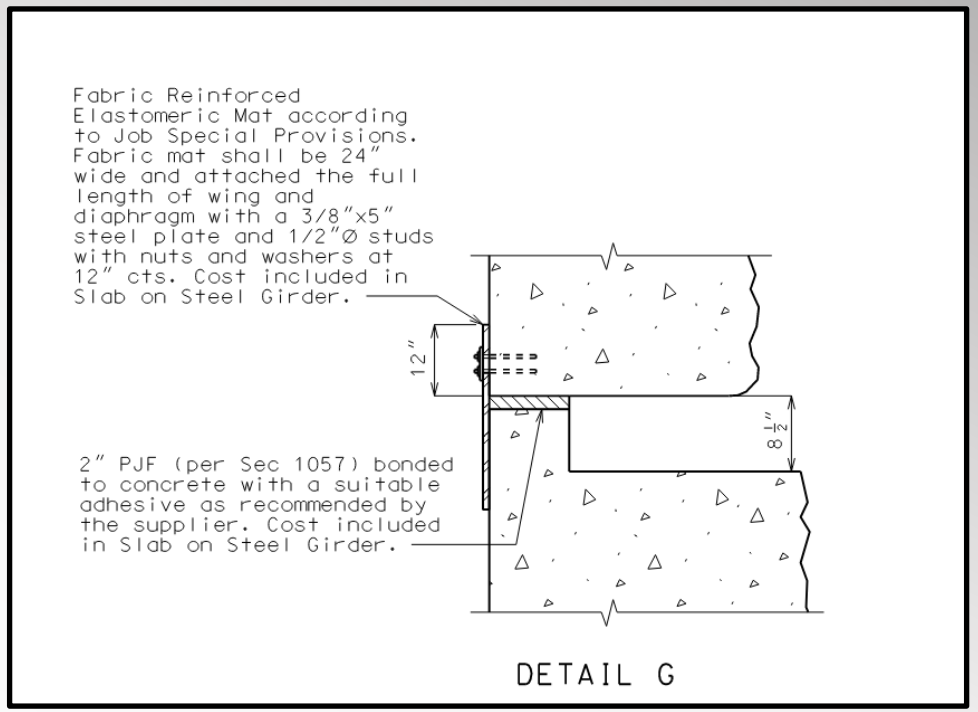
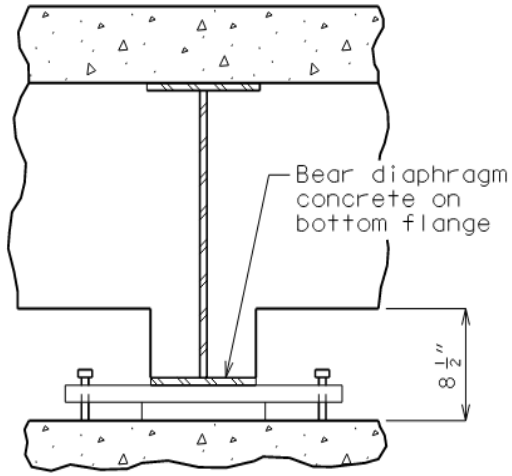
A9019 – Bent 2 Semi-Integral



SECTION F-F



DETAIL G



PART ELEVATION I-I

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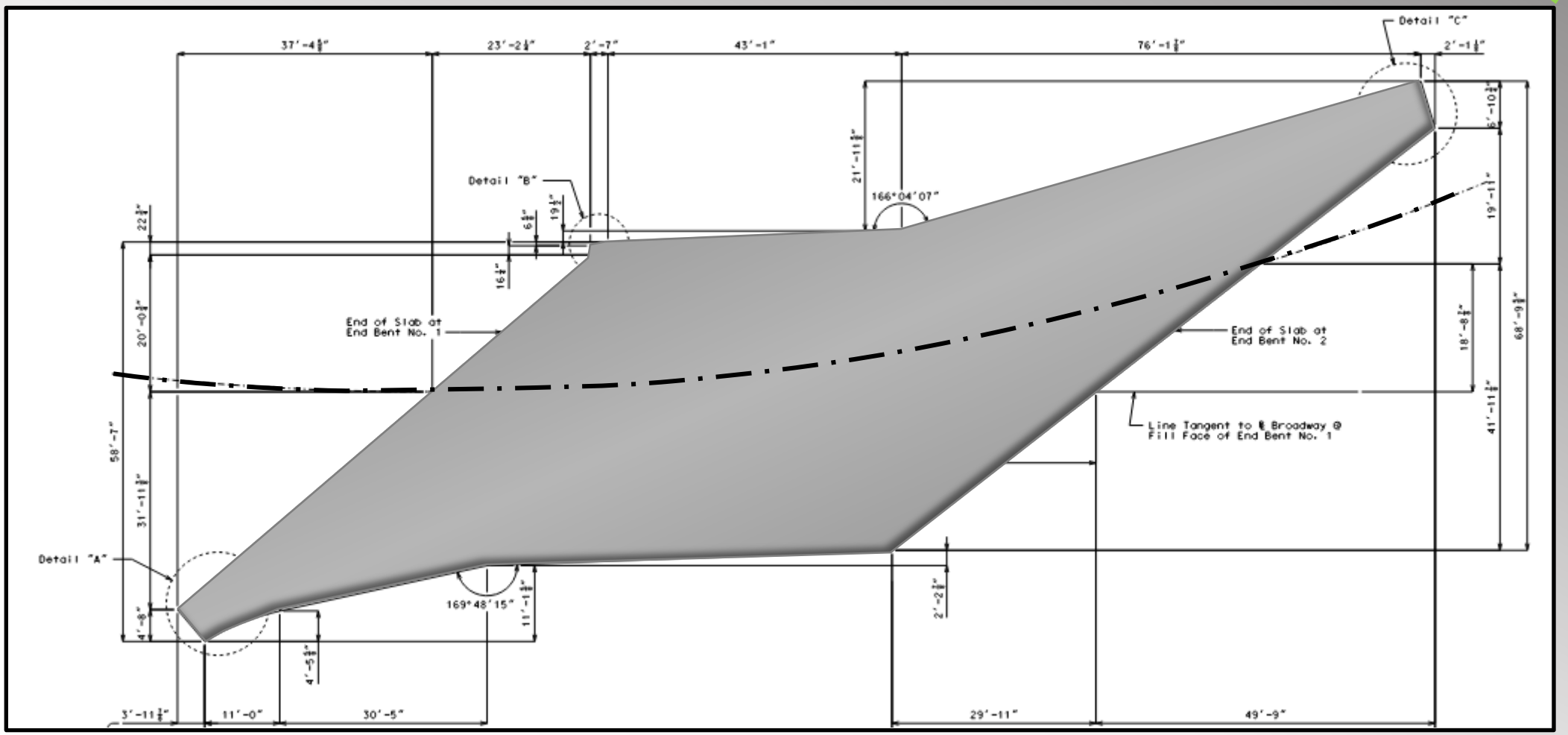
A9019 – SLAB



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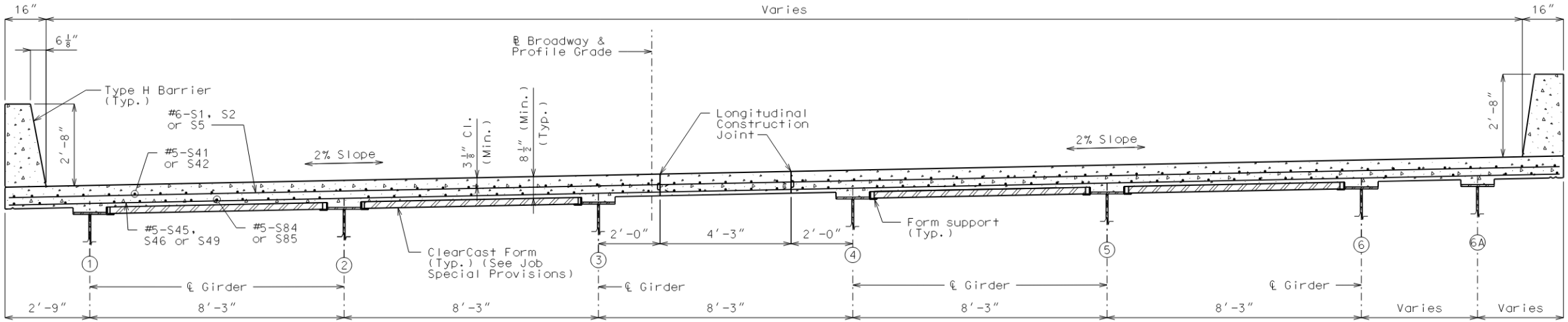
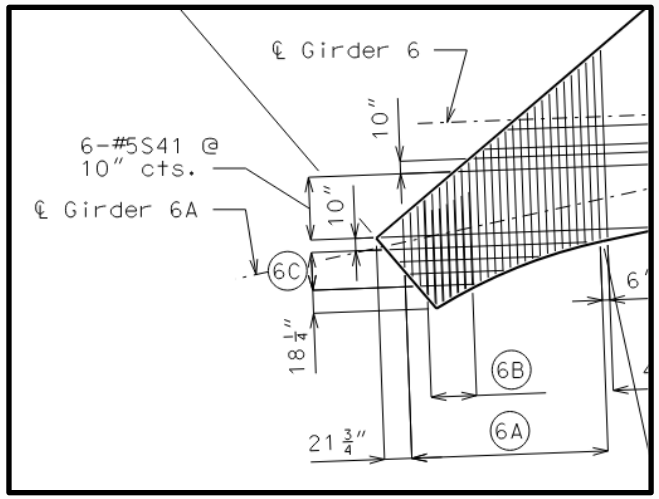
A9019 – SLAB



SECTION A–A NEAR END BENT NO. 1

Note:



(6A) 27-#6 (S9 thru S35) @ 6″ cts.

(6B) 7-#6-S36 (Bundled with S12-S18 bars)

(6C) 4-#5 (S37-S40) @ 10″ cts.

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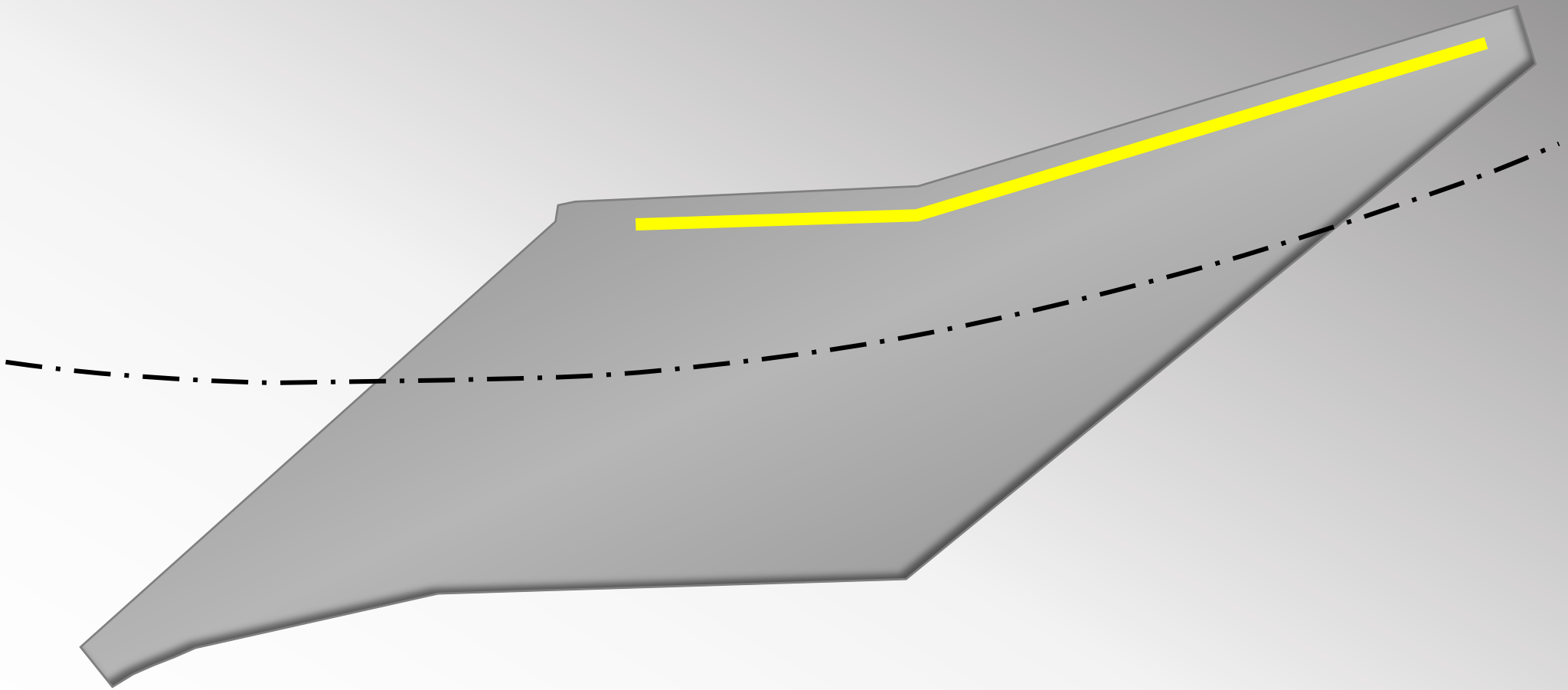
A9019 – Drainage System



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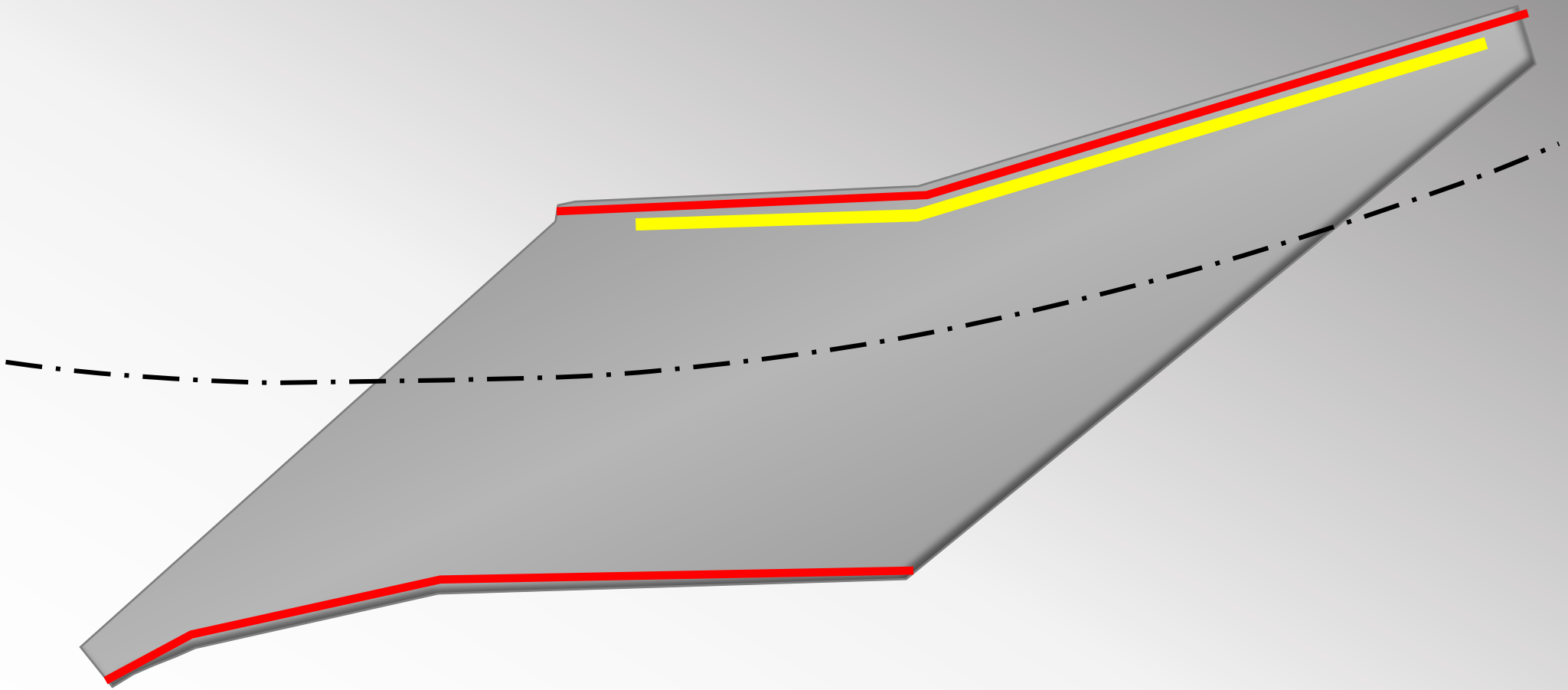
A9019 – CONDUIT



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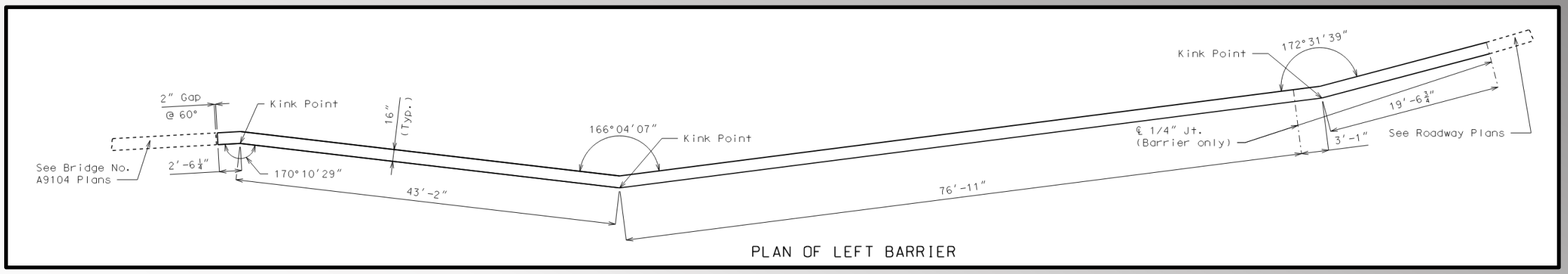
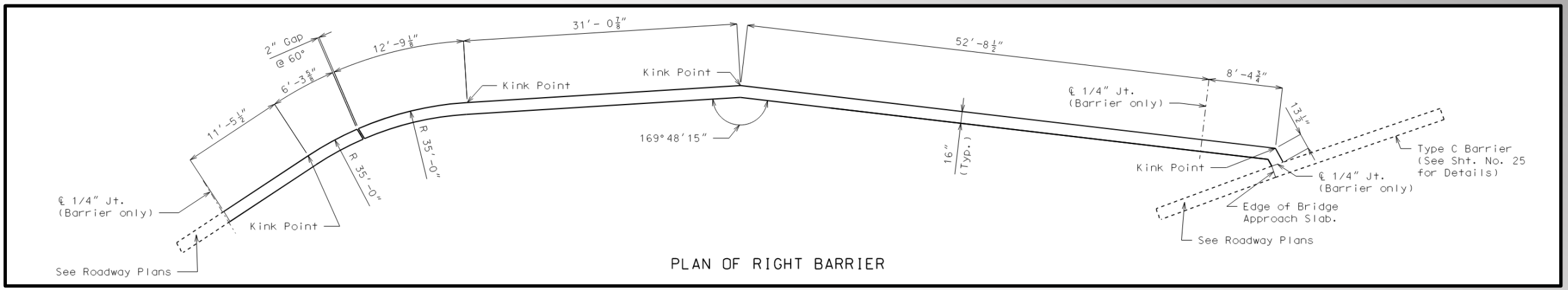
A9019 – BARRIER



PLAN OF LEFT BARRIER



PLAN OF RIGHT BARRIER

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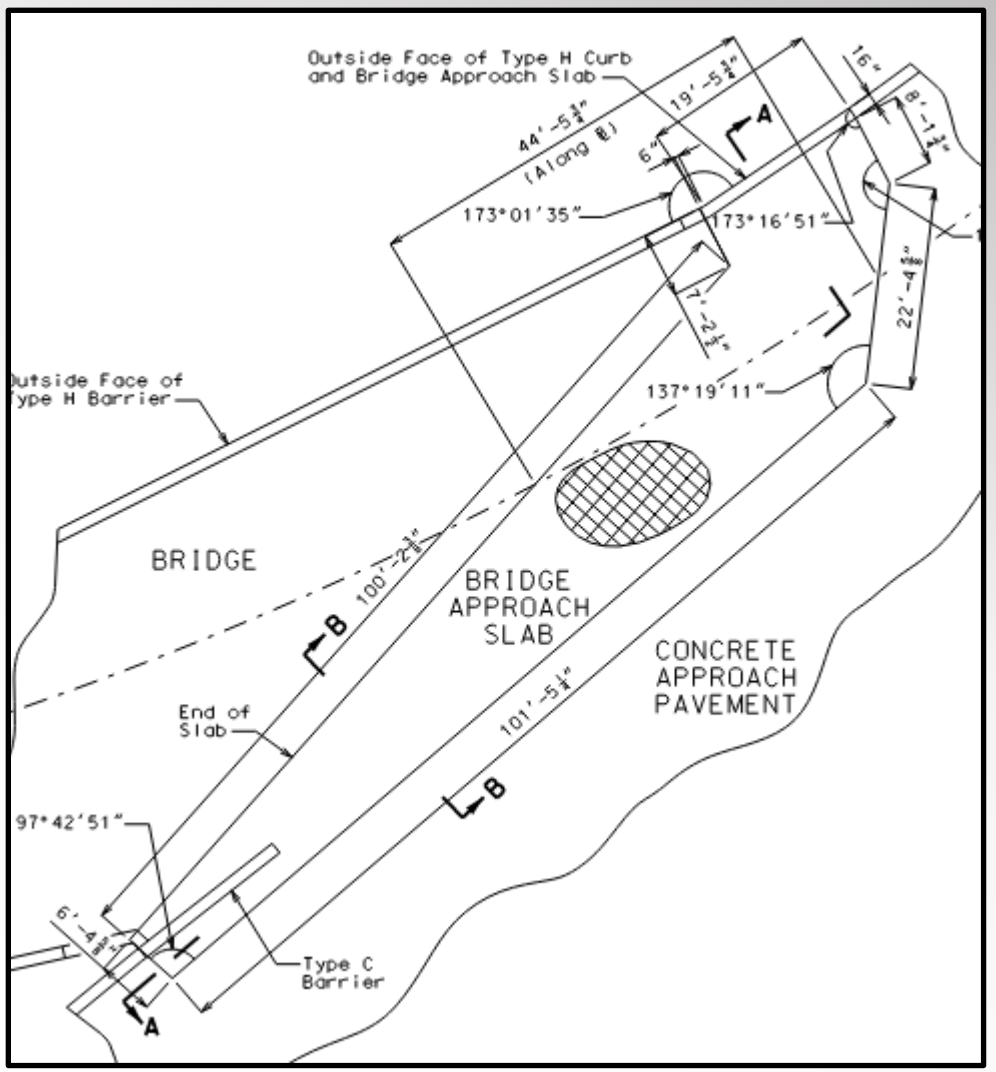
A9019 – Bridge Approach Slab



- Bent 2
- End Aligns with Ramp Pavement Joint
- Max 20’ span
- Reinforced edge beam

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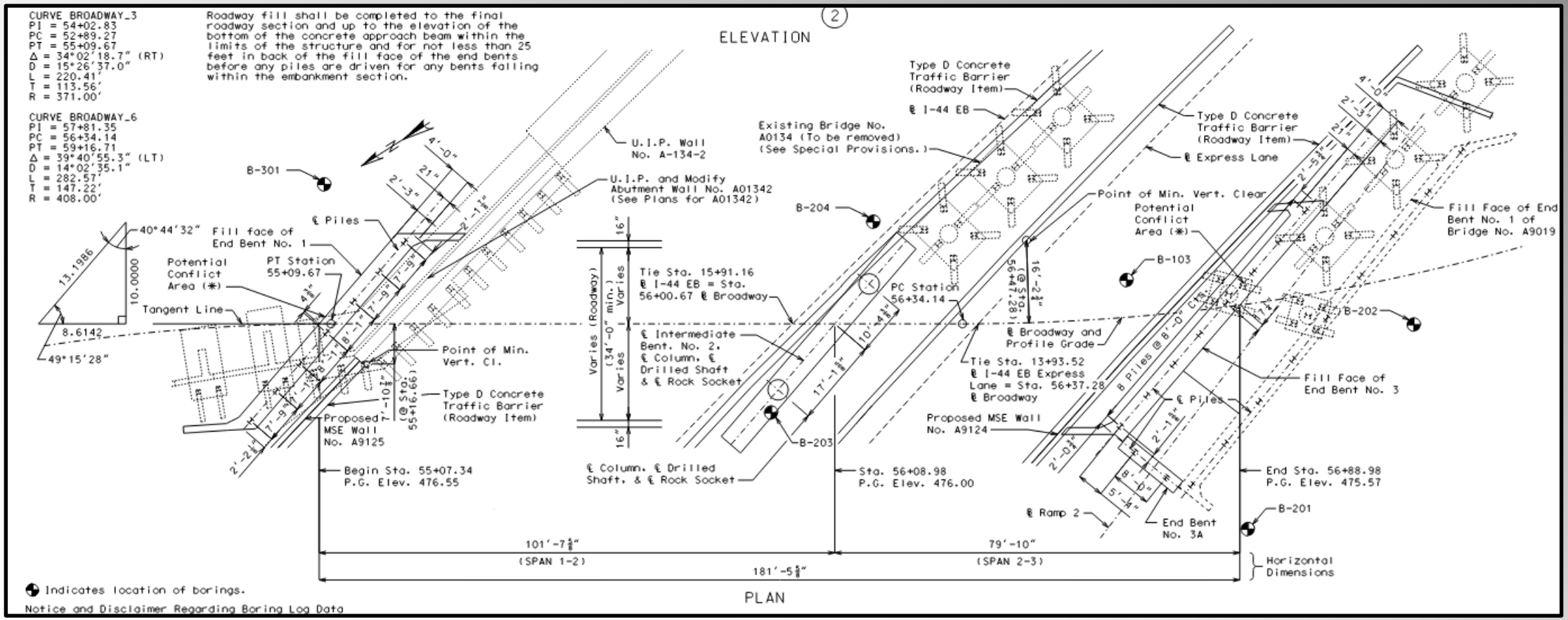

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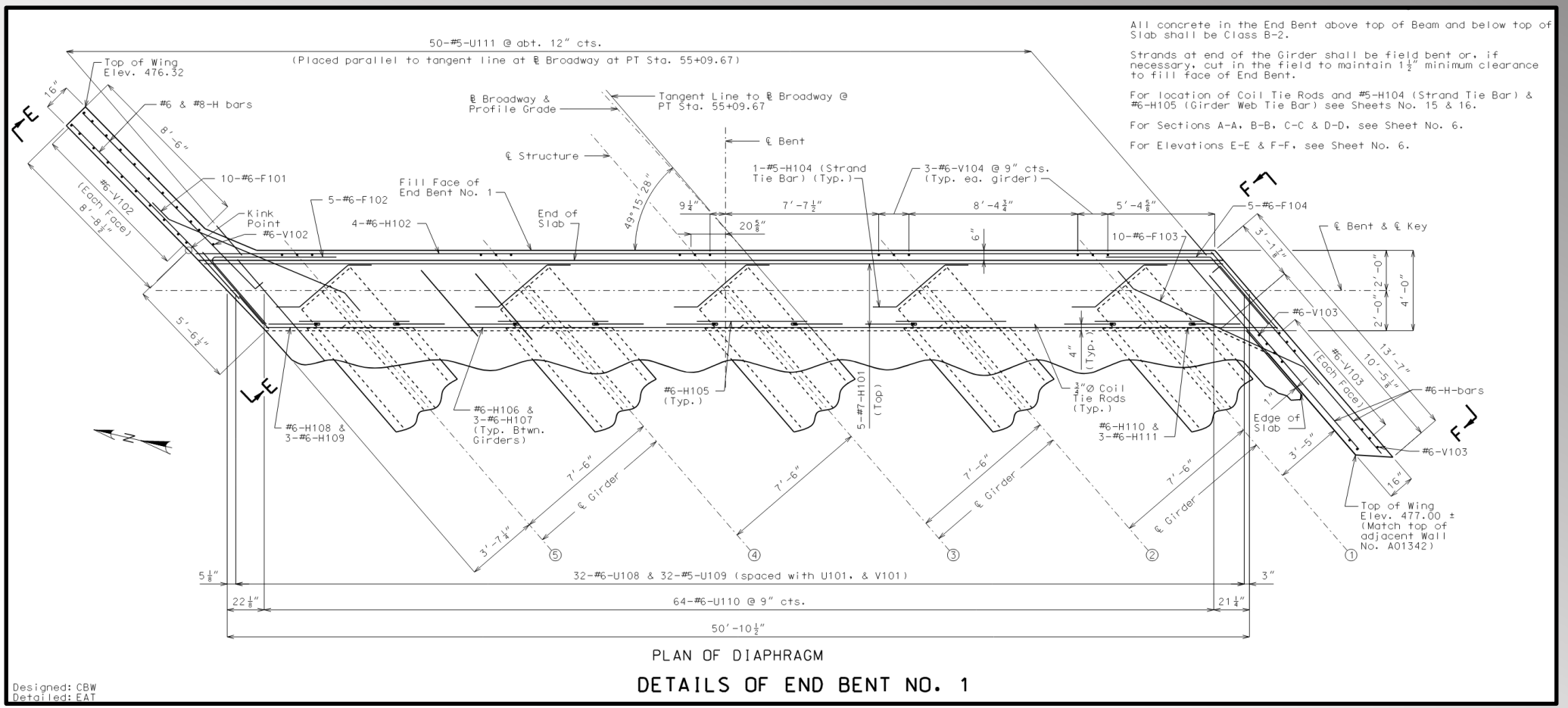
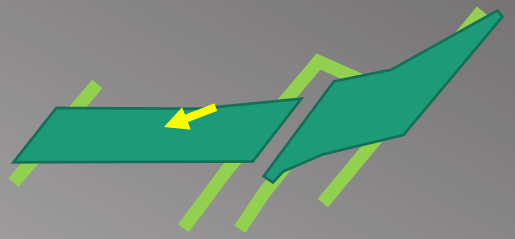
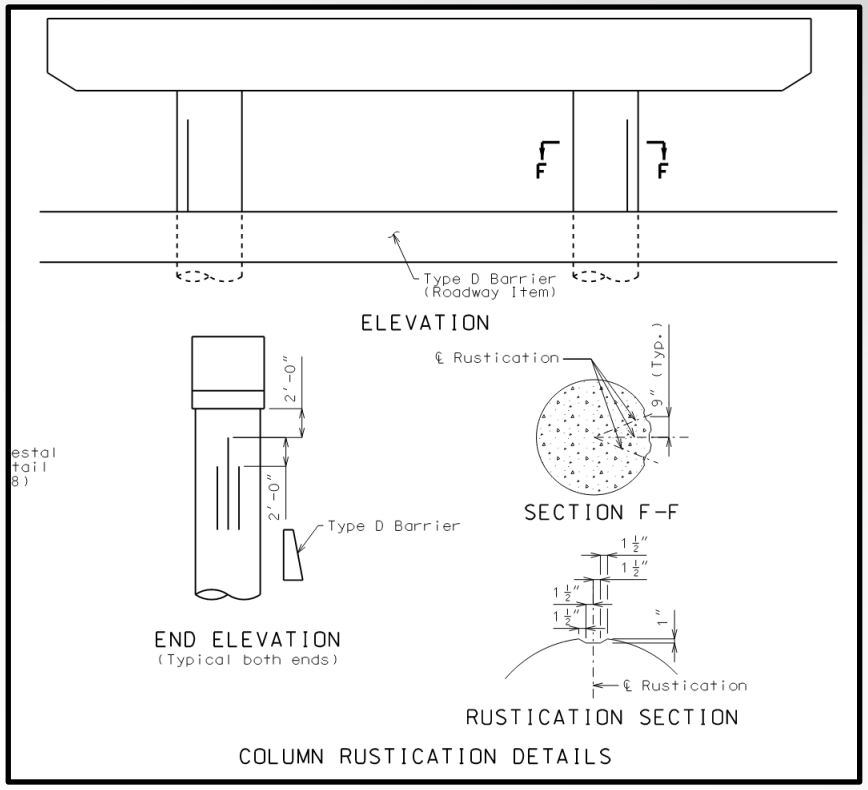
A9104 – Bent 1


All concrete in the End Bent above top of Beam and below top of Slab shall be Class B-2.
Strands at end of the Girder shall be field bent or, if necessary, cut in the field to maintain 1½" minimum clearance to fill face of End Bent.
For location of Coil Tie Rods and #5-H104 (Strand Tie Bar) & #6-H105 (Girder Web Tie Bar) see Sheets No. 15 & 16.
For Sections A-A, B-B, C-C & D-D, see Sheet No. 6.
For Elevations E-E & F-F, see Sheet No. 6.
50-#5-U111 @ abt. 12" cts.
(Placed parallel to tangent line at ℄ Broadway at PT Sta. 55+09.67)
Top of Wing Elev. 476.32
#6 & #8-H bars
℄ Broadway & Profile Grade
Tangent Line to ℄ Broadway @ PT Sta. 55+09.67
℄ Bent
℄ Structure
1-#5-H104 (Strand Tie Bar) (Typ.)
3-#6-V104 @ 9" cts. (Typ. ea. girder)
10-#6-F101
5-#6-F102
Fill Face of End Bent No. 1
End of Slab
Kink Point
#6-V102
4-#6-H102
#6-V102 (Each Face)
10-#6-F103
5-#6-F104
℄ Bent & ℄ Key
#6-V103
#6-V103 (Each Face)
#6-H-bars
#6-H106 & 3-#6-H107 (Typ. Btwn. Girders)
#6-H108 & 3-#6-H109
#6-H105 (Typ.)
5-#7-H101 (Top)
¾"Ø Coil Tie Rods (Typ.)
#6-H110 & 3-#6-H111
Edge of Slab
℄ Girder
Top of Wing Elev. 477.00 ± (Match top of adjacent Wall No. A01342)
32-#6-U108 & 32-#5-U109 (spaced with U101. & V101)
64-#6-U110 @ 9" cts.
50'-10½"
PLAN OF DIAPHRAGM
DETAILS OF END BENT NO. 1
Designed: CBW
Detailed: EAT

A9104 – Bent 2





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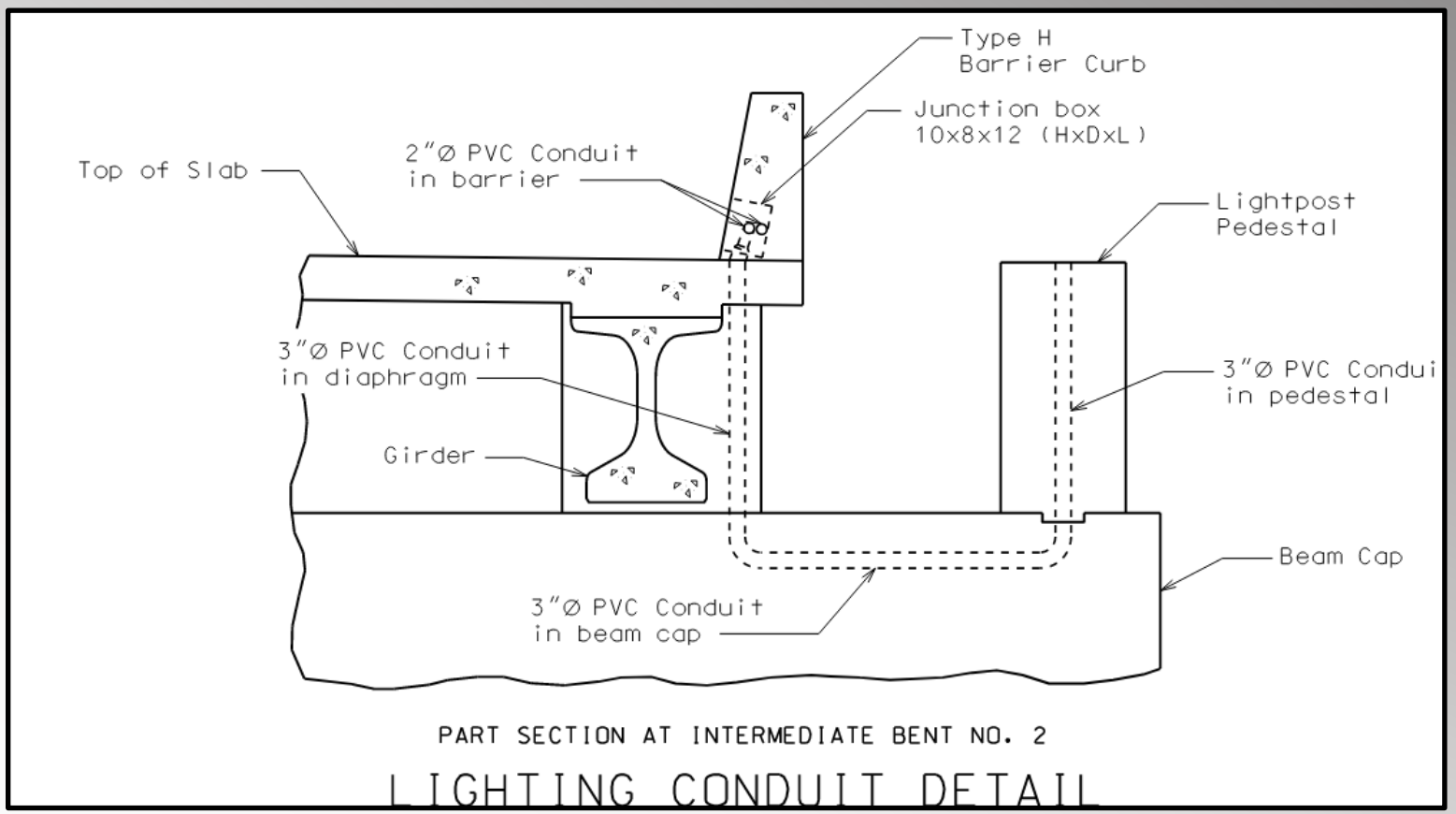
A9104 – Bent 2



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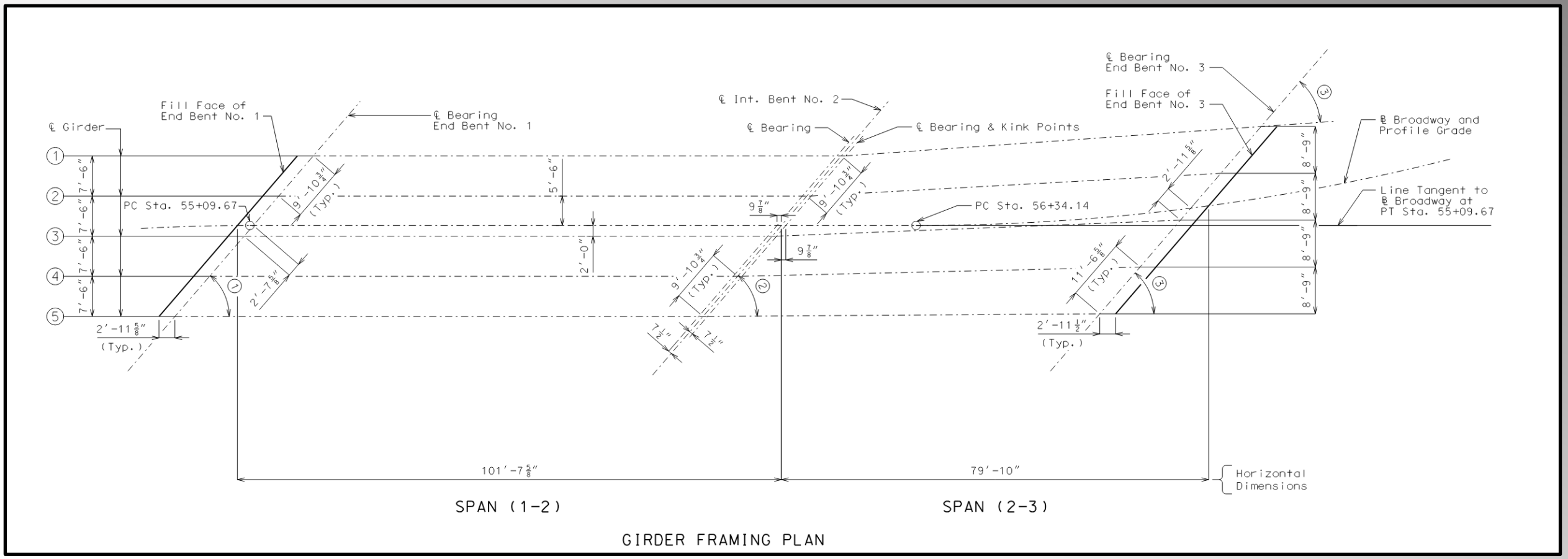
A9104 – Girder Framing



GIRDER FRAMING PLAN

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A9104 – GIRDERS

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A9104 – Girders at Bent 2

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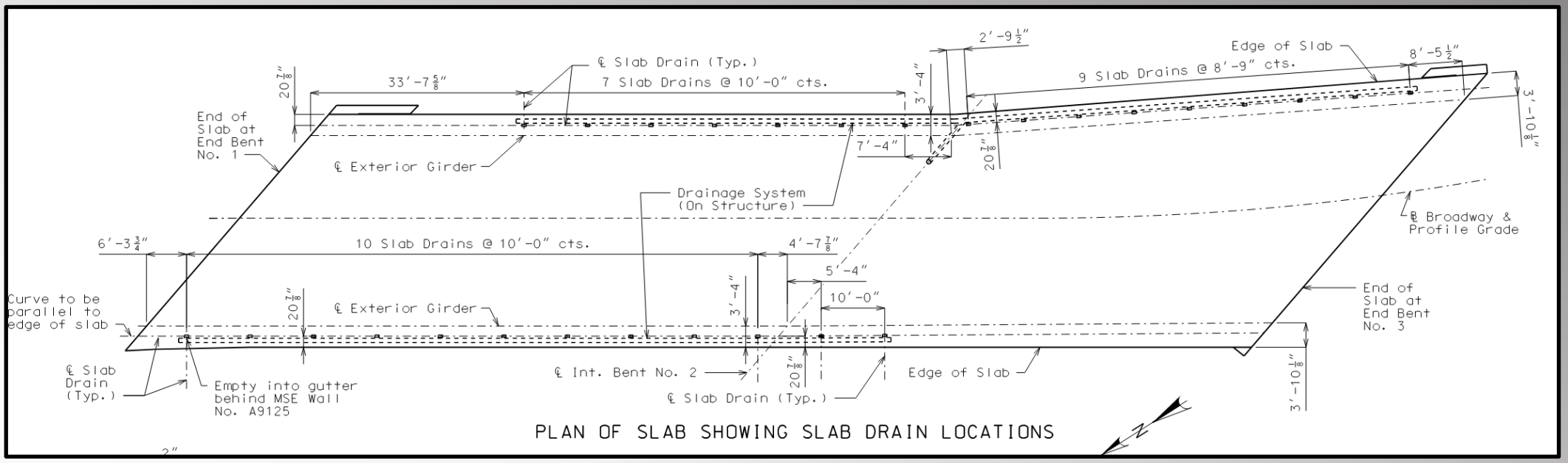
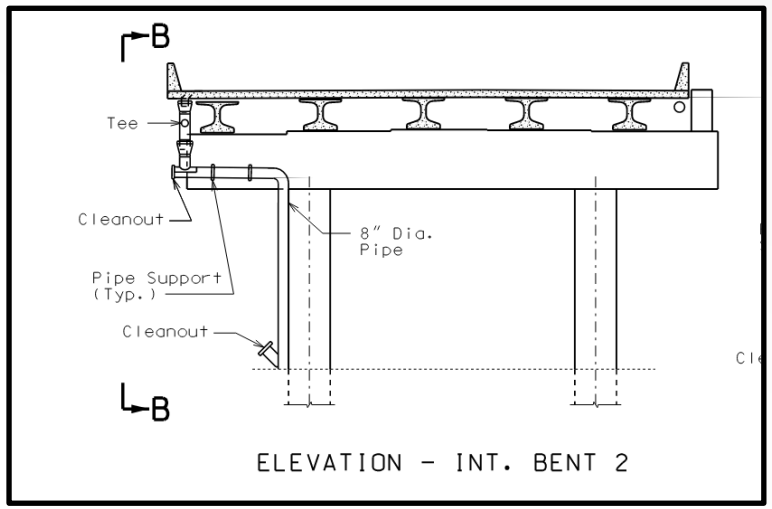
A9104 – Slab Drainage System





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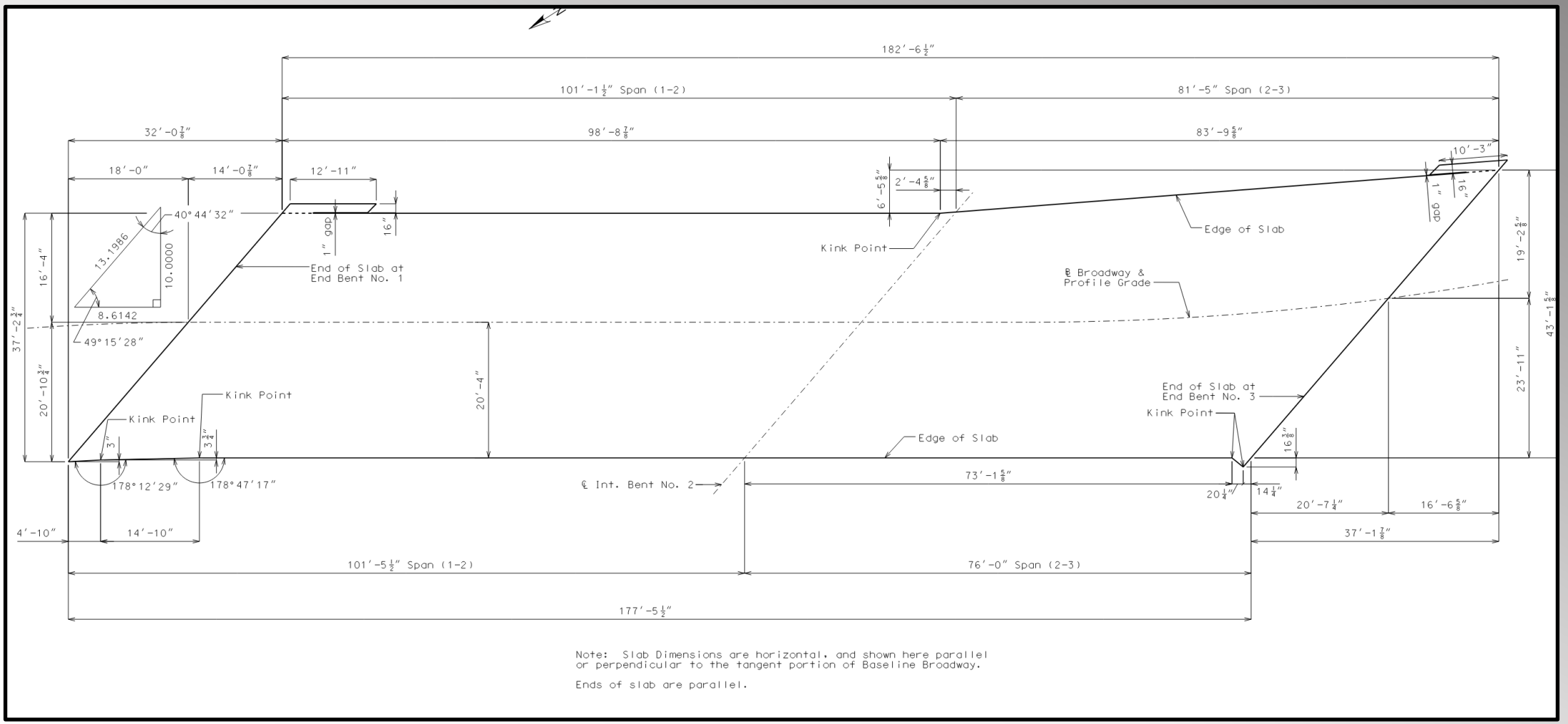
A9104 – SLAB



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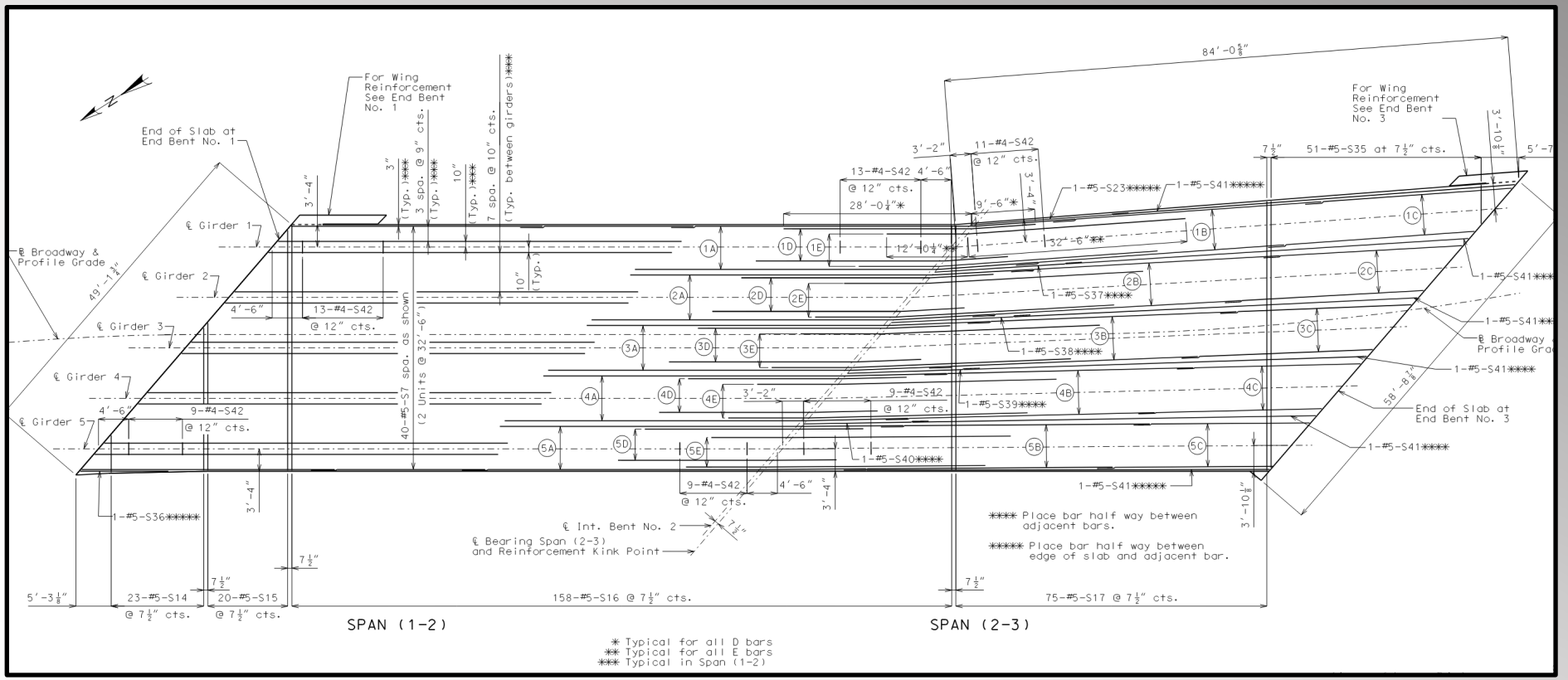
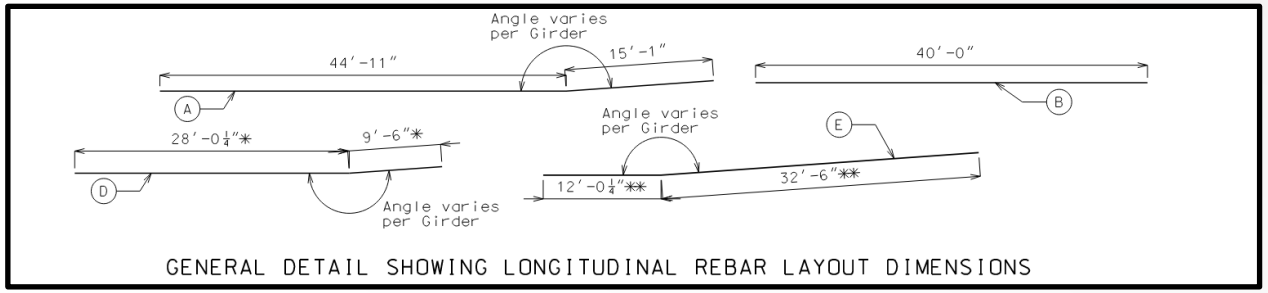
A9104 – SLAB





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A9104 – ClearCast Forms

- Proprietary
  - TrueTech Bridge
- See defects in pour
- Aids inspection
- Slight cost increase

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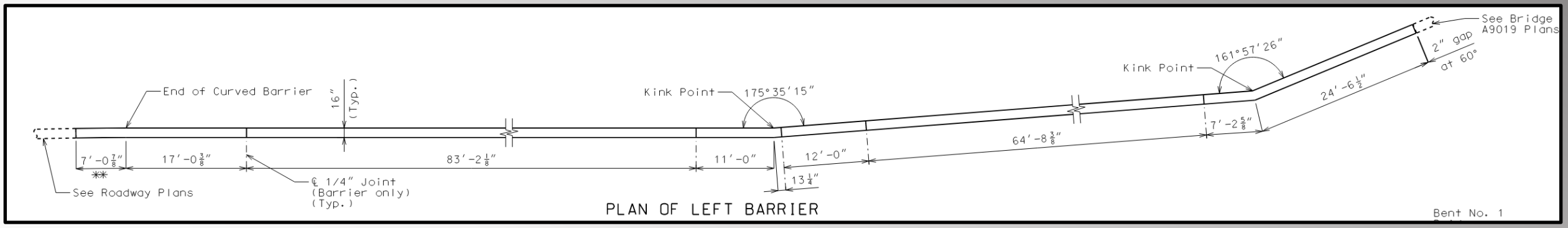
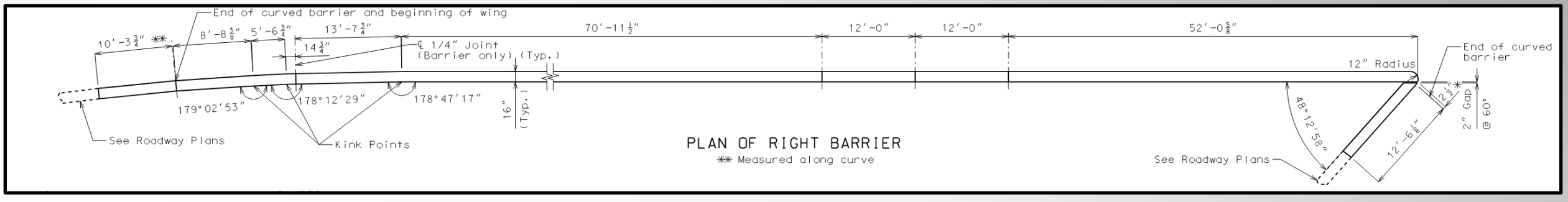
A9104 – BARRIER





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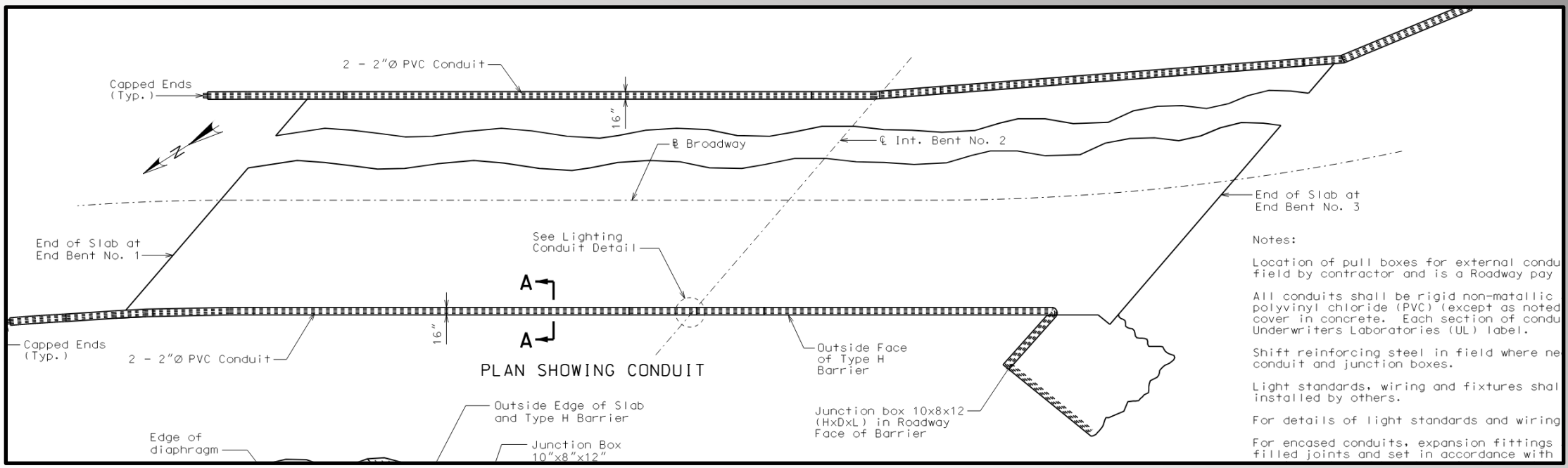
A9104 – CONDUIT



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Between the Bridges

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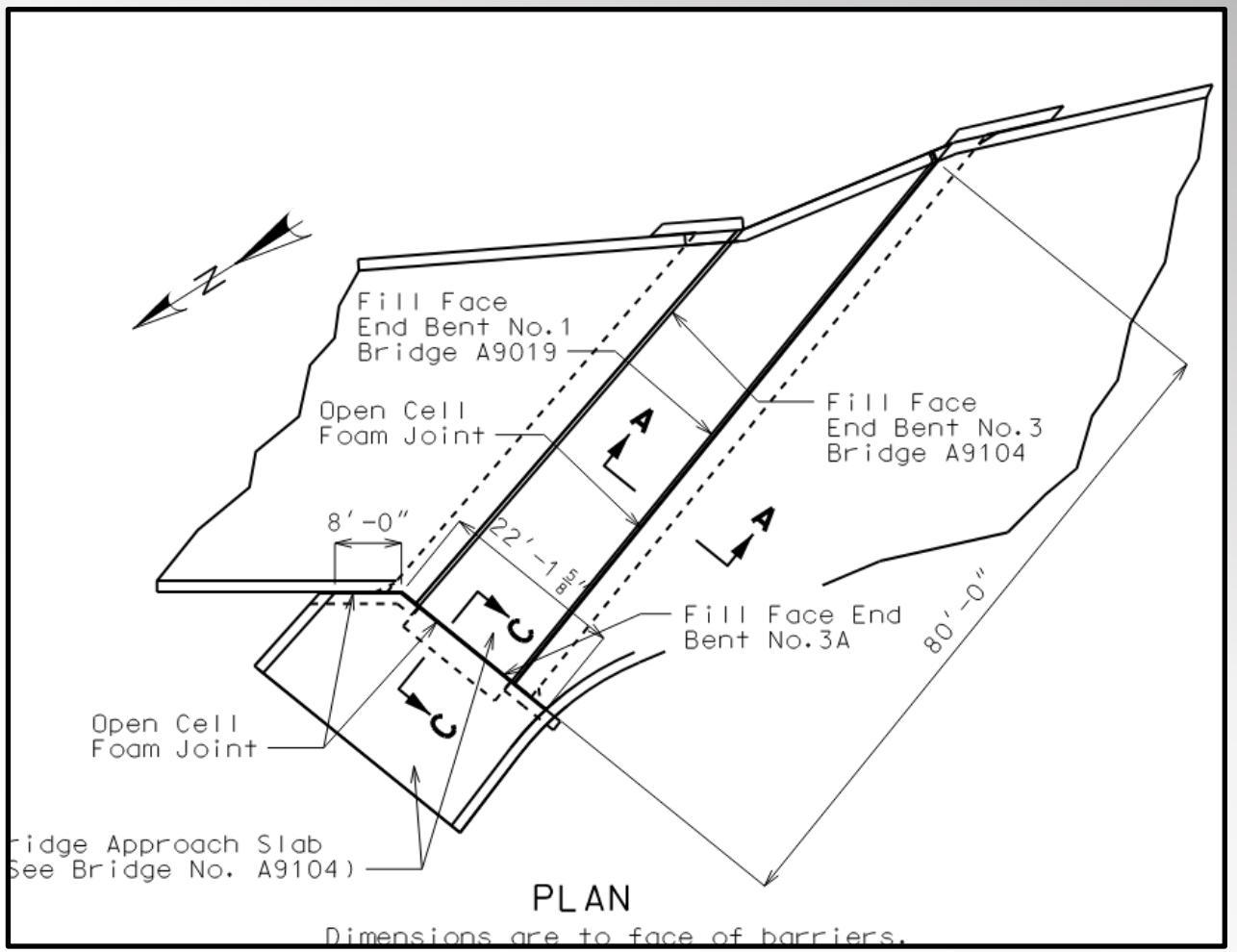
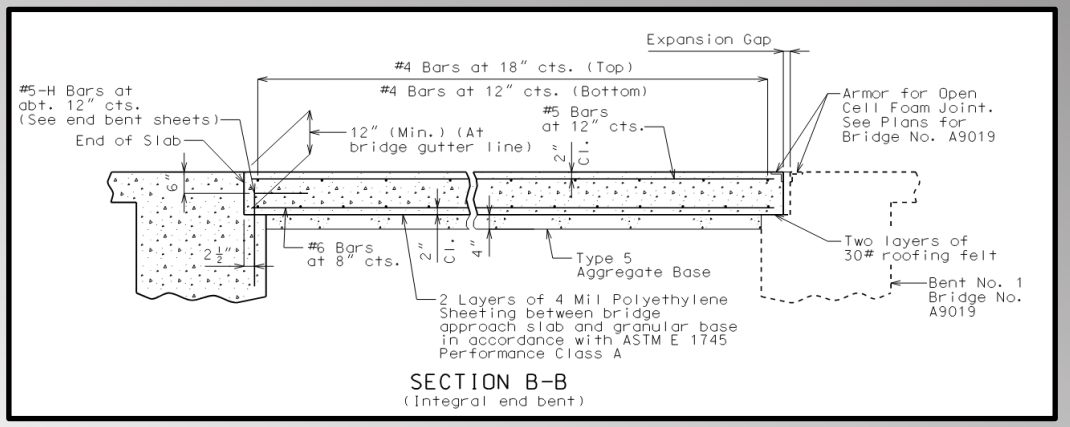
Between the Bridges





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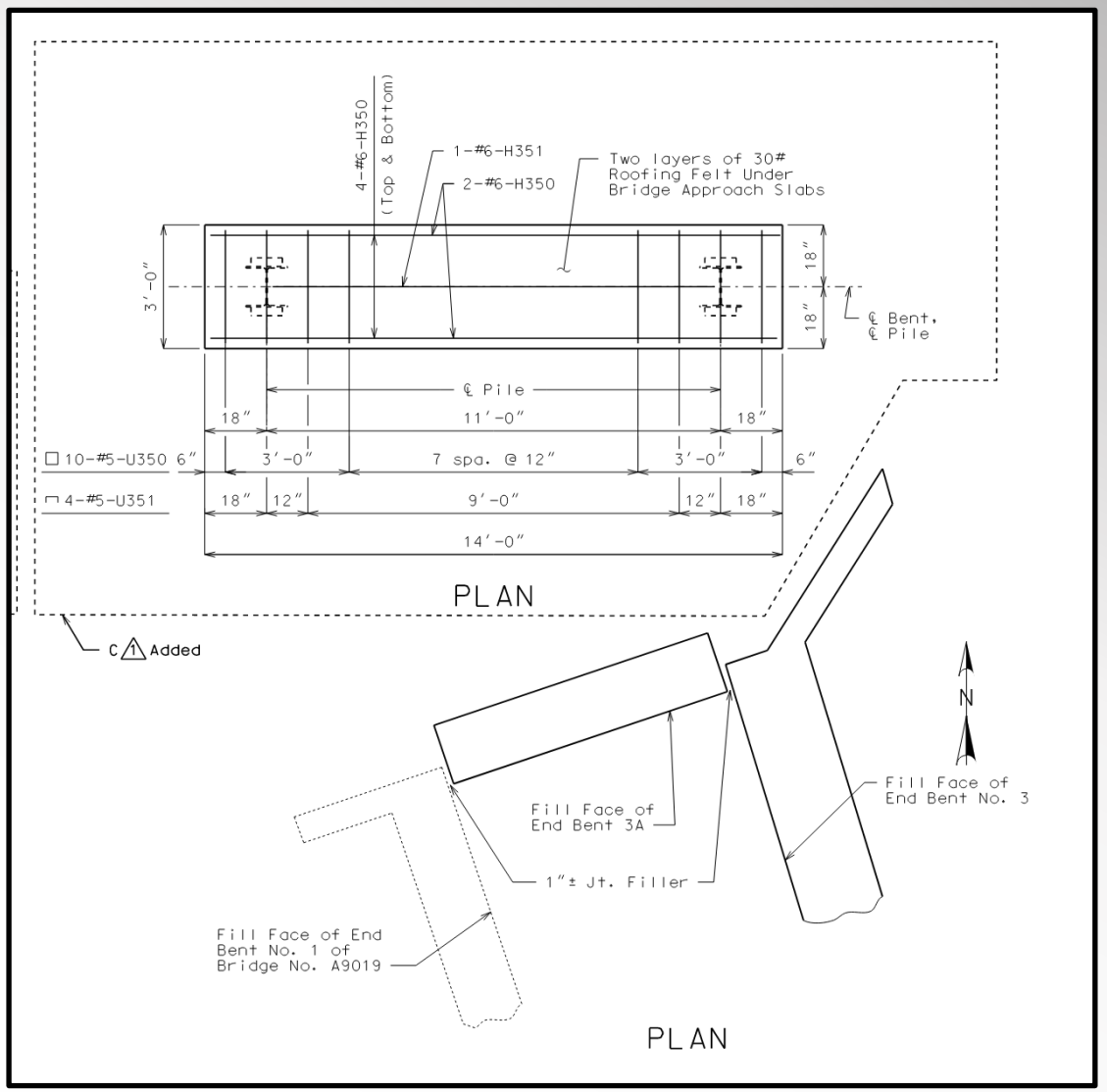
Between the Bridges



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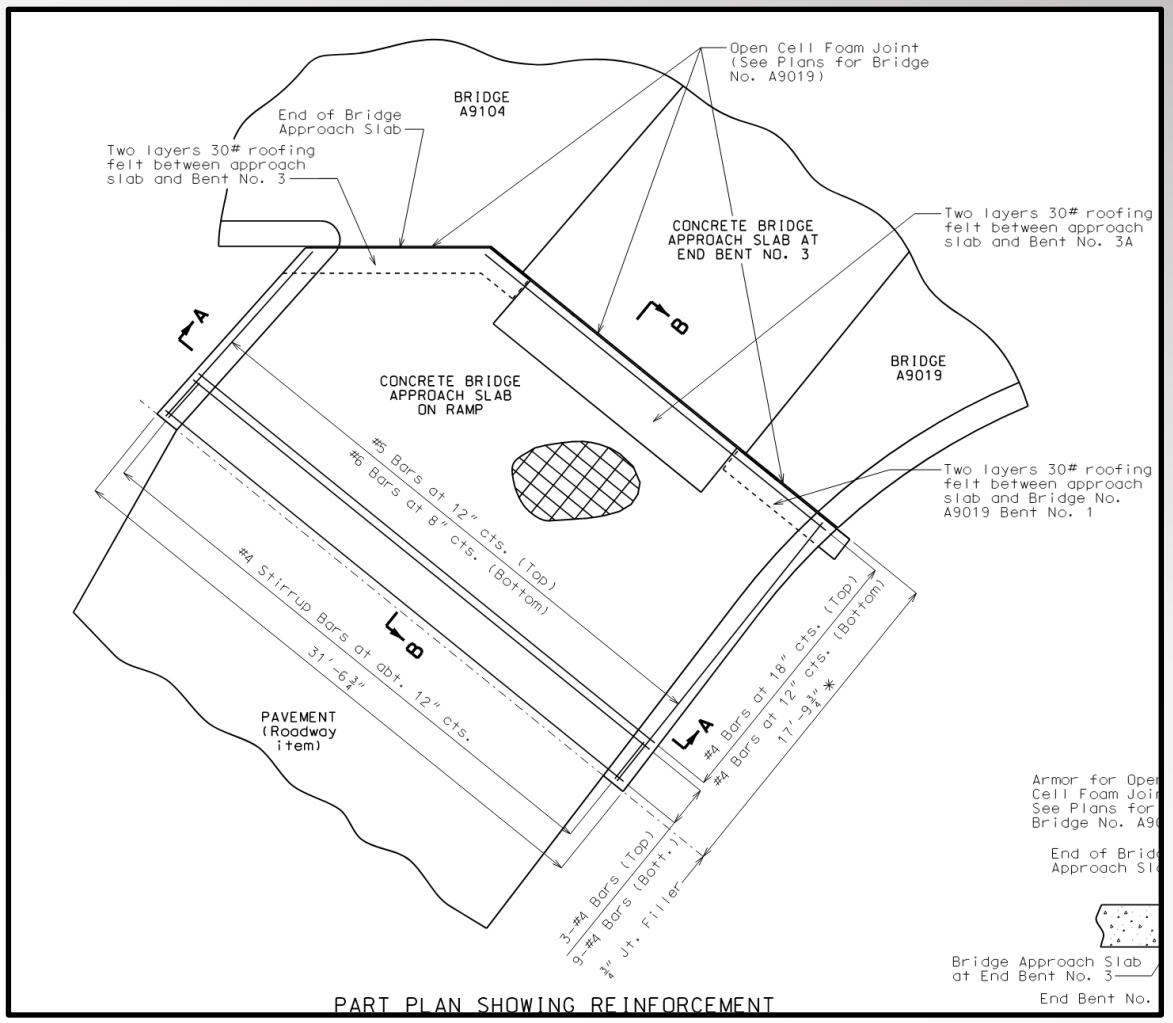
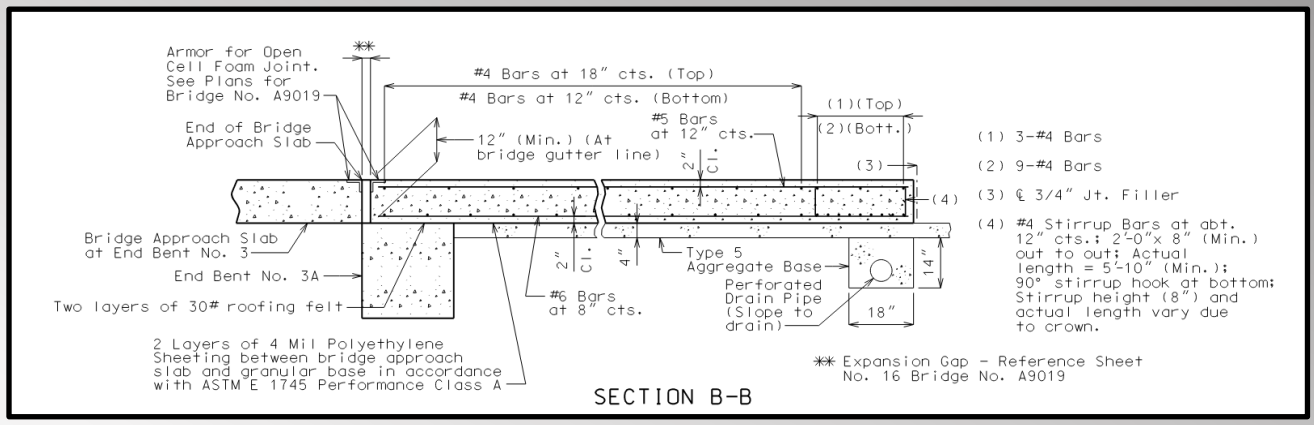
Between the Bridges



PART PLAN SHOWING REINFORCEMENT



SECTION B-B

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Traffic and Roadway

- Traffic Volumes
- Horizontal and Vertical Alignments
- Drainage & Utilities
- Signal Design
- Modified Rock Base / Ground Improvements
- Maintenance of Traffic

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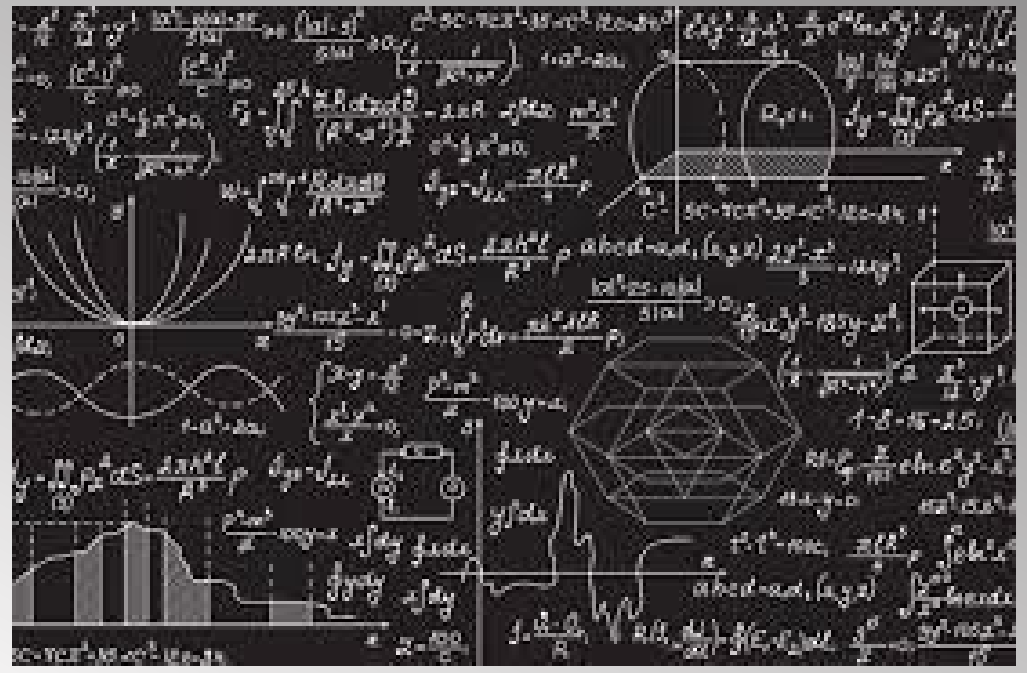
Roadway and Traffic

- Traffic Volumes
  - What Traffic???
  - Intersection Control
  - One Lane vs. Two Lane Bridge
    - Or No Bridge



How to Determine Baseline Traffic Volumes during COVID-19

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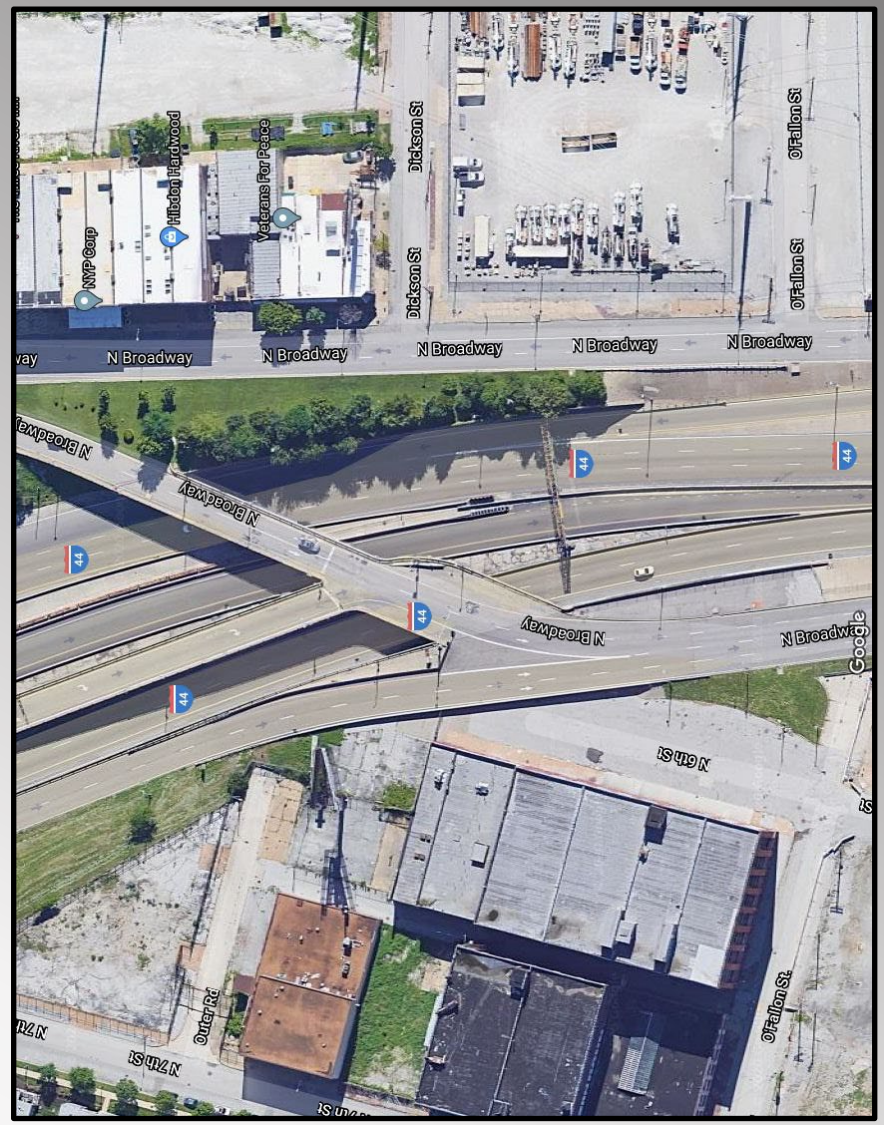
Roadway and Traffic

- Horizontal and Vertical Alignments
  - Try to achieve 16’-6” vertical clearance
  - Also wanted to improve intersection sight distance at Expresslanes Ramp



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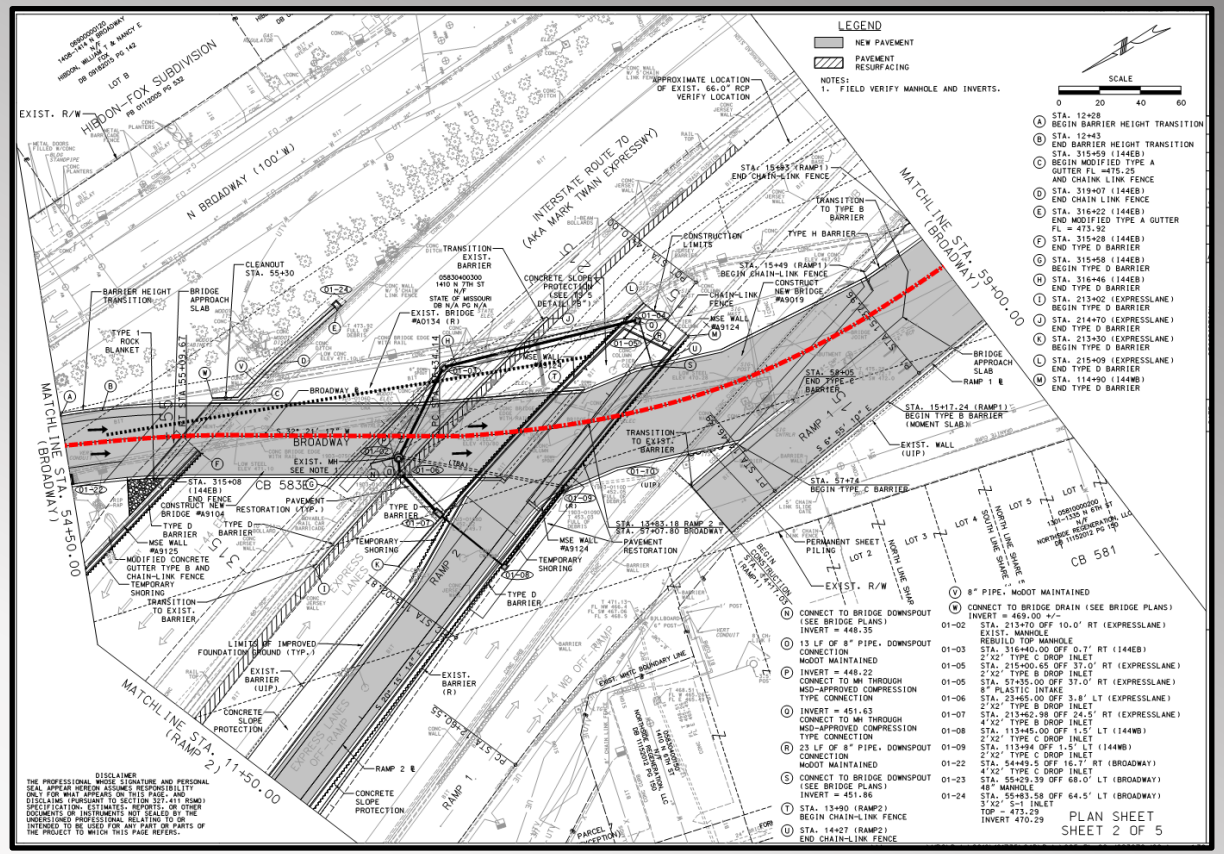

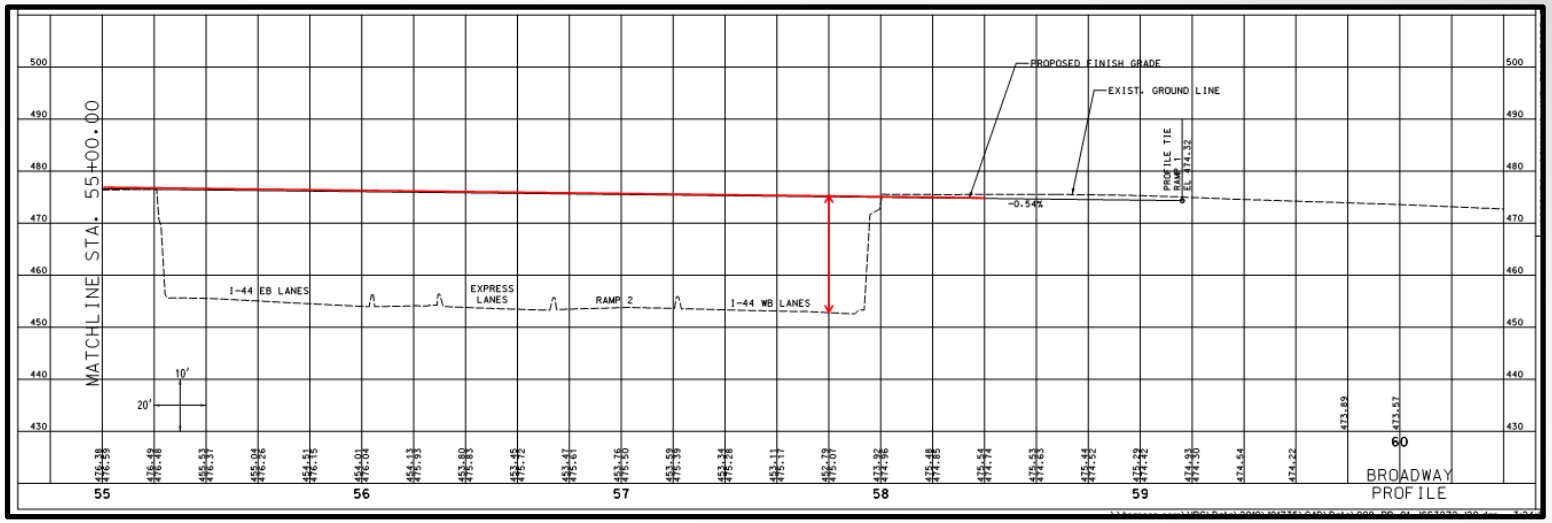

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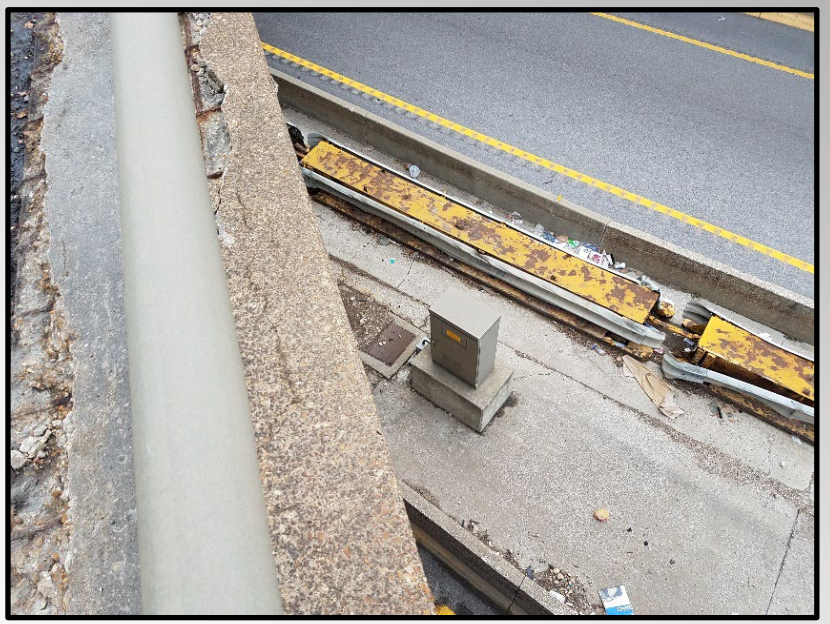
Roadway and Traffic

- Drainage and Utilities
  - Limited Greenspace on Project
  - Case of the Missing Drainage Manhole



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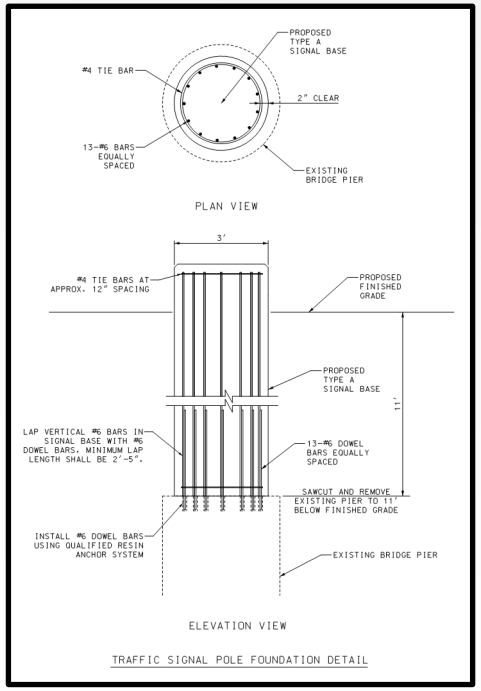
ROADWAY AND TRAFFIC

- Signal Design
  - Utilize Existing Bridge Pier



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ROADWAY AND TRAFFIC

- Modified Rock Base / Ground Improvements
  - MSE Walls for Expresslanes Ramp

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Roadway and Traffic

- Maintenance of Traffic (MOT)
  - Close Expresslanes and Restrict WB I-44 to One Lane with Detour
    - Nope
  - Keep Expresslanes Open with Truck Restrictions and Restrict WB I-44 to One Lane
    - Included in Construction Documents
  - Close Expresslanes, Move Existing Barrier, Two WB I-44 Lanes
    - Contractor Plan

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QUESTIONS?

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