

Colorado Department of Transportation Staff Bridge Bridge Detail Manual	Chapter: 17 Effective: June 30, 2024 Supersedes: February 10, 2023
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Inspection Sketches

17.1 Purpose

The purpose of this drawing is to provide structure information (plan, section, elevation) for field use by inspectors to validate the Specifications for the National Bridge Inventory (SNBI) / National Bridge Inspection Standards (NBIS), Structure Inventory and Appraisal (SI&A) items, and element quantities. In addition, the inspection sketch linework models should be set up in order to be used to maintain linework for the structure for future repair and overlay work. Typically, inspectors will take a hard copy of the sketch to indicate any changes, damage areas, additional field notes, etc. The purpose of this chapter is to establish uniform procedure for presenting information on inspection sketches.

17.2 Responsibility

This sketch/drawing should be prepared and checked after all the structure plans are final and shall be submitted for archiving with the final plans. Since this is a working document, the pdf need not be ISO compliant.

As-built information, as well as subsequent repairs and maintenance will need to be reflected in this inspection sketch. For metal arch and precast arch culverts the inspection sketch shall be based on shop drawings and other as-built information. The Designer of the repairs is responsible for the updates to the inspection sketches.

The graphic presentation of information on this drawing shall be the responsibility of the individual preparing the drawing.

17.3 Requirements

Separate inspection sketches/drawings are required for all major structures (i.e. bridge, culvert), all minor structures and for tunnels. They shall be delivered in both the original CAD and pdf format.

Major modifications during construction that affect the structure's dimensions, add additional inspection elements, or lane changes that revise vertical clearances shall require an updated inspection sketch prior to project closeout.

Structures shall be drawn true size and include the basic outline, bridge rail, curbs, edge of deck, sidewalks, approach slabs, and medians.

The CAD file name shall be the structure number with descriptor (e.g., F-16-XQ Sketch.dgn). This file should have a minimum of 2 models, one for the bridge linework and one for the border. Include any other linework models that are available for roadway, utilities, ROW, and survey information that would show in a general layout type of drawing. The other models in the file shall be referenced and scaled to fit the border. Additional models may be used for the typical section and profile if deemed necessary. The linework model shall either use the project coordinate system with associated geographic coordinate system (GCS) from the survey group or state plane system GCS (central, north, south) based on available aerial imagery. The CAD file shall not reference any external files. The model shall contain all available linework information for the bridge. Control lines, piles, centerlines, girder labels, construction lines, etc. are not shown in the sketch border sheet. Rolled girders shall utilize properly named cells, e.g. W11x24. Welded plate girders shall use rectangles for the plate members.

The structure shall be laid out with increasing mile point (MP) from left to right. This may be contrary to stationing or layout of the construction plans.

17.3.1 Size and Scale

The border model shall be 2D at a 1"=1' scale.

Maximum scale for referenced plan views shall be 1"= 50'. If the scale is too large, a larger border (8.5"x14") or multiple sheets may be necessary.

Typically, sketches should fit on an 8.5"x11" sheet with readable dimensions and text (size .07). Girder labels shall use .10" Text. Generally, the structures are shown with the Plan view on top, the Elevation below it and then the Section view on the bottom.

Very long structures, such as viaducts, shall be shown in segments with match lines and stacked on the same page along with the elevation view.

Dimensions shall be shown to the nearest inch.

The border around the sheet has a simple title block at the bottom (see examples included).

Borders for inspection sketches are available in MicroStation as cells: SHEET_InspectionSketch (8.5"x11") and SHEET_InspectionSketch-Long (8.5"x14").

17.3.2 Plan View

The Plan View for all structure types shall include:

- North Arrow
- Name of Waterway and approximate edges, and Direction-of-flow arrow

- Highways, paths and railroads that the bridge crosses
- Direction arrow for One-Directional traffic
- Skew angle (see Chapter 2 for definition) shown to the nearest second
- Width, span length, span number

The plan view is used to draw in deficiencies such as patches and damage.

Plan views for bridges over roads shall also include:

- X indicators at vertical clearance points
- Vertical clearance information table (mark minimum and maximum)

17.3.3 Elevation View

The Elevation View for all structure types should be shown at the same scale as the plan view. Vertical scale may be exaggerated.

The Elevation view shall include:

- The labeling of the substructure units (as per Chapter 1 Section 1.13 of this Manual)
- Front face to front face bridge length (NBIS bridge length)
- Back face to back face bridge length (total bridge length)
- Centerline of bearing to centerline of bearing length
- Maximum span length (if multiple, only one needs to be labeled)
- Minimum span length (if multiple, only one needs to be labeled)
- Existing grade line underneath the bridge
- Channel location
- Roads, highways, railroads, and other permanent features, including curbs and barrier
- Pier and Abutment foundations (piles and caissons may be displayed shortened with break lines, although the model shows the true length)
- Vertical dimension from bottom girder to bottom footing/piles
- Dimensions for minimum vertical and lateral underclearances for roadways underneath the bridge. The dimensions shall be left blank, to be completed by the Inspector in the field, since they can change after an overlay or road reconstruction. Vertical dimensions shall be shown at each lane line. Each lane line shall be labeled (YS – yellow stripe, WS – white stripe, ST – stripe, skip or solid). If insufficient space is available, a larger scale detail shall be added on another sheet
- Label of upper and lower nodes and typical panel length for truss bridges

Depict fracture critical members in red using DRAFT_Miscellaneous-Red level (Open Roads Designer (ORD)).

The vertical clearance is measured from the road surface to the lowest point of the structure crossing overhead.

The “underpass” horizontal clearance should be measured between the most restrictive features: concrete barriers, substructure unit, oncoming traffic lanes, toe of slope steeper than 1 to 3 (see SNBI for additional information). The purpose of the horizontal clearance measurement is to give the largest available clearance for the movement of wide loads.

Inspection sketches depict the CDOT numbering system relative to the direction of inventory of the highway; Abutment 1 would be at the lower mile point. Span 1 follows Abutment 1, Span 2 follows Pier 2, and so on.

17.3.4 Section View for Bridges

The Section view shall be drawn looking in the inventory direction (up MP). It denotes the full width of the bridge (typical section) and is used to show:

- Raised medians
- Restricted width
- The rail style and height, and curb height above bare deck
- Type of girder
- Girder spacing
- Girder label
- Vertical dimension between top of rail and bottom of girder
- Lanes and shoulders

Depict fracture critical members in red using DRAFT_Miscellaneous-Red level (ORD).

Do not show the pier cap or concrete diaphragm in section view.

17.4 Culvert Representation

In addition to the requirements of Section 17.3, the following information shall be shown:

17.4.1 Plan View for Culverts

- The out to out length along the culvert
- The length to the far edges of the culvert perpendicular to the roadway
- The skew angle
- If the culvert section is variable, section cuts may be added to clarify sections

17.4.2 Elevation View for Culverts

- Fill under all roadway pavements shall be dimensioned

The Elevation is a view of the culvert cut perpendicular to the roadway centerline (see section A Fig. 17.4-1).

17.4.3 Section View for Culverts

- The distance between inside faces of walls
- The interior cell dimensions

The Section view depicts the section perpendicular to the centerline of the culvert (see section B Fig. 17.4-1).

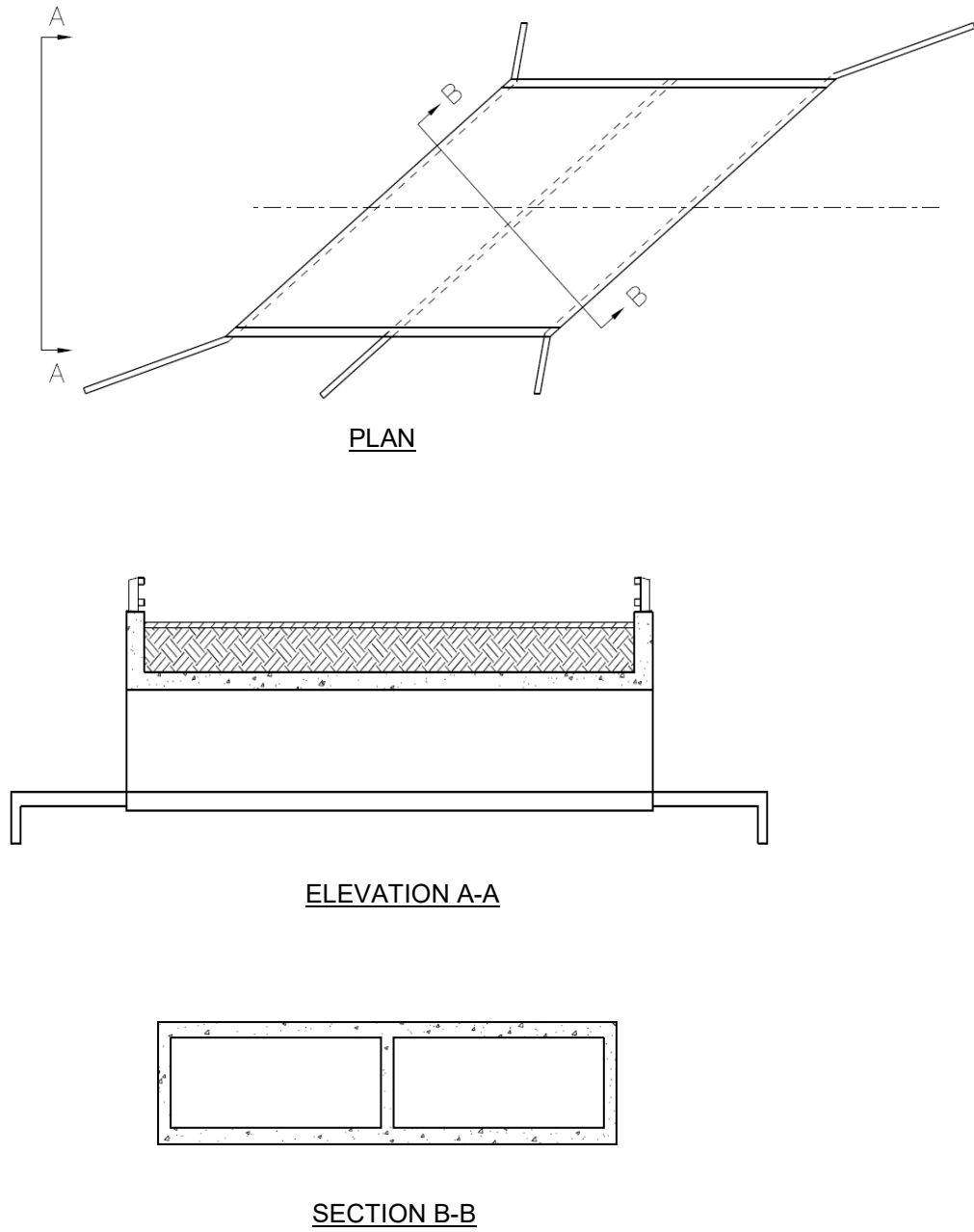


Fig. 17.4-1 Culvert Elevation and Section View

17.5 Tunnel Representation

In addition to the requirements of Section 17.3, the following information shall be shown:

17.5.1 Plan View for Tunnels

- Dimensions for the total length and blank dimensions for tunnel width, sidewalks, access ways and barrier

17.5.2 Elevation View for Tunnels

- The high point and/or direction of slope

17.5.3 Section View for Tunnels

- Ventilation areas, lighting, fire suppression items and barriers
- Additional sections may be required to depict changing tunnel information
- Vertical clearance dimensions shall be shown at each lane line, mark the minimum

17.6 Examples

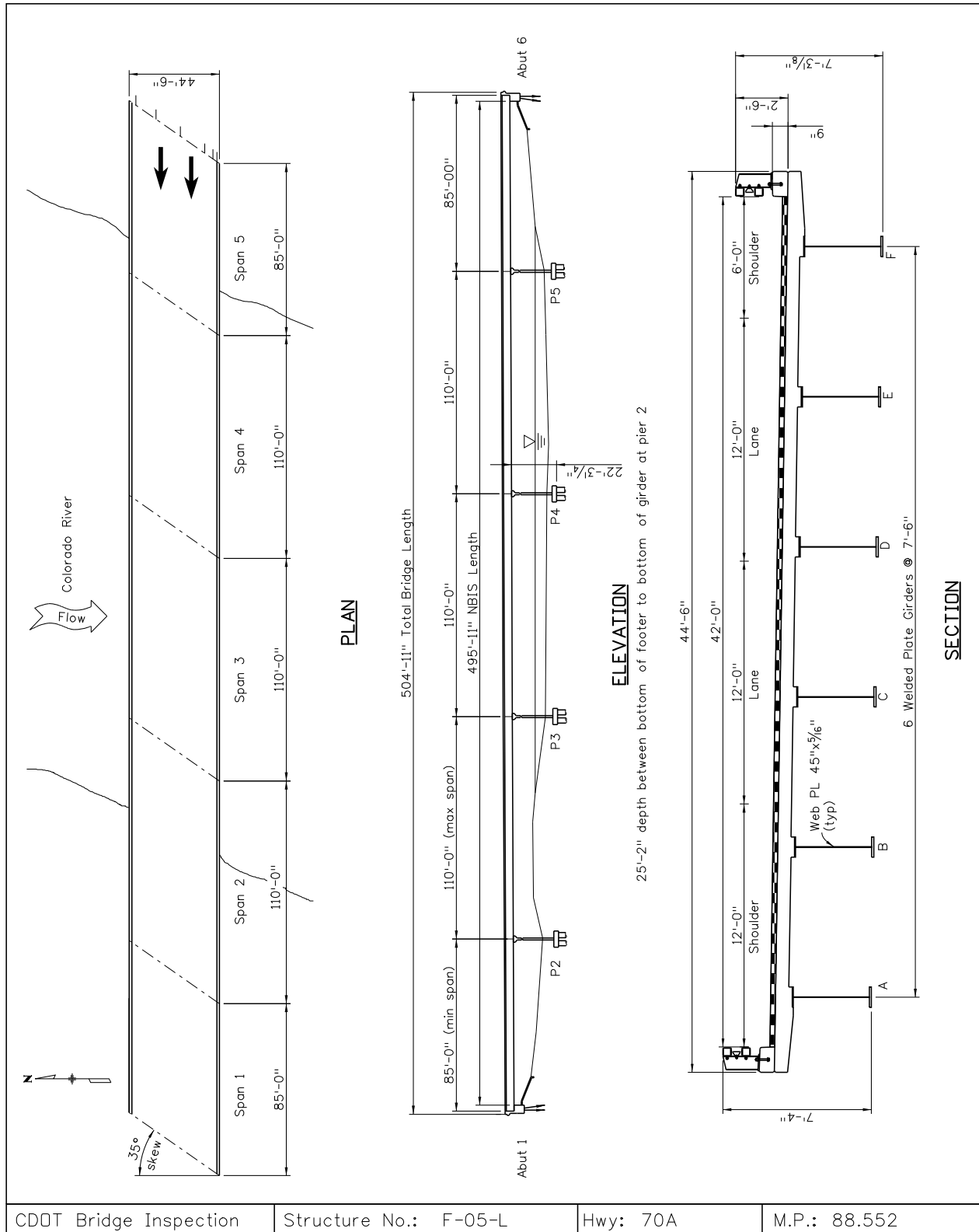
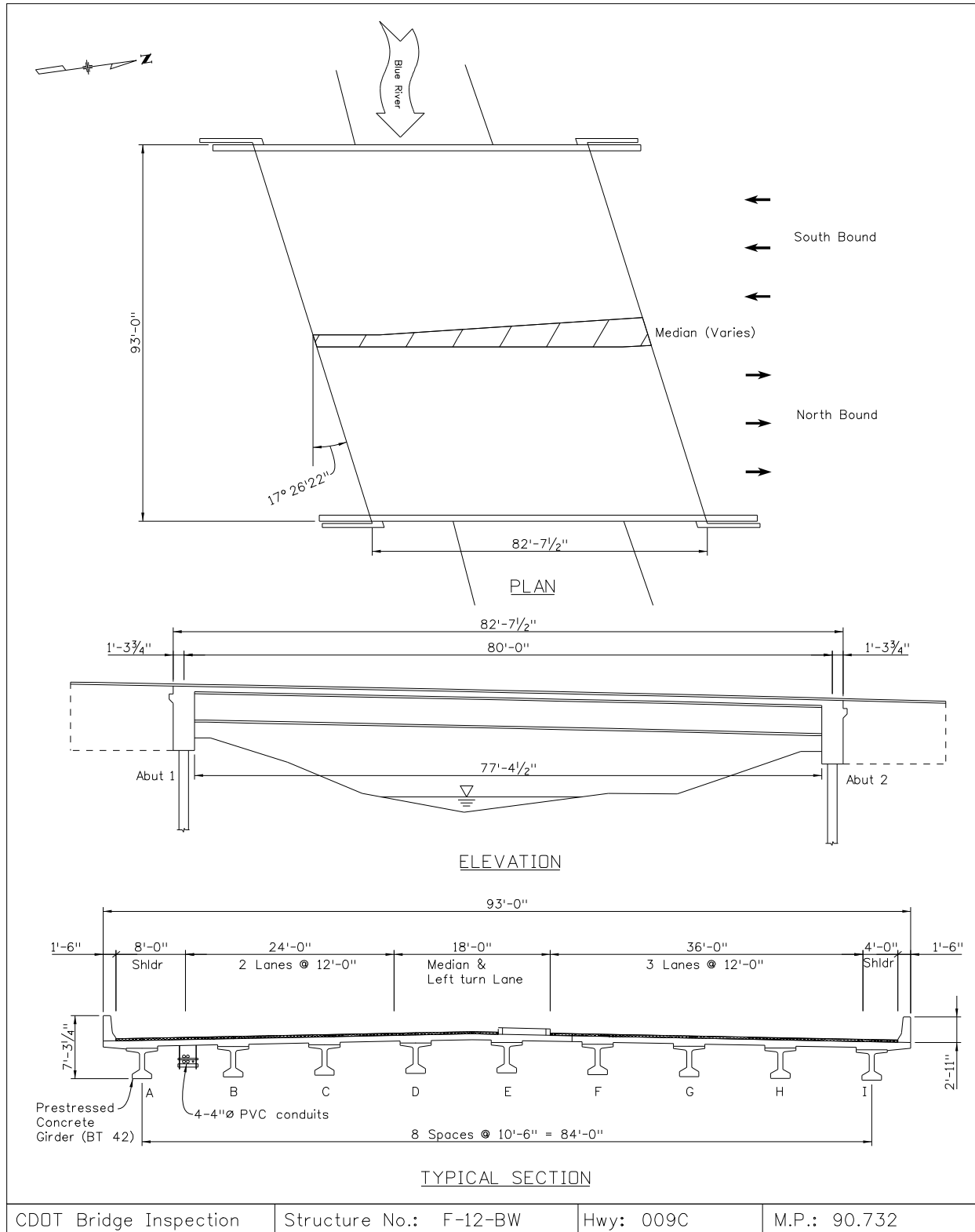


Fig. 17.6-1 Bridge Inspection Sketch – Example 1



CDOT Bridge Inspection

Structure No.: F-12-BW

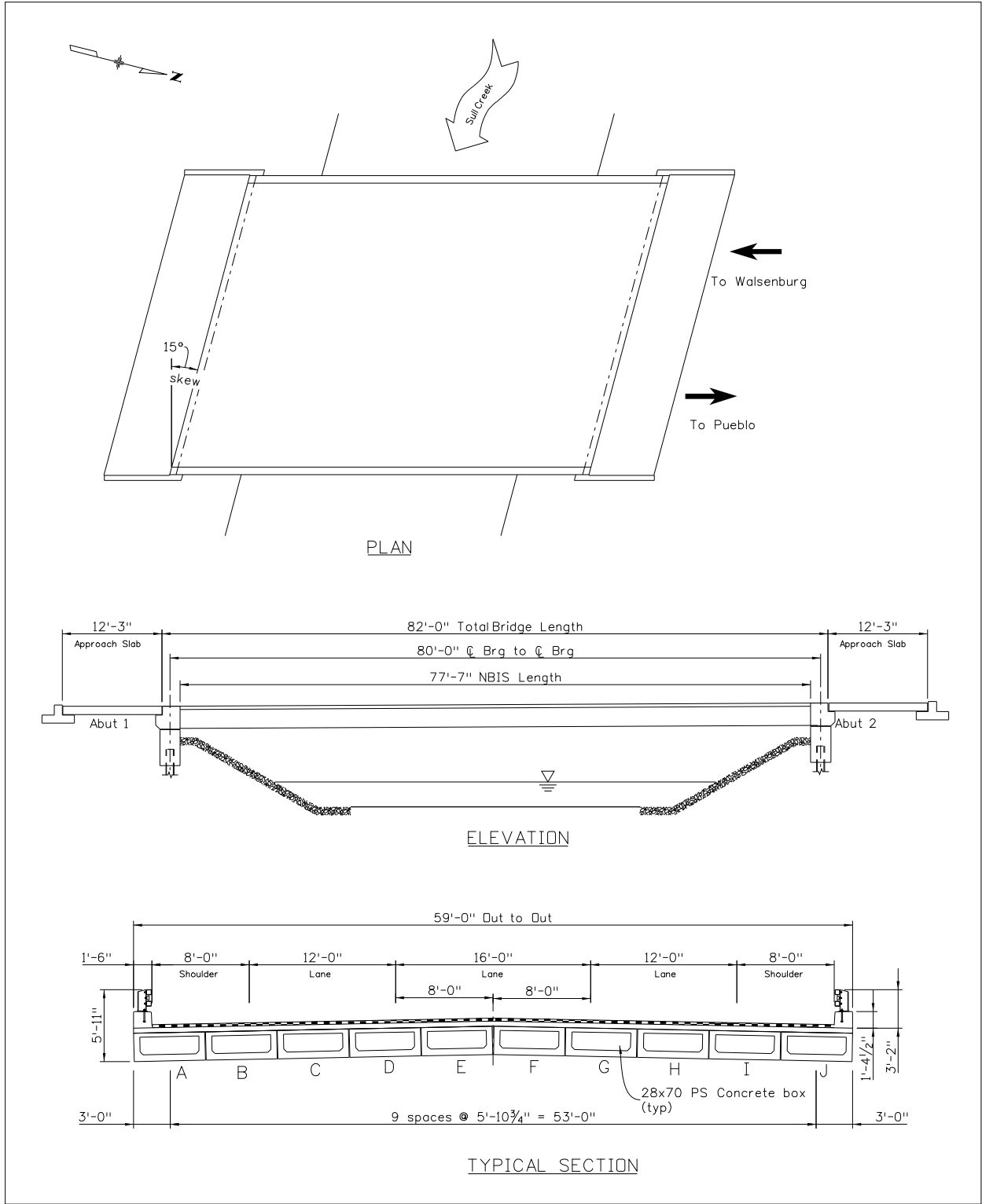
Hwy: 009C

M.P.: 90.732

File Name: 2_F-12-BW Sketch.dgn

Print Date: 1/24/2023

Fig. 17.6-2 Bridge Inspection Sketch – Example 2

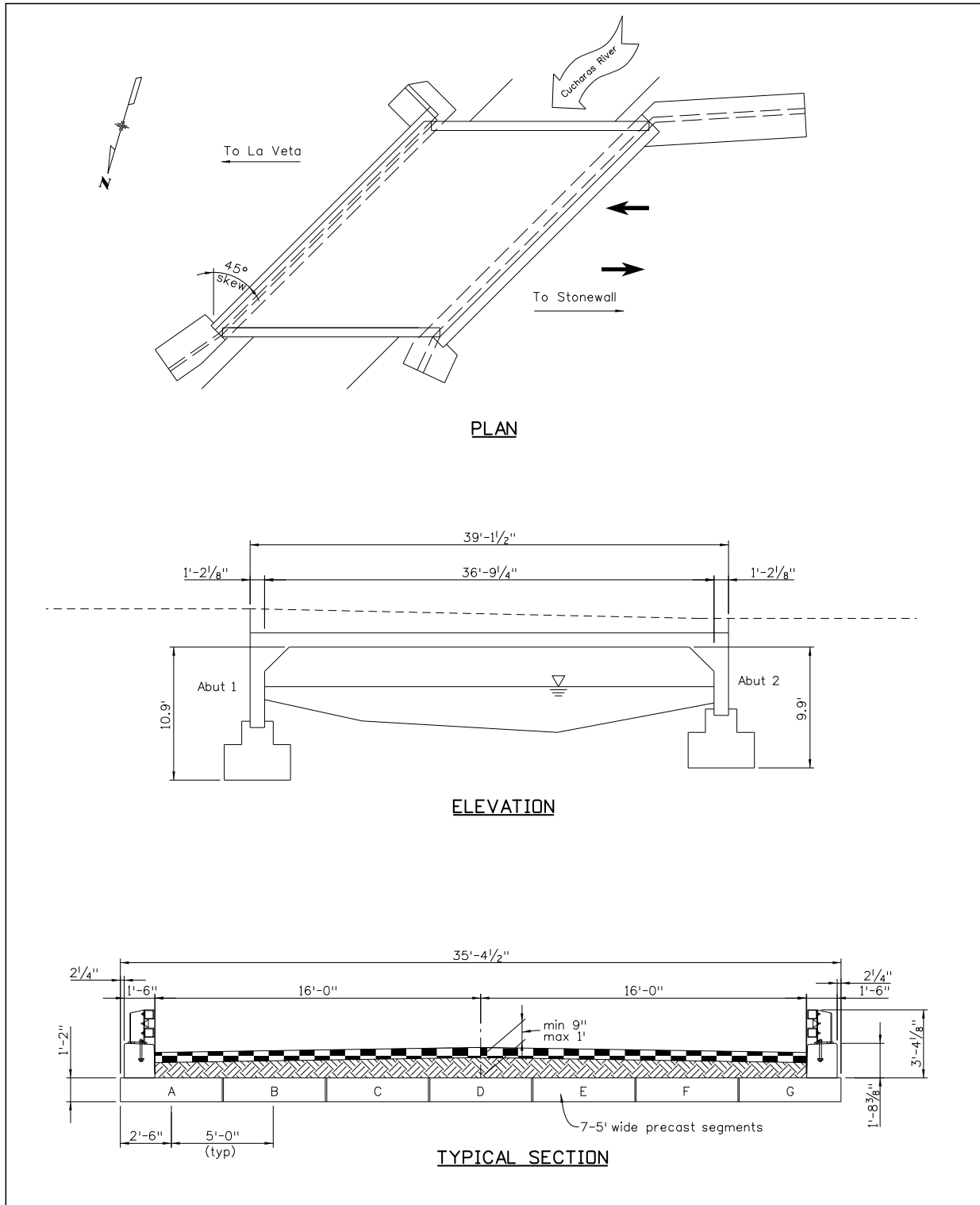


CDOT Bridge Inspection	Structure No.: N-17-BV	Hwy: 025C	M.P.: 3.426
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File Name: 3_N-17-BV Sketch.dgn

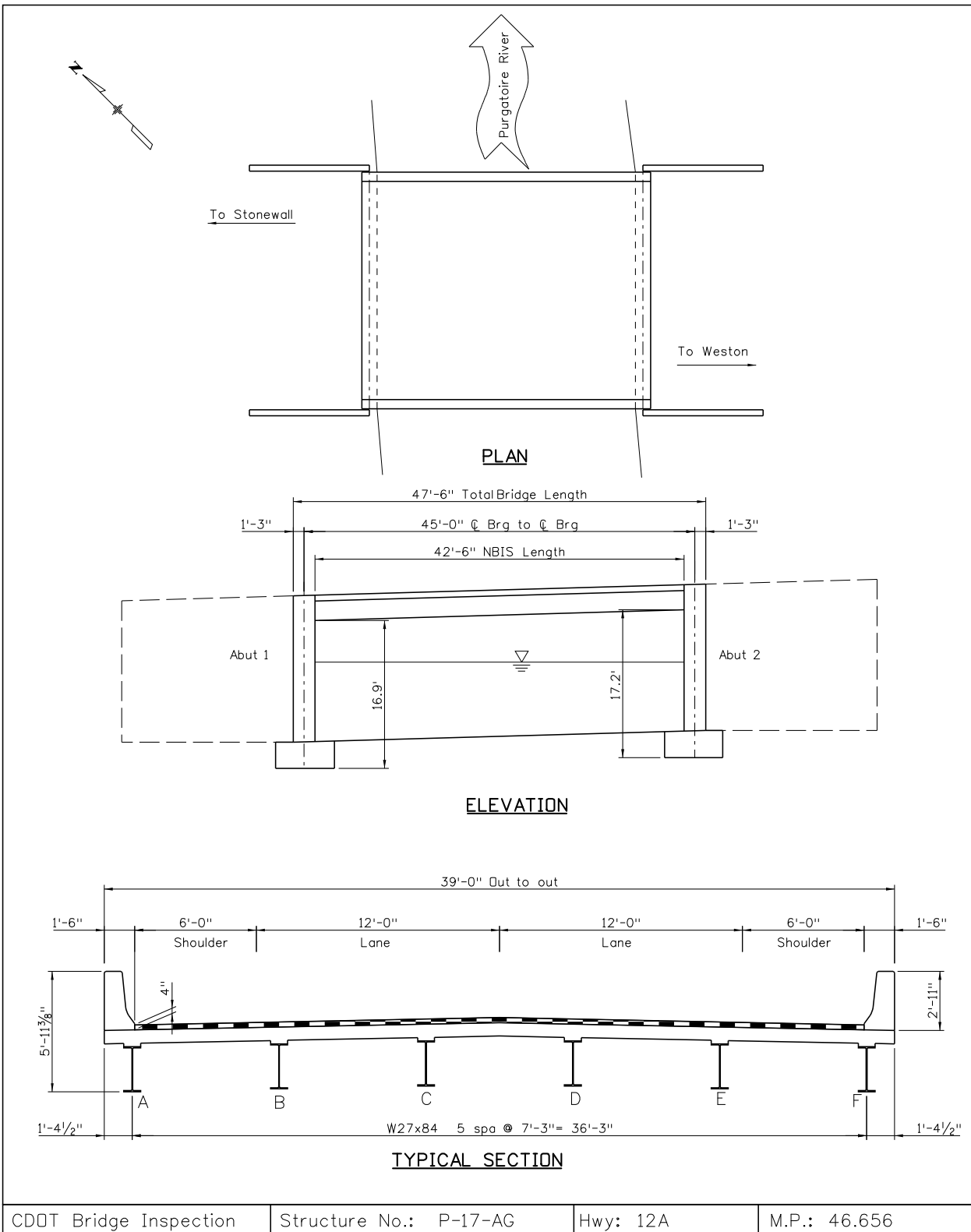
Print Date: 2/10/2023

Fig. 17.6-3 Bridge Inspection Sketch – Example 3



CDOT Bridge Inspection	Structure No.: D-16-C	Hwy: 12A	M.P.: 12.947
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Fig. 17.6-4 Bridge Inspection Sketch – Example 4



CDOT Bridge Inspection

Structure No.: P-17-AG

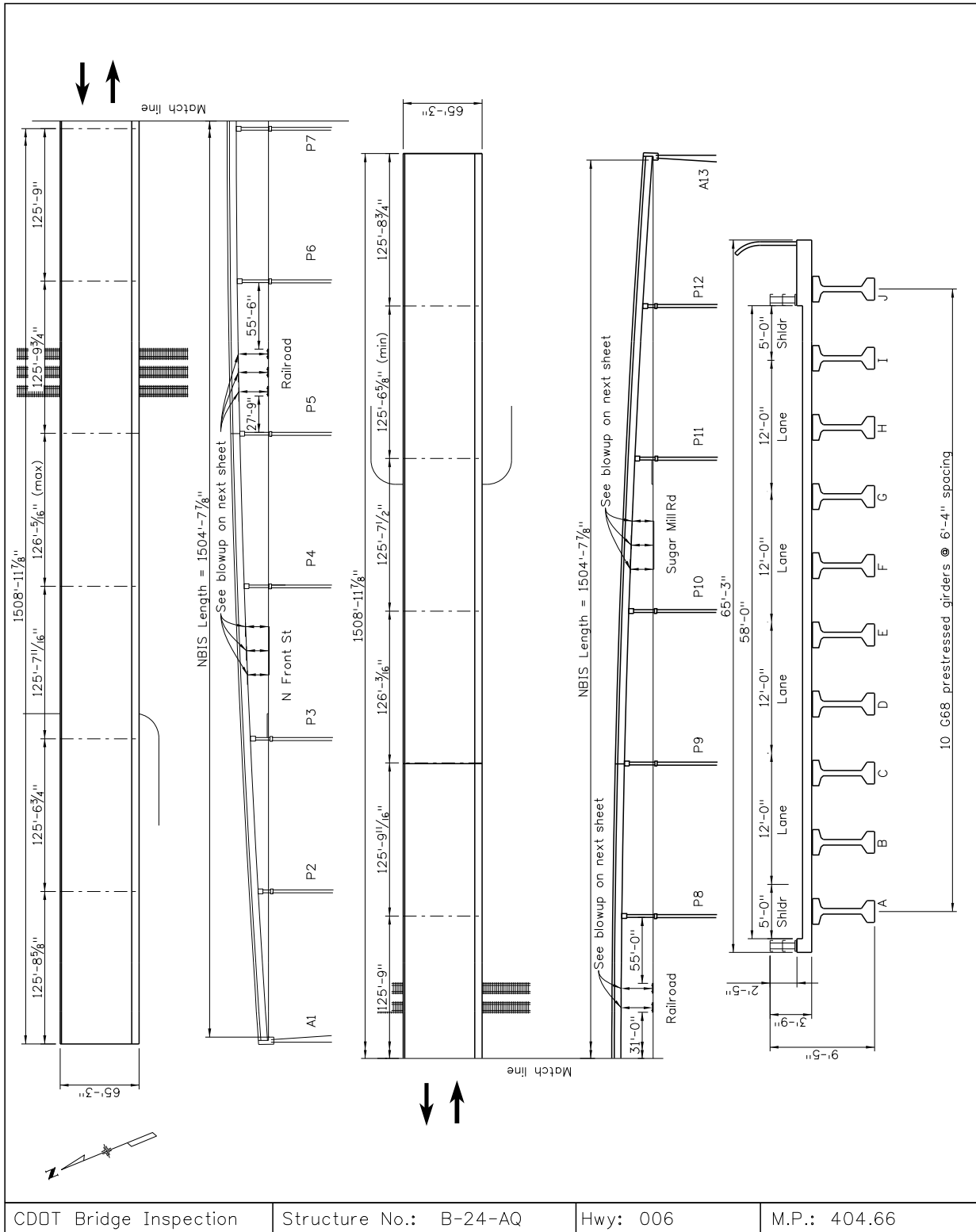
Hwy: 12A

M.P.: 46.656

File Name: 5_P-17-AG Sketch.dgn

Print Date: 1/24/2023

Fig. 17.6-5 Bridge Inspection Sketch – Example 5



CDOT Bridge Inspection

Structure No.: B-24-AQ

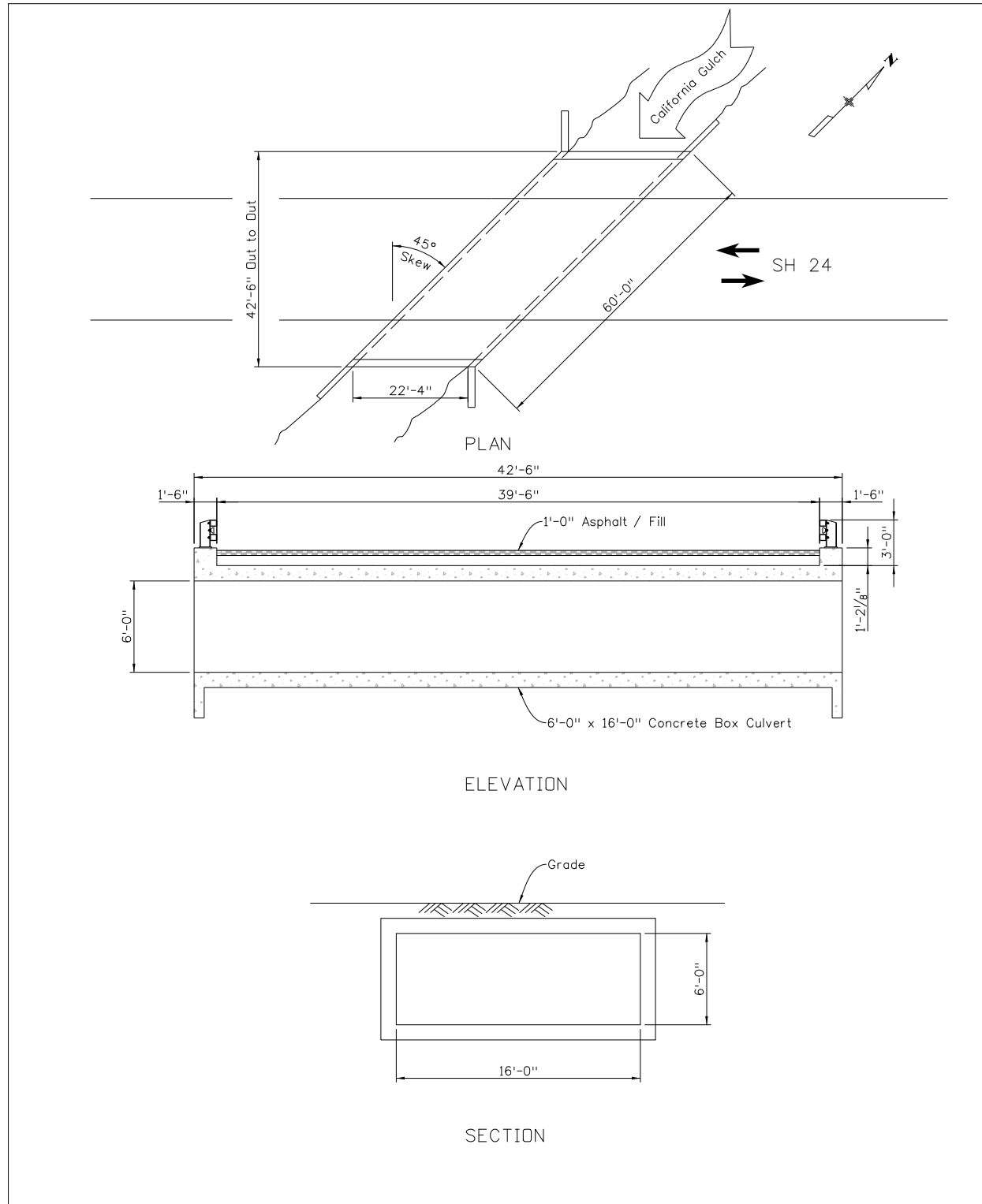
Hwy: 006

M.P.: 404.66

File Name: 6_B-24-AQ Sketch.dgn

Print Date: 2/9/2023

Fig. 17.6-6 Bridge Inspection Sketch – Example 6



CDDT Bridge Inspection

Structure No.: H-11-AC

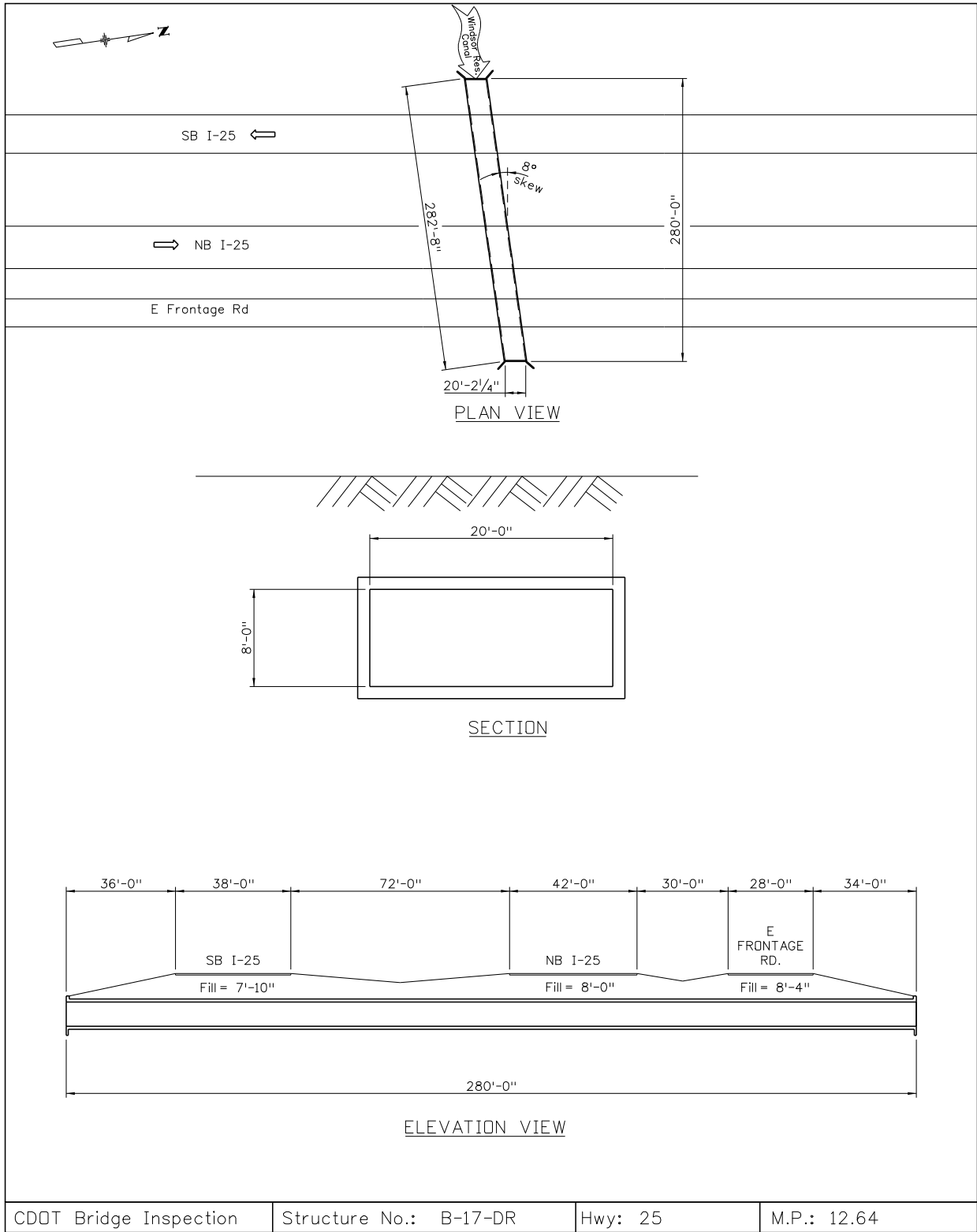
Hwy: 24

M.P.: 178.25

File Name: 7_H-11-AC Sketch.dgn

Print Date: 2/9/2023

Fig. 17.6-7 Culvert Inspection Sketch – Example 7



CDOT Bridge Inspection

Structure No.: B-17-DR

Hwy: 25

M.P.: 12.64

File Name: 8_B-17-DR_Sketch.DGN

Print Date: 1/24/2023

Fig. 17.6-8 Culvert Inspection Sketch – Example 8

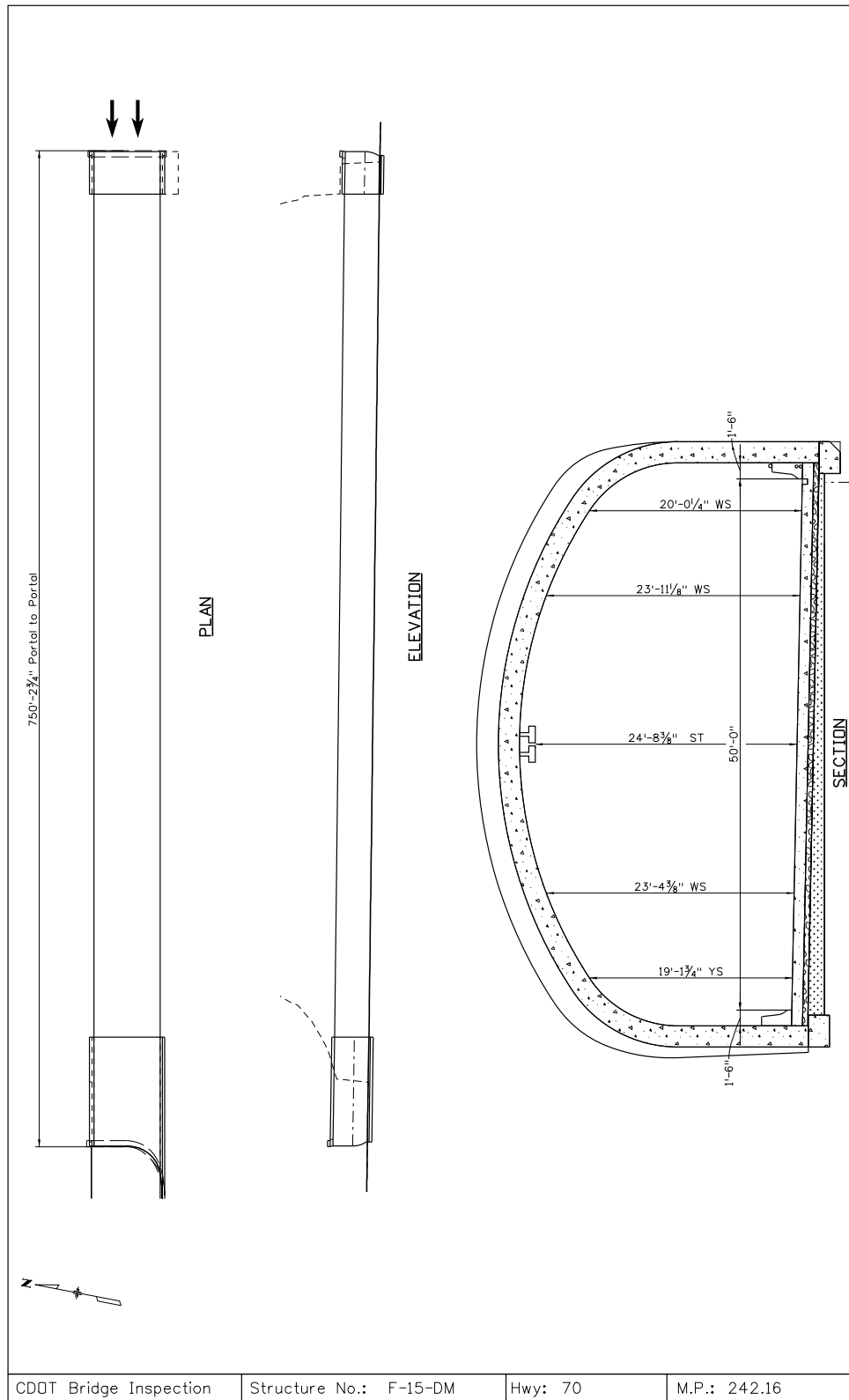
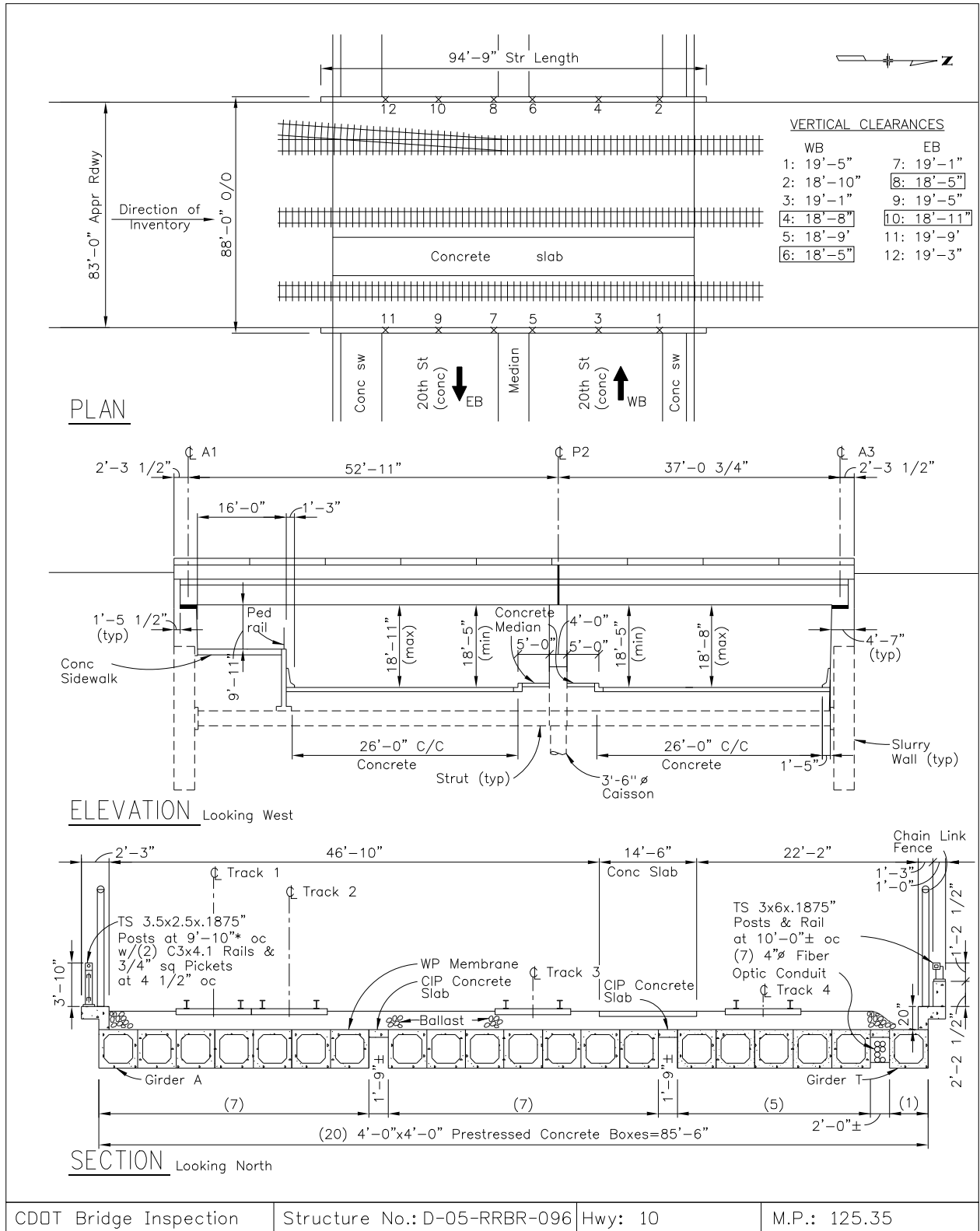


Fig. 17.6-9 Tunnel Inspection Sketch – Example 9



CDOT Bridge Inspection

Structure No.: D-05-RRBR-096 Hwy: 10

M.P.: 125.35

File Name: 10_D-05-RRBR-096_Sketch.DGN

Print Date: 2/9/2023

Fig. 17.6-10 Bridge Inspection Sketch – Example 10