

## 6. Plan Preparation

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This chapter standardizes the content and appearance of bridge plans. The objective is to produce consistent drafting and bridge plans, because consistency enhances constructability of bridge projects. Exceptions to the standard appearance of the drafting and plan layout should only be used in unique circumstances.

The following sections provide a general description of the content and organization of each type of plan sheet. An example plan sheet is included for each section to demonstrate the layout and content. Appendix A has checklists to assist in verifying plan sheet completeness.

### 6.1. General Layout Sheet

#### 6.1.1. Plan

Place the plan view in the lower half of sheet toward the left-hand side.

The preferred scale is 1"=20'-0", but the 1"=30'-0" scale may be used for larger structures. For smaller structures use 1"=10'-0". Avoid 1"=40'-0" or 1"=50'-0" as these scales become crowded on reduced plans.

For large structures, draw a detail on the GENERAL LAYOUT sheet at a small enough scale, such as 1"=200'-0", so the entire structure fits, and create a STRUCTURE PLAN sheet with the structure drawn at a 1"=20'-0" scale.

A station line or reference line tied to each structure on the sheet is required. The acceptable types are:

- station line,
- profile grade line,
- inside or outside edge of pavement, or centerline of roadway.

Stationing should run left to right. Exceptions may be necessary, but in all cases orient the structures in a group similarly regardless of stationing.

#### 6.1.2. Elevation

Place the elevation view directly aligned above the plan view. Project the elevation view vertically from the lower side of the plan view.

Use the same scale as the plan view.

Show a datum line with stationing. Select a datum elevation that is a multiple of 10 feet (e.g. 0.00, 1450.00, or 100.00). Additionally, select a datum elevation so the datum line is a sufficient distance below the drawing with no part of the elevation view touching the datum line.

#### 6.1.3. Profile Grade

Place the profile grade line diagram above the elevation view.

The preferred scale is 1"=10'-0" but the scale may be exaggerated horizontally or vertically to accommodate all relevant information, i.e. "No Scale" is used.

#### 6.1.4. Typical Section

Place the typical section in upper right-hand portion of sheet.

The preferred scale is 1/4"=1'-0". The scale may be adjusted, but for large structures, place a detail on the GENERAL LAYOUT sheet drawn at a small enough scale so the entire structure fits. Then use the TYPICAL SECTION sheet for the structure drawn at a more detailed scale.

Show the section looking ahead on station. Identify by section letters or stationing if the section varies or station lines are not continuous across the structure.

Show pier(s) for multi-span bridges. Do not show abutments on single-span bridges.

#### 6.1.5. Sheet Title

Include the official name and number of the structure in the title block. See Section 10.6. for Department bridge identification standards. Only use abbreviations when necessary.

#### 6.1.6. Miscellaneous

Keep the GENERAL LAYOUT sheet neat and clean with clear, legible lettering. This sheet is subject to review by other agencies.

Provide an area on the GENERAL LAYOUT about 6 inches square in the lower right-hand corner for the

Drawing Index and Estimate of Quantities, if possible. The Drawing Index includes all applicable bridge sheets and the TEST BORING LOG AND LOCATIONS sheets from the foundation engineer.

In the lower right-hand corner include a symbol and note for the location of the bridge number plates and minimum vertical clearance, if applicable.

The stations and elevations on this sheet should be shown to no more than two decimal points.

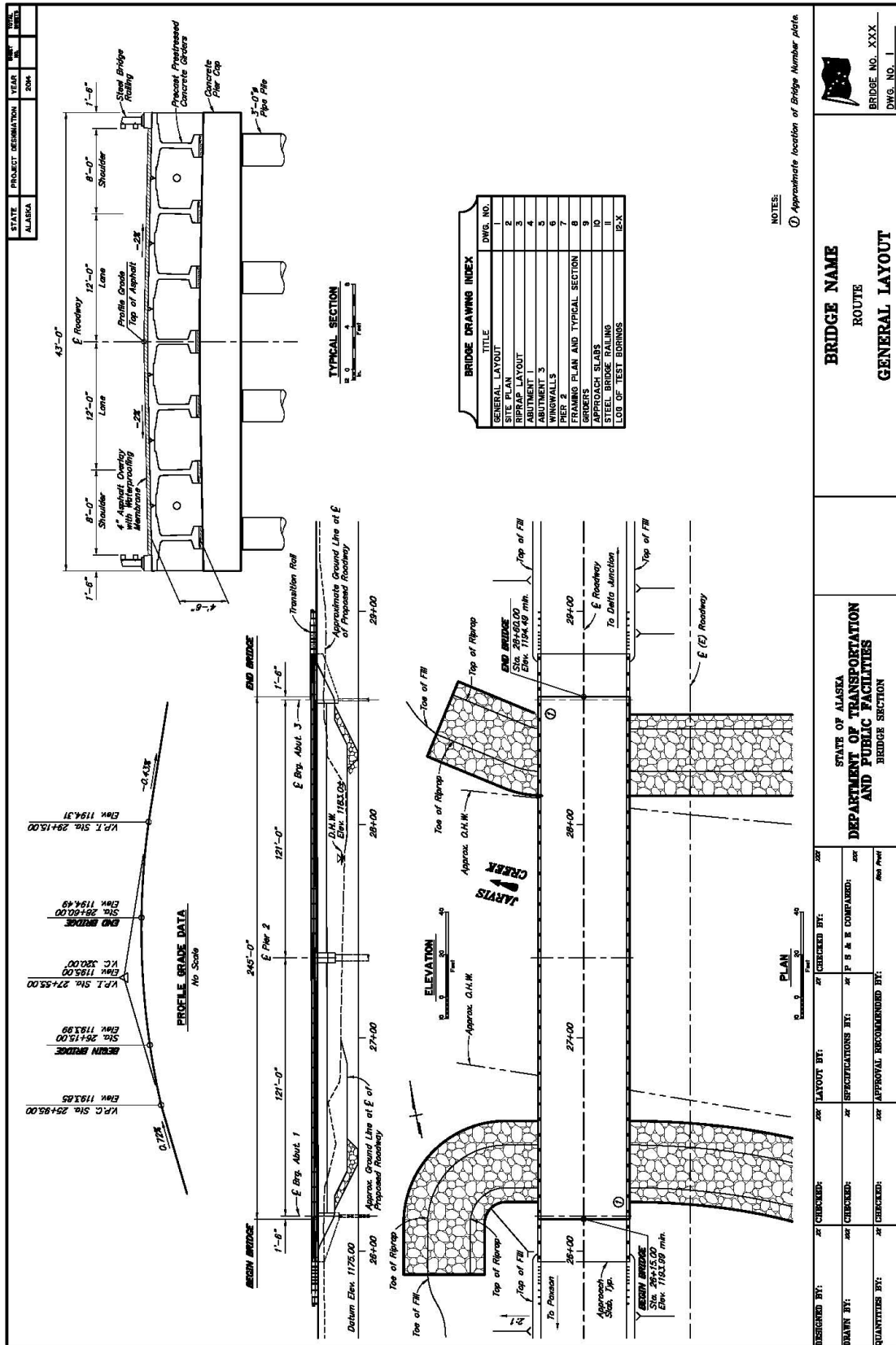


Figure 6-1  
Example General Layout Sheet

## 6.2. Site Plan Sheet

### 6.2.1. General Notes

Place the General Notes in the upper half of the sheet toward the right-hand side. An example of the General Notes content and format is shown in Figure 6-2.

### 6.2.2. Site Plan

Place the site plan in the upper, left-hand side of the sheet. The site plan scale is typically the same as the scale for the plan view on the GENERAL LAYOUT

sheet. Show alignment of the centerline, centerline of bearing with alignment, right-of-way lines, and utilities.

### 6.2.3. Miscellaneous

Place the foundation table (e.g. Pile Data Table) below the General Notes, and place the abbreviations list below the foundation table. The lower left-hand side of the sheet can be used for miscellaneous items, such as the Estimate of Quantities table if sufficient space is not available on the GENERAL LAYOUT sheet.

#### GENERAL NOTES

*DESIGN: .....AASHTO LRFD Bridge Design Specifications, Fifth Edition, 2010, with latest interim specifications. Seismic design per AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2009.*

*LIVE LOAD:.....HL-93*

*DEAD LOAD:.....Includes 50 psf for all wearing surfaces.*

*SEISMIC PARAMETERS:.....PGA = 0.54  
S<sub>s</sub> = 1.18  
S<sub>1</sub> = 0.46  
Site Class = D  
Liquefaction Potential = Low  
AASHTO 7% probability of exceedance in 75 years.*

*REINFORCEMENT:.....ASTM A706, Grade 60, F<sub>y</sub> = 60,000 psi  
Space reinforcement evenly unless otherwise noted.  
ASTM A970 Class HA Headed bars.*

*PRESTRESSED CONCRETE:.....See "GIRDERS" Dwg.*

*CONCRETE:.....Class A Concrete, f'c = 4000 psi, unless otherwise noted.*

*STRUCTURAL STEEL:.....ASTM A709 GR36T3, F<sub>y</sub> = 36,000 psi, unless otherwise noted.  
Galvanize all structural steel in accordance with AASTHO M111 unless shown otherwise.*

*STRUCTURAL STEEL PILING:...H-Piles – ASTM A709, GR50T3, F<sub>y</sub> = 50,000 psi.  
Pipe Piles – API 5L X52 PSL2, F<sub>y</sub> = 52,000 psi.  
Pile Tip reinforcing is required.*

**Figure 6-2**  
**Typical General Notes**

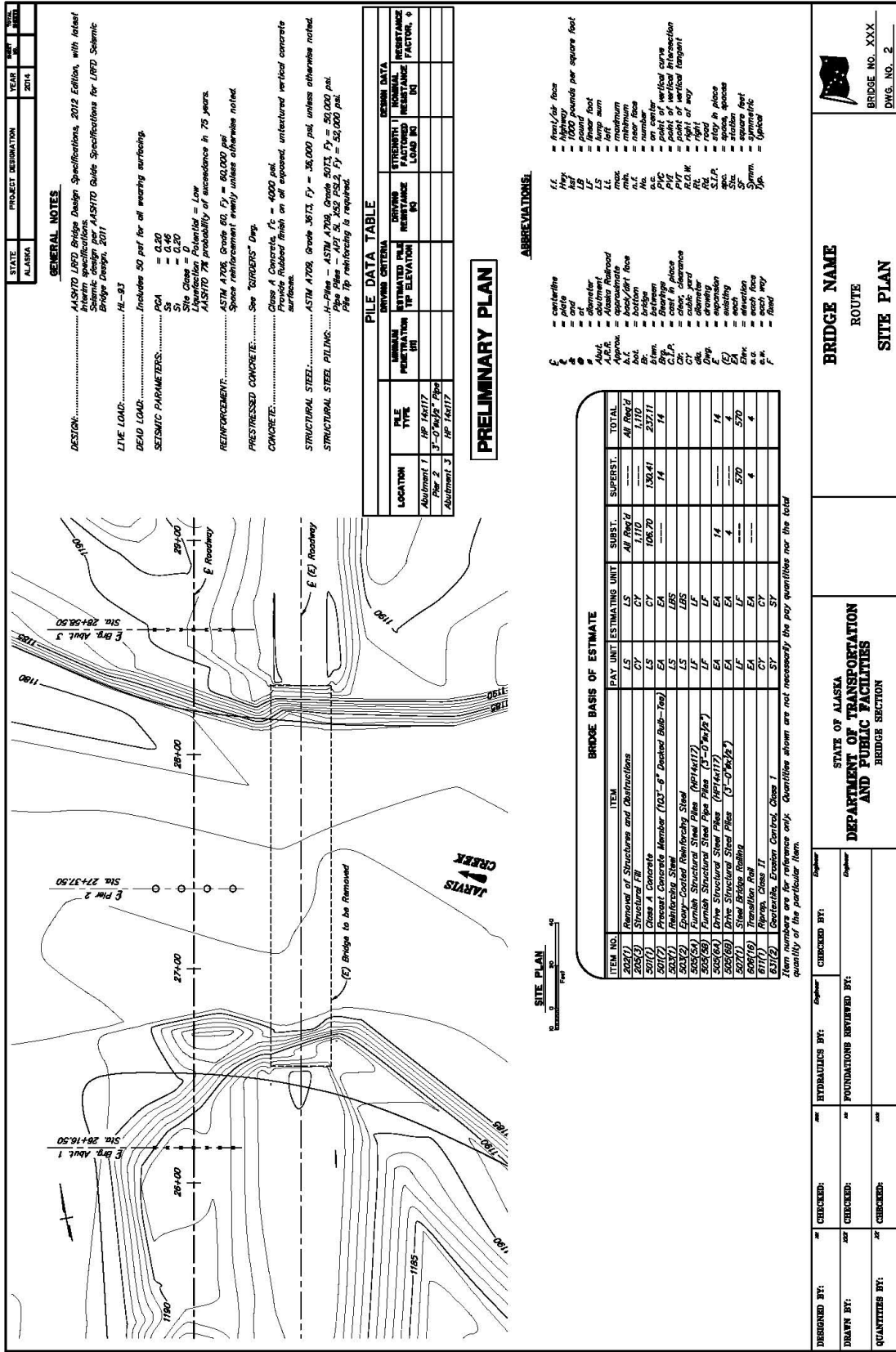


Figure 6-3  
 Example Site Plan Sheet

## **6.3. Abutment Sheet**

### **6.3.1. Plan**

Place at the plan view at the top, left side of sheet.

The preferred scale is 1/4"=1'-0". Use a scale of 1/8"=1'-0" for large structures, but show less detail.

Show partial reinforcement to indicate orientation of rebar on skewed bridges.

### **6.3.2. Elevation**

Align the elevation view under the plan view on the left side of sheet. Include a note if the view is looking back on station when showing Abutment 1.

Use the same scale as the plan view.

Do not show rear elevations.

Show utiliducts with a solid line and girders with a DOT2 linetype on PEN3.

### **6.3.3. Sections and Details**

The preferred scale for sections and details is 1/2"=1'-0" minimum. Do not show sections and details with reinforcement at less than a 3/8"=1'-0" scale.

Orient sections in the direction of the view or section cut.

Align the bottom of the footing with the bottom of the footing from the elevation view.

Sections and details are to be taken from the plan, elevation, or secondary views rather than from other sections.

Do not repeat details in similar sections.

Do not shade or show aggregate in sections.

Label mandatory construction joints.

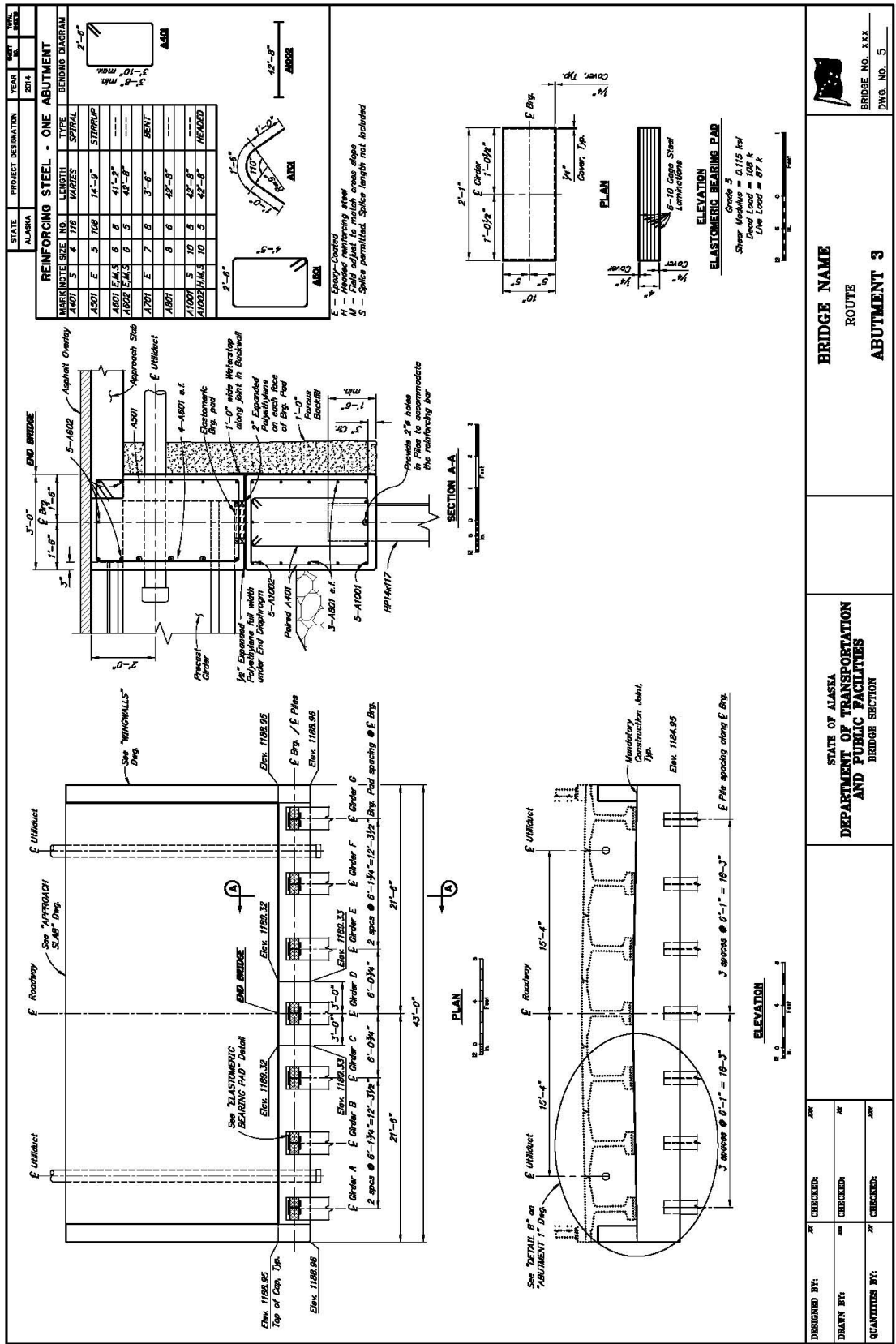


Figure 6-4  
Example Abutment Sheet

## **6.4. Wingwall Sheet**

### **6.4.1. Elevation**

Place the elevation view at the top left side of the sheet.

The preferred scale is  $1/2''=1'-0''$ . Use a scale of  $1/4''=1'-0''$  for large structures.

Show the elevation looking normal to outside face of the wingwall.

### **6.4.2. Sections**

Use projections for sections of the elevation view.

Use the same scale as the elevation view.

Label rebar without spacing.

Do not show abutment reinforcement.

Do not show sections and details with reinforcement less than a  $3/8''=1'-0''$  scale; the preferred scale is  $1/2''=1'$  minimum.

Orient sections in the direction of the view or section cut.

Do not shade or show aggregate in sections.

### **6.4.3. Finished Elevation**

Use  $3/8''=1'-0''$  scale minimum; the preferred scale is  $1/2''=1'-0''$ .

Orient the finished elevation view in the same direction as the elevation view.

Show the finished ground line with earth hatching angled at 45 degrees on PEN6.

Use layer PEN5 for railing, curb, and girders.

Use the Hidden linetype for everything below the finished ground line.

Do not show rebar in this view.

Do not show the abutment outline hidden behind the wingwall.

Label the finished ground line.

Show the expansion joint in the concrete curb and steel rail or concrete barrier, whichever applies.



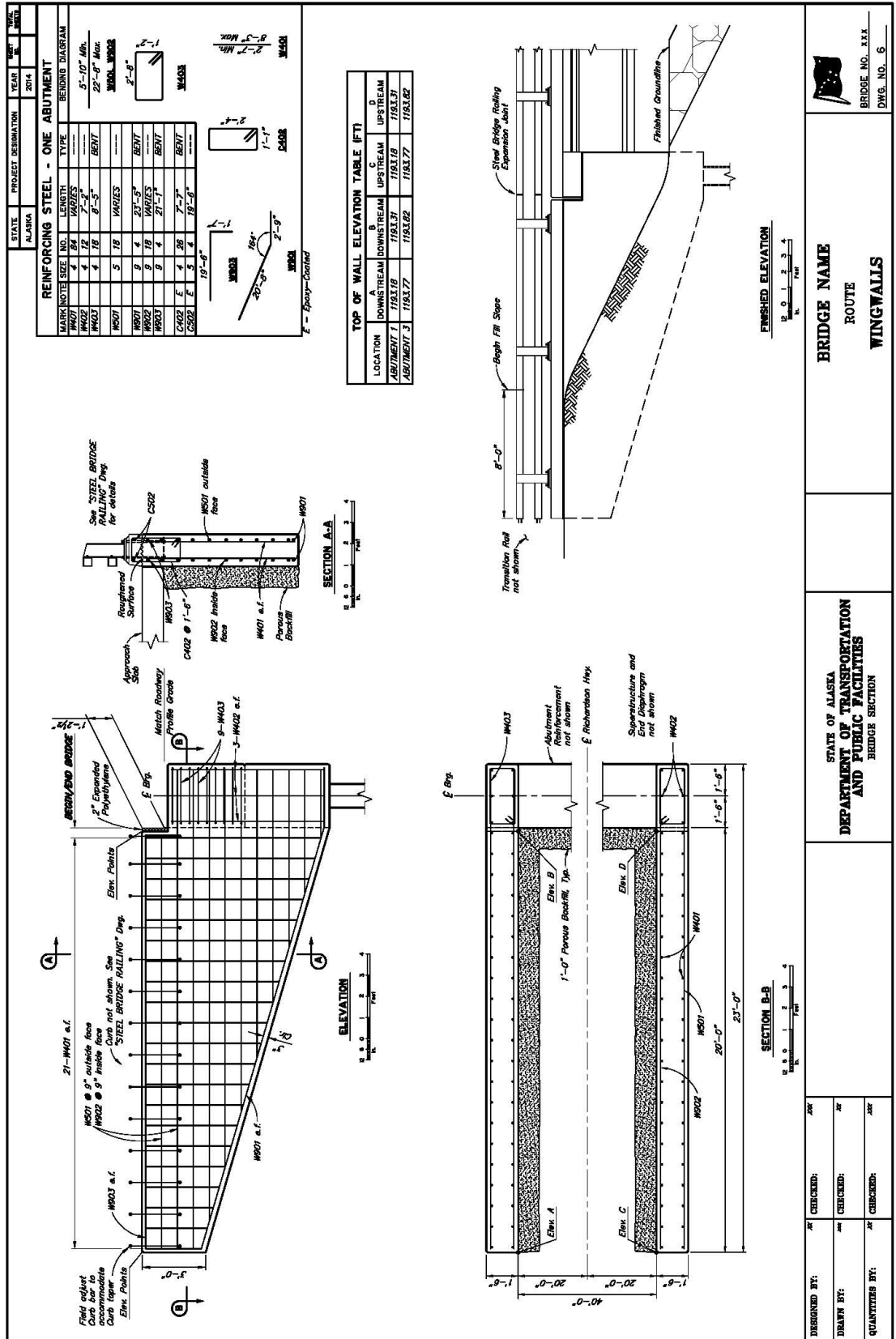


Figure 6-5  
Example Wingwall Sheet

## **6.5. Pier Sheet**

### **6.5.1. Plan**

Place the plan view at the top left side of sheet.

The preferred scale is 1/4"=1'-0". Use a scale of 1/8"=1'-0" on large structures.

Do not show layout information that is shown on the site plan.

Show partial reinforcement to indicate the orientation of rebar on skewed bridges.

### **6.5.2. Elevation**

Use projections for the elevation from Plan view.

Use the same scale as the plan view.

Show girders when spacing allows.

### **6.5.3. Sections**

Use a minimum scale of 3/8"=1'-0"; the preferred scale is 1/2"=1'-0".

Orient sections in the direction of the section cut.

Call out reinforcing steel clearances other than 2".

Architectural columns require multiple section cuts.

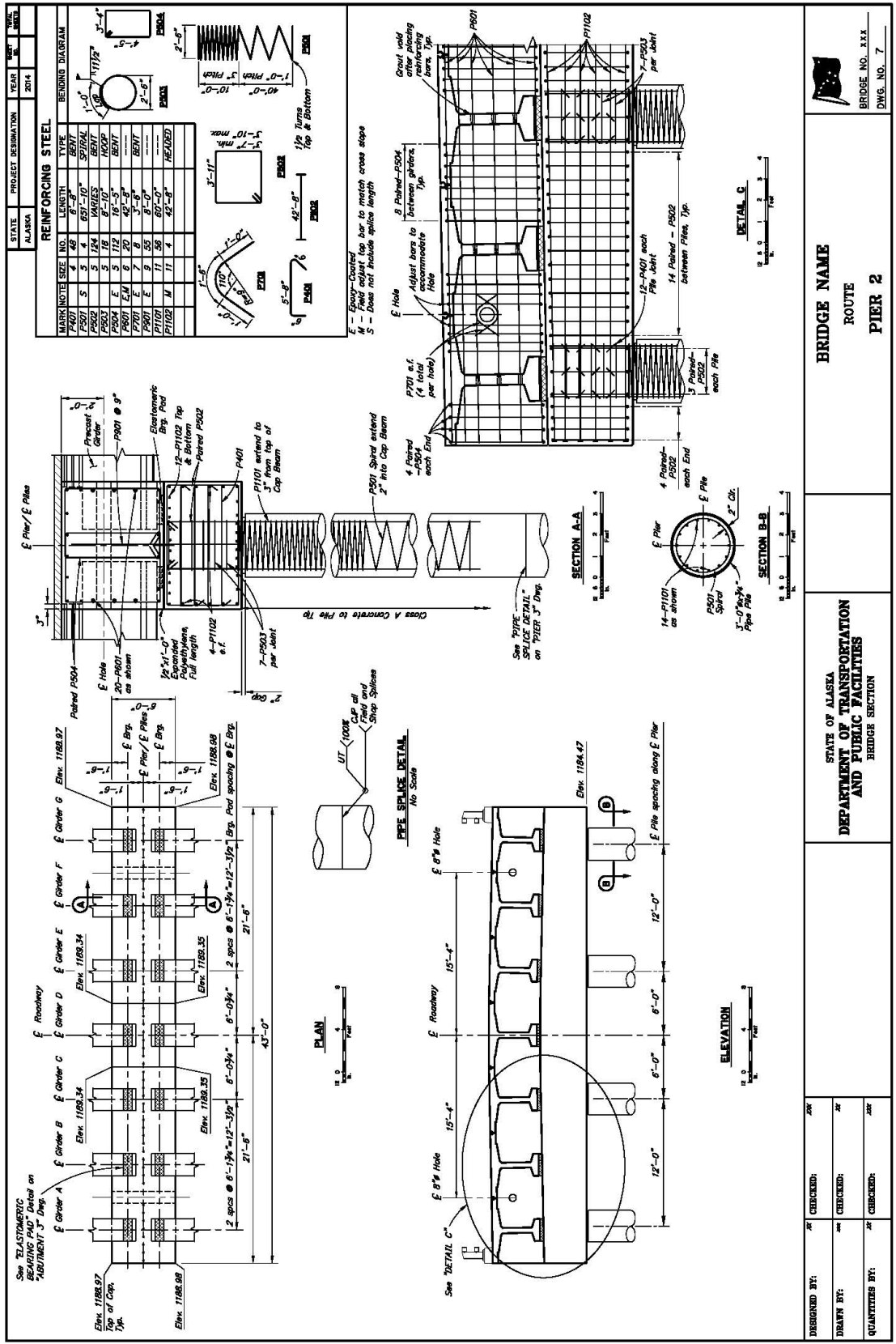


Figure 6-6  
Example Pier Sheet

## 6.6. Framing Plan and Typical Section Sheet

The Typical Section and Framing Plan may be placed on separate sheets if necessary.

### 6.6.1. Typical Section

Place the typical section at the top, left side of sheet looking ahead on station.

The preferred scale is  $1/4"=1'-0"$ . Use a  $1/8"=1'-0"$  scale on large structures.

Show concrete diaphragm reinforcement.

Show dimensions for overall structure and centerline utilities.

### 6.6.2. Framing Plan

Place the framing plan on the bottom half of the sheet. Orient the framing plan on the sheet the same way as the plan view on the GENERAL LAYOUT sheet.

Use a scale that shows the bridge length with approach slabs.

Do not show stationing.

Show dimensioning for the overall bridge length, shear key spacing, bridge railing for payment, bridge railing post spacing, centerline girder spacing from edge of deck and centerline of structure, and diaphragm spacing.

Label each centerline girder (e.g. Girder A, Girder B, etc.). Show the roadway centerline with Center linetype on layer PEN5. Show the centerline of bearings with Center2 linetype on layer PEN5. Show the centerline of girders with Center2 linetype on layer PEN5.

### 6.6.3. Diaphragm Sections and Details

Use a scale of  $3/4"=1'-0"$  for sections and details with reinforcement.

Orient sections and details in the direction of the view or section cut.

Do not shade or show aggregate in sections.

Show dimensions related to the diaphragm.

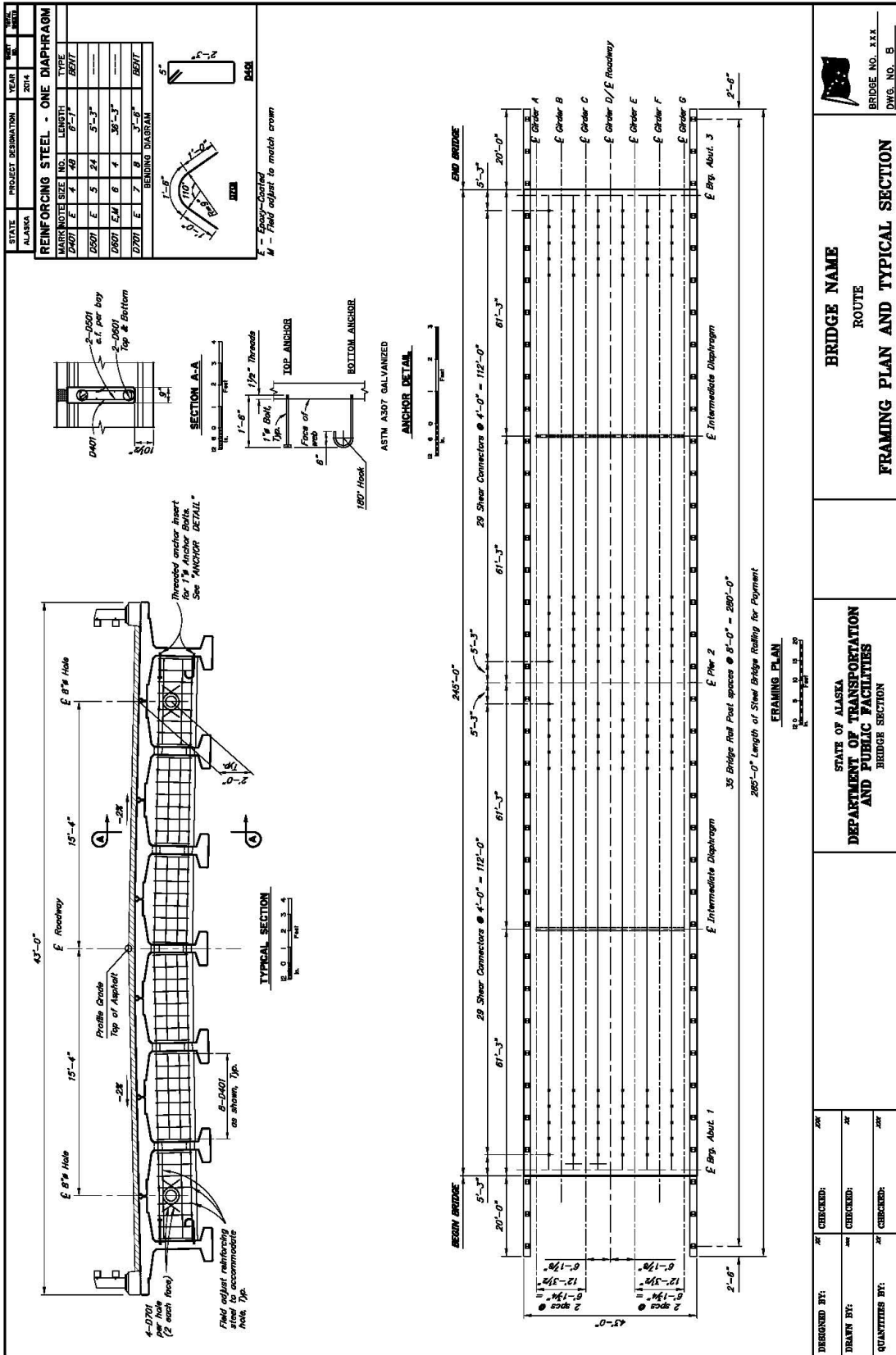


Figure 6-7  
Example Framing Plan and Typical Section Sheet

## **6.7. Girder Sheet**

This section pertains to precast, prestressed concrete girders. Steel girder designs are less common, so refer to the most recent steel bridge plan set for drawing layout and drafting.

### **6.7.1. Plan**

Place the plan view at the top, left side of sheet looking ahead on station.

Draw the plan view to scale, but due to the areas removed by the break lines show as “No Scale”. Include the ends and center portion of the girder in the plan view. Show either the exterior or interior top flange reinforcing steel spacing; do not show both. Include enough of the reinforcing steel at the ends of the deck to include the first shear key.

### **6.7.2. Elevation**

Place the elevation view below the plan view.

Draw the elevation view to scale, but similar to the plan view show “No Scale” due to the break lines. Ensure that each section of shear reinforcing steel (typically G403 bars) spacing is included in the elevation view.

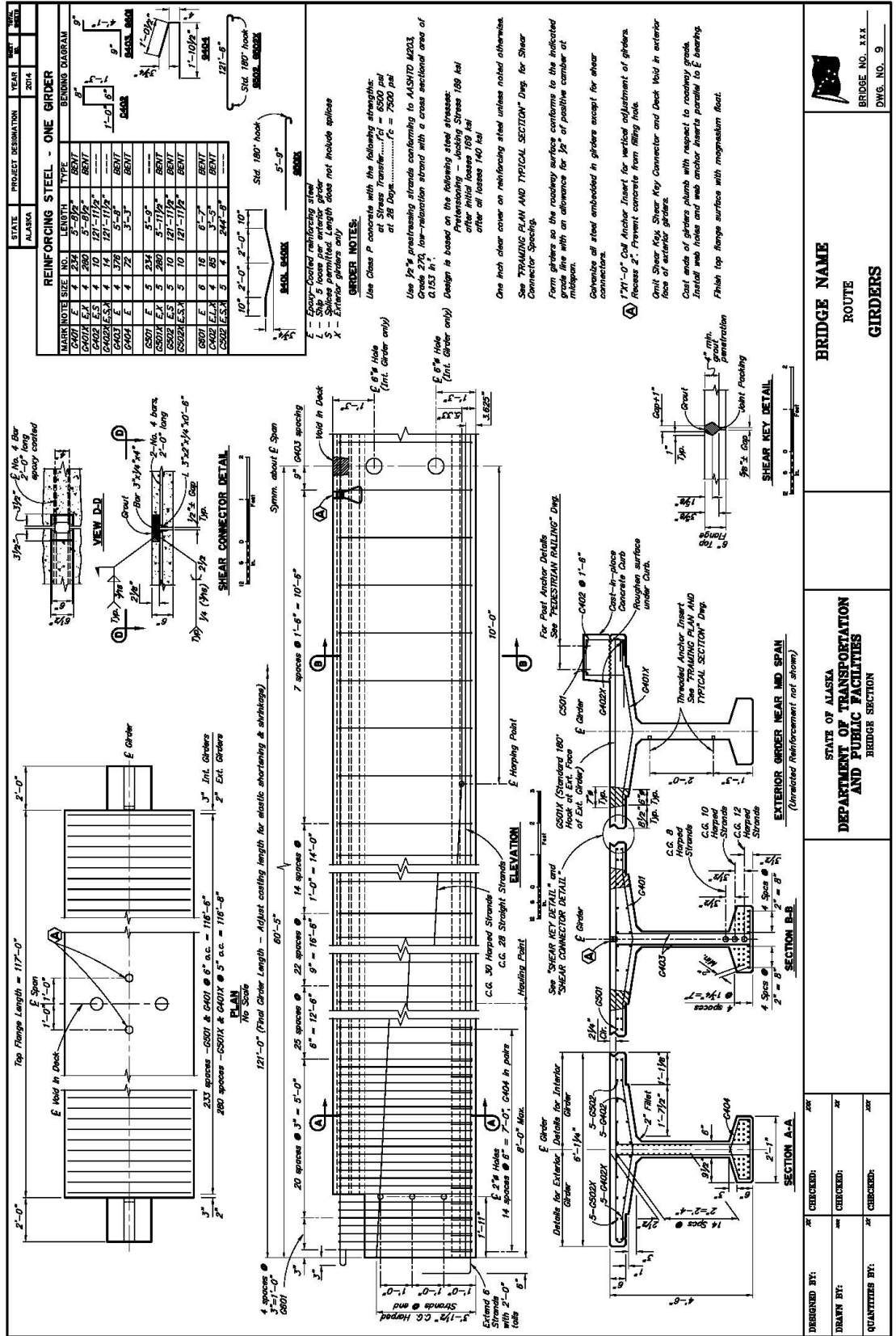
Section the elevation view at the bearing and near the midspan. Show these sections and an exterior midspan section below the elevation view. None of these views have a scale.

### **6.7.3. Girder Notes and Details**

Place the Reinforcing Steel Schedule in the upper right-hand corner.

Place the Girder Notes under the reinforcing steel schedule.

Place the shear key detail, shear connector detail, and associated view as space allows on the rest of the drawing.



**Figure 6-8**  
**Example Girder Sheet**

## **Appendix 6.A**

# **PLAN SHEET CHECKLISTS**

Appendix 6.A presents the following standardized checklists for each of the following most common plan drawings:

- General Layout;
- Site Plan;
- Abutment;
- Wingwall;
- Pier;
- Framing Plan and Typical Section; and
- Girder.



Project No. \_\_\_\_\_

Date: \_\_\_\_\_

Bridge No. \_\_\_\_\_

Designer(s): \_\_\_\_\_

**GENERAL LAYOUT**

Are the following items properly included on the GENERAL LAYOUT sheet?	Yes	No	N/A
<p>1. Plan</p> <ul style="list-style-type: none"> <li>• North arrow</li> <li>• Traveled way, shoulder and median width of approach roadways</li> <li>• Top and toe of approach fill or cut</li> <li>• Slope of fill or cut</li> <li>• Horizontal clearance under structure (including future alignment)</li> <li>• Alignment data</li> <li>• Name and direction of nearest towns or cities</li> <li>• Designation of construction and/or bridge centerlines</li> <li>• Skew angle (between the normal or radial to centerline of structure and centerline of pier or abutment)</li> <li>• Location of minimum vertical clearance</li> <li>• Deck drains and manholes</li> <li>• Location of bridge number plates</li> <li>• Begin Bridge (BB) and End Bridge (EB) station and elevation</li> <li>• Bank protection or slope paving</li> <li>• Centerline piers or bents</li> <li>• Structure mounted signs</li> <li>• Temporary railings and approach rail</li> <li>• Tie between toe of slope and railroad tracks</li> <li>• Railroad right-of-way lines for structures over railroad tracks</li> <li>• Approach slab</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>2. Elevation</p> <ul style="list-style-type: none"> <li>• Abutment and pier numbers</li> <li>• Datum line with elevation and stations</li> <li>• Original ground line at bridge centerline, or as noted</li> <li>• Total length of bridge (BB to EB)</li> <li>• Span lengths</li> <li>• Bank protection or slope paving</li> <li>• Vertical clearance to nearest 1" (round off to lower number)</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>3. Profile Grade</p> <ul style="list-style-type: none"> <li>• Gradients, pertinent elevations and stations</li> <li>• Show length of vertical curves.</li> <li>• Do not show superelevation diagram on GENERAL LAYOUT sheet</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Are the following items properly included on the GENERAL LAYOUT sheet?	Yes	No	N/A
1. Typical Section <ul style="list-style-type: none"> <li>• Width of traveled way, sidewalks, shoulders, and medians on bridge</li> <li>• Overall width of bridge</li> <li>• Location of profile grade</li> <li>• Crown or maximum superelevation</li> <li>• Surfacing and waterproofing membrane</li> <li>• Superstructure thickness top of deck to bottom of girder (or main slab)</li> <li>• Type of girder (e.g. steel, composite, non-composite, precast prestressed, or cast-in-place prestressed, etc.)</li> <li>• Utilities and openings for future utilities</li> <li>• Typical pier for multiple spans or no substructure for single spans</li> <li>• Rail or barrier type</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project No. \_\_\_\_\_

Date: \_\_\_\_\_

Bridge No. \_\_\_\_\_

Designer(s): \_\_\_\_\_

**SITE PLAN**

Are the following items properly included on the SITE PLAN sheet?	Yes	No	N/A
1. Site Plan <ul style="list-style-type: none"> <li>• Remove contour lines that interfere with dimensions, stations, or bearings.</li> <li>• Relocate any interfering pertinent information, especially utility data and existing features to be removed.</li> <li>• Stations and bearing of centerline piers and abutments.</li> <li>• If all supports are parallel, the bearings may be noted accordingly.</li> <li>• Same layout line on the Site Plan as used on other details.</li> <li>• Sufficient layout information for a survey crew to stake out hubs for the contractor's use</li> <li>• Horizontal and vertical data for Bench Mark (if present) near bridge</li> <li>• Do not repeat layout information on details sheets, particularly bearings, stations, and curve data.</li> <li>• Pile layouts if not convenient to show elsewhere in the plans</li> <li>• Outline of existing bridge "To Be Removed"</li> <li>• Riprap dimensions and layout line geometry, if not shown on a RIPRAP LAYOUT sheet.</li> <li>• Ordinary High Water Line</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. General Notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Foundation Table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Hydraulic Summary, if not shown on a RIPRAP LAYOUT sheet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project No. \_\_\_\_\_

Date: \_\_\_\_\_

Bridge No. \_\_\_\_\_

Designer(s): \_\_\_\_\_

**ABUTMENT SHEET**

Are the following items properly included on the ABUTMENT sheet?	Yes	No	N/A
1. Plan <ul style="list-style-type: none"> <li>• Dimension along same layout line as is stationed on Site Plan</li> <li>• Do not dimension piles from edges of footings</li> <li>• Layout dimensions only; other dimensions shown on larger details</li> <li>• Centerline of roadway</li> <li>• Centerline of bearings</li> <li>• Bearing pads with hatching</li> <li>• Begin/End Bridge</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Elevation <ul style="list-style-type: none"> <li>• Piles and dimensions</li> <li>• Girders, curb, and railing with DOT2 linetype on PEN3 layer</li> <li>• Avoid detail dimensions</li> <li>• Section cut lines</li> <li>• Utility holes</li> <li>• Weep holes</li> <li>• Show elevations on slope paving; exception, a constant dimension below soffit</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Section Views	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Bearing Pad Details	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Reinforcing Steel Table (“Bar Chart”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project No. \_\_\_\_\_

Date: \_\_\_\_\_

Bridge No. \_\_\_\_\_

Designer(s): \_\_\_\_\_

### WINGWALL SHEET

Are the following items properly included on the WINGWALL sheet?	Yes	No	N/A
1. Elevation <ul style="list-style-type: none"><li>• Railing not shown</li><li>• Section cuts</li></ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Sections <ul style="list-style-type: none"><li>• Do not show dimensions; dimensions shown in plan view.</li><li>• Utilities not shown</li><li>• Centerline of roadway and bearing</li></ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project No. \_\_\_\_\_

Date: \_\_\_\_\_

Bridge No. \_\_\_\_\_

Designer(s): \_\_\_\_\_

**PIER SHEET**

Are the following items properly included on the PIER sheet?	Yes	No	N/A
1. Plan <ul style="list-style-type: none"> <li>• Railing not shown</li> <li>• Dimension along same layout line as stationed on the SITE PLAN</li> <li>• Centerline of roadway</li> <li>• Centerline of bearings</li> <li>• Bearing pads shown with hatching</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Elevation <ul style="list-style-type: none"> <li>• Geometry dimensions for pier cap and column</li> <li>• Utility openings</li> <li>• Centerline of roadway.</li> <li>• Crain and drain pipe, if required</li> <li>• All footings</li> <li>• Column bars and stirrups or spiral reinforcing</li> <li>• Cap stirrups and reinforcement</li> <li>• A few footing reinforcing bars shown to identify location of bars in mat</li> <li>• Location of sections</li> <li>• Footing elevations</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Section Views	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Bearing Pad Details (if not shown on ABUTMENT sheet)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Reinforcing Steel Table (“Bar Chart”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project No. \_\_\_\_\_

Date: \_\_\_\_\_

Bridge No. \_\_\_\_\_

Designer(s): \_\_\_\_\_

**FRAMING PLAN AND TYPICAL SECTION**

<b>Are the following items properly included on the FRAMING PLAN AND TYPICAL SECTION sheet?</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. Typical Section <ul style="list-style-type: none"><li>• Utilities with reinforcement around opening</li><li>• Asphalt overlay</li><li>• Section cut for diaphragms</li><li>• Anchor bars for diaphragms</li><li>• Substructure not shown</li><li>• Lane and shoulder dimensions not shown</li></ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Framing Plan <ul style="list-style-type: none"><li>• Approach slab</li><li>• Rail posts</li><li>• Shear keys</li><li>• Diaphragms with Hidden2 linetype on PEN1</li><li>• Dimension out to out of deck</li></ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Diaphragm Details	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project No. \_\_\_\_\_

Date: \_\_\_\_\_

Bridge No. \_\_\_\_\_

Designer(s): \_\_\_\_\_

### GIRDER

Are the following items properly included on the GIRDER sheet?	Yes	No	N/A
1. Plan <ul style="list-style-type: none"><li>• Deck reinforcing steel spacing</li><li>• Void locations</li></ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Elevations <ul style="list-style-type: none"><li>• Reinforcing stirrup spacing</li><li>• Final girder length</li><li>• Harping point</li><li>• Hauling point</li><li>• Holes, center and at ends</li><li>• Harped and straight strand center of gravity</li></ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Sections <ul style="list-style-type: none"><li>• Girder geometry</li><li>• Prestressing steel number and locations</li><li>• Reinforcing steel types and locations</li><li>• Voids</li><li>• Exterior girder inserts</li></ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Girder Notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Reinforcing Steel Table ("Bar Chart")	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>