# Appendix C — Plan Assembly & Drafting

## C.1—GENERAL PLAN INFO

Reserved for future use.

## C.2—TITLE BLOCKS

Reserved for future use.

## C.3—PLAN SHEET REQUIREMENTS

Reserved for future use.

## C.4—PLAN REVISIONS

Reserved for future use.

## C.5—STANDARD NOTES

The standard notes listed in this section are up-to-date at the time of publication. For the most up-to-date standard notes, see "NDOT Production" ProjectWise Datasource. It is the designer's responsibility to incorporate the most up-to-date notes in their designs.

A cell was created for each note subsection in the cell libraries named "OBD Front Sheet Notes" and "OBD Geology." A pdf of the cell library for the notes can also be found under Standard Plans\Bridge\OpenBridge Documentation.

### C.5.1—Front Sheet Notes

#### C.5.1.1—General

**001** This structure is designed in accordance with the AASHTO LRFD Bridge Design Specifications, XXXXX Edition, including subsequent interim revisions.

**002** The Contractor may substitute any one of the alternate designs shown on the plans for the original design. All quantities are based on the original design and no additions or deductions will be allowed for the use of an alternate design.

**003** The concrete bridge deck is designed by the empirical design method.

**004** The superstructure and substructure are designed for a future wearing surface of three inches of asphalt, 35 psf.

**005** The superstructure is designed for the allowance of stay-in-place forms (5 psf) between girders.

**006** All dimensions shown are in horizontal plane only. No allowances have been made for vertical curve or roadway cross slope.

**007** Unless noted "NOT TO SCALE", all details are drawn using a constant scale in accordance with NDOT Bridge Scaling Policy.

**008** Girder shims that will be provided to the Contractor account for the dead load deflection due to weight of the slab, rail/barrier, wearing surface (if present), and median (if present) only. The Contractor is responsible for making the necessary adjustments for the specific forming system used to achieve the slab grades and elevations shown on the plans.

**009** The shim shots may be taken before or after the turndowns and diaphragms are poured.

**010** The finishing machine shall be supported by the girders of the phase that is being poured. When closure pours are required, the bridge finishing machine shall be supported on the completed Phase I and Phase II slabs. Intermediate cross frames and diaphragms under closure pours shall be left out, or bolts left loose, until after the Phase II pour.

### C.5.1.2—Excavation

**020** The Pay Item, "EXCAVATION (ESTABLISHED QUANTITY)", shall include the channel excavation/fill through the bridge as shown on the plans.

**021** The Pay Item, "EARTHWORK MEASURED IN EMBANKMENT", shall include the channel excavation/fill through the bridge as shown on the plans.

**022** Any excavation required for Riprap below the new channel cross section shall be subsidiary to the respective Riprap Pay Item.

### C.5.1.3—Substructure

**030** All structural steel shall conform to the requirements of ASTM A709, Grade 36.

**031** The Pay Item, "STRUCTURAL STEEL FOR SUBSTRUCTURE", shall include any of the following applicable items: tie rods, turnbuckles, sheet pile bent plates, nose armor angles, steel channel framing at integral Abutments.

**032** Tie Rods shall conform to ASTM A709, Grade 36 steel. Turnbuckles shall conform to ASTM A668, Class C.

**033** After fabrication, all structural steel for substructure, except steel channel framing at integral Abutments, shall be galvanized according to ASTM A123.

### C.5.1.4—Concrete & Reinforcement

**040** Concrete for slab, approach slabs, and rails/barriers shall be Class "47BD", with a 28-day strength of 4,000 psi.

**041** Concrete for slab, approach slabs, diaphragms, turndowns, and rails/barriers shall be Class "47BD", with a 28-day strength of 4,000 psi.

**042** All other cast-in-place concrete shall be Class "47B" concrete, with a 28-day strength of 3,000 psi.

**043** Chamfer all exposed edges of concrete.

**044** Unless noted as "Optional", all construction joints shown are mandatory.

**045** All reinforcing steel shall be epoxy coated and conform to the requirements of ASTM A615, Grade 60 steel.

**046** The minimum clearance, measured from the face of the concrete to the surface of any reinforcing bar, shall be 3" for substructure elements and 2" for superstructure elements, except where otherwise noted.

**047** Field bend and/or clip reinforcing bars to maintain minimum clearance. Epoxy coat clipped ends.

**048** Contractor shall maintain a minimum placement and finishing rate of at least XXX feet/hour along CL Bridge. Should the Contractor not possess the necessary equipment and facilities to maintain the minimum placement and finishing rate, the slab shall be placed in sections. All Positive moment sections of the slab shall be placed followed by placement of the Negative moment sections of the slab. Alternate procedures for placing deck concrete may be submitted for approval by the Contractor.

**049** All Positive moment sections of the slab shall be placed followed by placement of the Negative moment sections of the slab.

### C.5.1.5—Prestressed Girders

**060** The prestressed girders have been designed assuming 100% continuity at the interior supports for live load.

**061** Prestressed concrete girders must be at least 9 days old before they can be set on the Bridge substructure.

**062** Surveying for shim shots, forming the bridge deck, turndowns, diaphragms, and placing construction material on the girders is not allowed until the girders have reached design strength and are at least 30 days old.

**063** All girder lines and spans, between expansion joints, shall be set before the shims are calculated.

**064** Shim shots are valid for 60 days. If the deck is not placed within 60 days, shim shots must be retaken, shims may be adjusted, and all costs shall be subsidiary to the Pay Item "CLASS 47BD-4000 CONCRETE FOR BRIDGE".

**065** The Contractor must provide any temporary intermediate diaphragms and/or bracing necessary to provide lateral and torsional stability for the girders during construction of the concrete slab.

**066** The temporary intermediate diaphragms/bracing shall be removed after the concrete slab has attained 75% of its design strength. The cost for furnishing, installing, and removing the temporary intermediate diaphragms and/or bracing shall be subsidiary to the Pay Item, "CLASS 47BD-4000 CONCRETE FOR BRIDGE".

### C.5.1.6—Steel Girders

**080** All structural steel for rolled beams, stiffeners, separators, and all splice material shall conform to the requirements of ASTM A709, Grade 50W weathering steel.

**081** All structural steel for girder flanges, webs, stiffeners, separators, and all splice material shall conform to the requirements of ASTM A709, Grade 50W weathering steel.

**082** All structural steel for girder flanges, webs and splice material marked "HPS" shall conform to the requirements of ASTM A709, Grade 70W High Performance Steel. All other structural steel shall conform to the requirements of ASTM A709, Grade 50W.

**083** Nuts, bolts, and washers used in the assembly of weathering steel shall be Type 3.

**084** All bearing stiffeners and girder ends, except at field splices, shall be vertical after final erection. All other stiffeners and all field splices shall be normal to the top flange.

**085** During girder fabrication, the flanges at the splice must line up within 1/8" of parallel to the adjacent flanges without applying external force before the splice is drilled.

**086** Where Charpy V-notch testing is required the impact energy requirements shall be determined using Temperature Zone 2.

**087** All rolled beams shall be placed with mill camber upwards.

**088** The Contractor may eliminate any bolted field splice and/or butt welded flange splice by extending the heavier of the two sections so connected. The Contractor shall make all necessary adjustments in bearings and bearing seat elevations caused by these changes. These changes and a revised blocking diagram shall be shown on the shop plans and will be subject to approval by the Engineer. No change in the contract price or quantities will be made for this change.

**089** As an alternate design, all intermediate stiffener plates may be omitted if X" web plates are used in place of X" web plates shown.

**090** Butt splices will be permitted for flange or web plates exceeding 60 feet in length. The locations of the splice shall be shown on the shop plans and will be subject to approval by the Engineer.

**091** During girder fabrication, the final camber tolerance shall not exceed those in Table 5.3 of AWS D1.5. "S" is the length of girder between splices.

**092** Where the entire slab is not expected to be placed in one day, the Contractor shall submit an alternate proposed slab pouring sequence to the Bridge Division at the preconstruction conference so that new camber and shims may be calculated.

**093** All fasteners shall be 7/8" Φ high strength bolts, ASTM F3125 Gr. A325. Fasteners for flange splices shall be supplied with sufficient grip length to exclude threads from the shear planes. All other fasteners (web splices and separator connections) may be detailed with the threads included in the shear planes.

**094** Field tack welding of form hangers or miscellaneous hardware to any part of the steel girder, except for shear connectors, shall be prohibited.

**095** When assembling the girders, they shall be set according to the blocking diagram before any bolts are tightened to a snug-tight condition.

**096** Field splices shall be clean and free of all foreign matter before field assembly. The plates shall be in full contact when the bolts are tightened to a snug-tight condition.

**097** The Contractor must provide any temporary bracing required to support the girder web and flanges against all torsional or lateral forces until the structure is fully erected. The girders with cross-frames for this bridge are designed to resist torsional and lateral forces caused by temporary construction loads applied to the fully erected steel framework prior to achieving composite action with the deck.

**098** Girders and cross-frames or diaphragms are to be detailed, fabricated and erected for a no load fit (NLF) condition.

**099** Girders and cross-frames or diaphragms are to be detailed, fabricated and erected for a steel dead load fit (SDLF) condition.

### C.5.1.7—Miscellaneous

**110** All materials, equipment, tools, labor, and incidentals necessary to complete the work, not paid for directly, shall be considered subsidiary to other items for which payment is made.

**111** Details, quantities, or information for all Group 9 items contained in these bridge plans are for use "BY OTHERS."

**112** Membranes are paid for by the plan view area of covered deck and approaches.

**113** For integral abutments: No form work, reinforcing steel, or construction loads shall be placed on the girders (concrete girders need to be 30 days old and have reached their design strength) until the abutment concrete has set for 72 hours or reached a minimum compressive strength of 2,000 psi.

**114** See Roadway Plans and Special Provisions for details and information regarding optional Contractor's Access Bridge or Access Crossing.

### C.5.1.8—Repair/Rehab

**120** Before ordering any materials, the Contractor shall make a detailed field inspection of the structure verifying all dimensions and reporting to the Engineer any discrepancies between the field measurements and those shown on the plans.

**121** All materials removed shall become the property of the Contractor and shall be removed from the project site.

**122** The State does not guarantee that these repair plans or the As-built plans depict the actual site conditions and shall not be liable for any discrepancies.

**123** Dimensions shown were obtained from the as-built Plans. The Engineer shall establish control points from the existing structure as needed.

**124** The Contractor shall place a 1" deep saw cut at the limits of concrete removal to facilitate a clean, smooth line when breaking back existing concrete.

**125** All existing concrete surfaces to be in contact with the new construction shall be thoroughly roughened and cleaned before placing any new concrete.

**126** Existing unbroken concrete surfaces to be in contact with the new concrete shall be scarified to an amplitude of ¼".

**127** Use surface saturated dry condition when placing new concrete against old concrete.

**128** Damage to existing structures, consequent to the Contractors operations, shall be repaired at the Contractor's expense, under the direction of the Engineer.

**129** Actual field conditions may require repair more or less than what is depicted in the plans. The final areas to be repaired shall be determined by the Engineer. The Bridge Office shall be notified when field conditions impede the implementation of these plans or vary significantly from what is shown.

### C.5.1.9—Utilities

**140** (Utility Company) shall furnish all PVC sleeves, conduit, inserts, and hardware required for the utility attachment to the bridge. All material to be installed by the Bridge Contractor shall be delivered to the bridge site by the utility company within 72 hours after notification from the Bridge Contractor. The contact person for (Utility Company) is XXXXX and can be reached at (XXX) XXX-XXXX.

**141** The Contractor shall install the sleeves and inserts as shown on the plans. The Contractor shall install the conduit from the face of the abutment to the toe of the slopes under the approach slabs but will not be required to install the hangers and conduit between abutments. The installation by the Bridge Contractor will not be paid for directly but shall be subsidiary to the Pay Item, "CLASS 47BD-4000 CONCRETE FOR BRIDGE".

## C.5.2—Geology Sheet Notes

### C.5.2.1—General

**150** All pile spacing is given at the bottom of concrete.

**151** Piers/Bents are designed for scour to Elev. XXXX.XX for 100-Year Flood. Piers/Bents are checked for scour to Elev. XXXX.XX for 500-Year Flood.

**152** Abutment piling followed by the letter "B" shall be battered at X:12.

**153** Pier/Bent piling followed by the letter "B" shall be battered at X:12.

### C.5.2.2—Borings

**160** The borings, as logged on the plans, represent the character of the subsoil at the location indicated. No guarantee is made that the subsoil conditions vary uniformly between or outside the given location.

**161** Figures beside the column of borings indicate the number of blows required to drive a standard penetrometer, of 2" O.D., the second and third 6 inches using a 140 lb. weight falling 30 inches, in accordance with ASTM D1586 procedures.

**162** * indicates refusal, greater than 50 blows in 6 inches

### C.5.2.3—Bearing Piles

**170** Structural steel for all "H" piles shall conform to ASTM A709, Grade 50.

**171** Prefabricated cast steel points will be required on all HP piles in this structure. They shall conform to the requirements of ASTM A27 Grade 70-36 or ASTM A148 Grade 90-60 and be listed on the NDOT Approved Products List.

**172** Concrete piling shall be prestressed concrete piles, Type I.

**173** All concrete for prestressed concrete bearing piles shall have a minimum 28-day compressive strength of 5,000 psi.

**174** As alternate, cast-in-place concrete piles may be used, provided that the Contractor shall be responsible for furnishing piling of sufficient length to obtain the penetration and bearing value required by the Geotechnical Engineer.

**175** All concrete for cast-in-place concrete piles shall be Class "47B" with a minimum 28-day compressive strength of 3,000 psi and 6" to 8" slump. The slump will be increased by adding plasticizer as required.

**176** All exposed pipe piles shall be filled with concrete. This concrete shall be Class "47B" with a minimum 28-day compressive strength of 3,000 psi. This concrete shall be subsidiary to the Pay Item, "PIPE PILING".

### C.5.2.4—Test Piles

**190** Test piles shall be driven, as shown in the TEST PILE DATA table.

**191** Pile order lengths, except for those shown for the test piles, are tentative. The final order lengths shall be based on the results obtained from the test pile driving.

**192** The driving of the test pile will be monitored with a Pile Driving Analyzer. The use of the Pile Driving Analyzer will require the Contractor to set up the hammer for driving. The Contractor shall bolt two accelerometers and two strain transducers to the pile before driving is started.

**193** The holes or anchors for the accelerometers and strain transducers will have been predrilled by Department personnel while the pile is still on the ground. The Contractor may be required to stop the hammer for wave speed determination after the first few blows.

**194** The Contractor shall drive the pile until the transducers are near the surface of the ground, or as directed by the Engineer, at which time the Contractor shall stop the hammer for the removal of the accelerometers and strain transducers. The Contractor shall then continue driving the pile to cut-off or as directed by the Engineer.

**195** The time delay in driving each pile being monitored by the Pile Driving Analyzer will normally range from 30 to 60 minutes.

**196** The Contractor shall provide access to the pile driving area for the Engineer's equipment vehicle (light truck). The work performed by the Contractor, in conjunction with the use of the Pile Driving Analyzer, as described herein, shall not be paid for directly, but shall be considered subsidiary to items for which direct payment is made.

**197** Final order lengths will be provided by the Engineer to the Contractor within three working days after the test pile driving is complete.

### C.5.2.5—MSE Wall Piling

**210** Abutment and grade beam piling may be driven before or after the construction of the MSE walls.

**211** If the piling are to be driven before the construction of the MSE wall, the Contractor shall place Corrugated Metal Pipe (CMP) sleeves around each piling prior to constructing the wall.

**212** If the piling are to be driven after the construction of the MSE wall, the Contractor shall place CMP sleeves at the exact location of each pile. This ensures that after the completion of the MSE wall, the Contractor can drive the piles through the sleeves.

**213** The CMP sleeves shall be maintained in a plumb position during construction of the MSE wall. Furnishing and placing of the CMP sleeves shall be included as part of the work for the MSE wall.

**214** After all piling for the abutment and grade beam are driven and the MSE wall is complete, the Contractor shall fill the space between the piling and the CMP sleeves with dry, clean sand. Backfilling with sand shall be considered subsidiary to the respective piling Pay Item.

### C.5.2.6—Integral Abutments

**230** All abutment piles, excluding wing pile, shall be started in holes predrilled to Elev. XXXX.XX. The minimum diameter of the holes for the pile shall be XX inches.

**231** Piles shall be placed in the drilled holes, driven to design bearing and the void between the hole wall and the pile shall be backfilled with dry, clean sand. Predrilled holes shall not be backfilled until all abutment and wing piles are driven. Drilling, disposal of removed soil, and providing and backfilling with sand will be considered subsidiary to payment for steel piling.

## C.6—PAY ITEMS

Reserved for future use.

## C.7—PLAN SHEET SCALING

Bridge Plan details should be drawn at full size in OBM design models, and then referenced into the standard NDOT Bridge border (ARCH D, 24 in. × 36 in.) at an appropriate, proportional scale factor. CADD software includes a number of appropriate scales to use. Suggested scale factors are provided in Table C.1.

Table C.1—Common Bridge Detail Scales

| Architectural | | Engineering | |
|---|---|---|---|
| Detail Scale | Master : Ref | Detail Scale | Master : Ref |
| Full Size | 1 : 1 | 1" = 5'-0" | 1 : 60 |
| 6" = 1'-0" | 1 : 2 | 1" = 10'-0" | 1 : 120 |
| 3" = 1'-0" | 1 : 4 | 1" = 20'-0" | 1 : 240 |
| 1 ½" = 1'-0" | 1 : 8 | 1" = 30'-0" | 1 : 360 |
| 1" = 1'-0" | 1 : 12 | 1" = 40'-0" | 1 : 480 |
| ¾" = 1'-0" | 1 : 16 | 1" = 50'-0" | 1 : 600 |
| ½" = 1'-0" | 1 : 24 | 1" = 60'-0" | 1 : 720 |
| ⅜" = 1'-0" | 1 : 32 | 1" = 100'-0" | 1 : 1200 |
| ¼" = 1'-0" | 1 : 48 | 1" = 200'-0" | 1 : 2400 |
| 3/16" = 1'-0" | 1 : 64 | | |
| ⅛" = 1'-0" | 1 : 96 | | |
| 1/16" = 1'-0" | 1 : 192 | | |
| 1/32" = 1'-0" | 1 : 384 | | |

Designers are not limited to these factors and may choose custom scale factors as appropriate. Multiple details can be placed within a border using a scale that best suits the particular detail.

Bridge Standard Note #007 shall be placed on all plans.

## C.7.1—Proportional Bridge Detail

For details scaled into the border in this manner, it will not be necessary to address scale below the title. In the Figure C.1, the detail was placed on the plan sheet at a scale of 1 ½" =1'-0" (it has been reduced in size to fit in this manual).

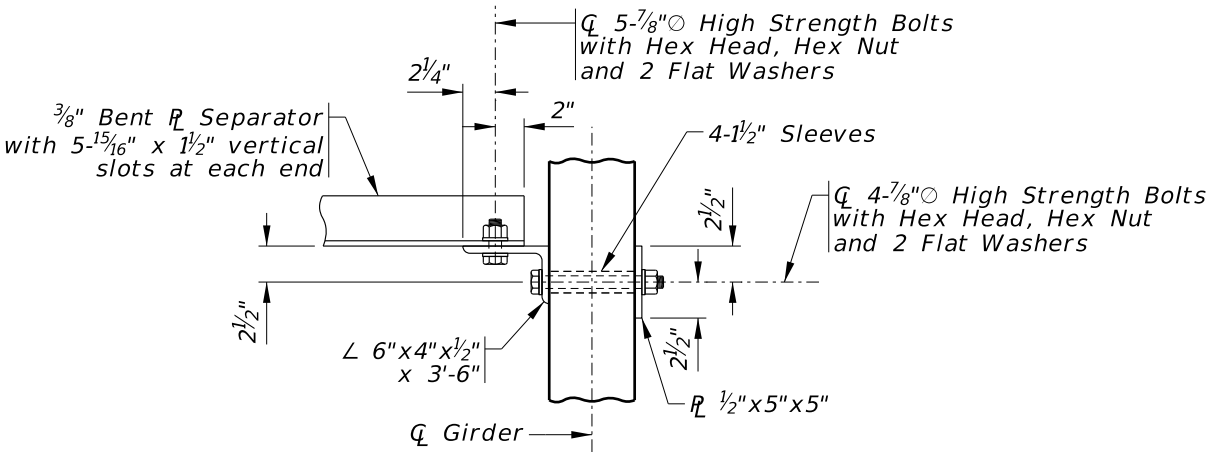


Figure C.1—Example of Proportional Detail

## C.7.2—Non-Proportional Bridge Detail

Only in special cases should the term Not to Scale be placed below the title of the detail. These situations include standard drawings that are meant to apply to a large number of bridge plans, or cases where it is appropriate to exaggerate either the X or Y scale of a drawing for clarity. In Figure C.2, the detail was drawn with scale two times larger in the X direction than it has in the Y direction.

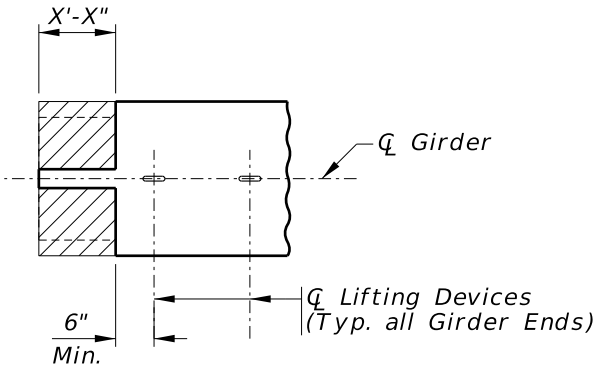


Figure C.2—Example of Non-Proportional Detail

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