# INDEX FOR B24-16 STANDARDS:

<table>
<thead>
<tr>
<th>B24-00-16</th>
<th>TITLE SHEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>B24-00-16</td>
<td>INDEX SHEET</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>GENERAL NOTES SHEET 1 OF 3</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>GENERAL NOTES SHEET 2 OF 3</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>GENERAL NOTES SHEET 3 OF 3</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>GENERAL INFORMATION</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>TYPICAL SECTION</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>BEAM KEYWAY AND BLOCK-OUT DETAILS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>BEAM CHAMFER DETAILS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>11&quot;x17&quot; PPCBB DETAILS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>11&quot;x17&quot; PPCBB DETAILS, 0° SKEW</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>11&quot;x17&quot; PPCBB DETAILS, 15° AND 30° SKEW</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>11&quot;x17&quot; PPCBB DETAILS, REINFORCING BAR LIST</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>11&quot;x17&quot; PPCBB DETAILS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>11&quot;x17&quot; RCBB DETAILS</td>
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<td>B24-00-16</td>
<td>11&quot;x17&quot; RCBB DETAILS, 0° SKEW</td>
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<td>B24-00-16</td>
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<tr>
<td>B24-00-16</td>
<td>11&quot;x17&quot; RCBB DETAILS</td>
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<tr>
<td>B24-00-16</td>
<td>BEARING DETAILS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>BRIDGE RAIL POST DETAILS SHEET 1 OF 2</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>BRIDGE RAIL POST DETAILS SHEET 2 OF 2</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>SUBDRAIN DETAILS SHEET FILE WINGS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>SUBDRAIN DETAILS, CONCRETE WINGS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>BRIDGE RAIL JOINING</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>ABUTMENT BACKFILL DETAILS SHEET FILE WINGS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>ABUTMENT BACKFILL DETAILS, CONCRETE WINGS</td>
</tr>
<tr>
<td>B24-00-16</td>
<td>INDEX SHEET</td>
</tr>
</tbody>
</table>
SPECIFICATIONS:

**DESIGN:**
ASSUMED LIFETIME SERIES OF 2035 EXCEPT AS NOTED ON THE PREPRINTED CONCRETE BEAM SHEETS.

**CONSTRUCTION:**
IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION SERIES 2015, PLUS APPLICABLE GENERAL SUPPLEMENTAL DESIGN STANDARDS, SPECIFICATIONS, DRAWING SHEETS, AND SPECIAL PROVISIONS SHALL APPLY TO CONSTRUCTION WORK ON THIS PROJECT.

**DESIGN STRESSES:**

**DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH THE ASSUMED LIFETIME SERIES OF 2035:**

- High Strength Steel
- Concrete

**DESIGN STRESS FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH THE LATEST REVISIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION:**

- Masonry
- Aluminum

**ENGLISH REINFORCING STEEL RECEIVED IN THE FIELD MAY DISPLAY THE FOLLOWING:**

- Bar Diameter
- Bar Designation

**EQUIVALENT TO THE BAR DIAMETER IN MILLIMETERS.**

**BAR DESIGNATION**

<table>
<thead>
<tr>
<th>Bar Designation</th>
<th>10</th>
<th>13</th>
<th>16</th>
<th>19</th>
<th>22</th>
<th>25</th>
<th>29</th>
<th>32</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEPTH</strong></td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
<td>A6</td>
<td>A7</td>
<td>A8</td>
<td>A9</td>
<td>A10</td>
</tr>
<tr>
<td><strong>WEIGHT</strong></td>
<td>B1</td>
<td>B2</td>
<td>B3</td>
<td>B4</td>
<td>B5</td>
<td>B6</td>
<td>B7</td>
<td>B8</td>
<td>B9</td>
</tr>
<tr>
<td><strong>WIDTH</strong></td>
<td>C1</td>
<td>C2</td>
<td>C3</td>
<td>C4</td>
<td>C5</td>
<td>C6</td>
<td>C7</td>
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<td>D1</td>
<td>D2</td>
<td>D3</td>
<td>D4</td>
<td>D5</td>
<td>D6</td>
<td>D7</td>
<td>D8</td>
<td>D9</td>
</tr>
</tbody>
</table>

**NOTES TO DESIGNERS:**

**GENERAL NOTES:**

1. BOX BEAM BRIDGES WITH CAST-IN-PLACE CONCRETE ABUTMENTS (SHEET PILE WINGS (0° SKEW ONLY) OR CONCRETE WINGS (0°, 15°, 30° SKEWS))

2. BOX BEAM BRIDGES WITH PRECAST CONCRETE ABUTMENTS (SHEET PILE WINGS (0° SKEW ONLY) OR CONCRETE WINGS (0°, 15°, 30° SKEWS))

3. PRESTRESSED AND NON-PRESTRESSED CONCRETE BOX BEAMS

**OTHER SUBMITTALS:**

THE CONTRACTOR SHALL PROVIDE SUBMITTALS FOR THE FOLLOWING ITEMS SHOWN IN THE TABLE BELOW.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRECAST CONCRETE MIX DESIGN</td>
</tr>
<tr>
<td>2</td>
<td>SELF-CONSOLIDATING HIGH EARLY STRENGTH CONCRETE MIX DESIGN</td>
</tr>
<tr>
<td>3</td>
<td>ULFPC MIX DESIGN, PLACEMENT PLAN AND LIST OF SIMILAR PROJECTS</td>
</tr>
<tr>
<td>4</td>
<td>QUALITY CONTROL PLAN ALTERNATE SITE CASTING</td>
</tr>
<tr>
<td>5</td>
<td>LIFTING LOOP PATH AND STRUCTURAL REPAIR PROCEDURES</td>
</tr>
<tr>
<td>6</td>
<td>MATERIAL PROPERTY CERTIFICATION FOR HIGH MOLECULAR WEIGHT METHACRYLATE (FOR REPAIR OF LEAKING BEAM JOINTS)</td>
</tr>
</tbody>
</table>

**TOLERANCES:**

**BOX BEAM DIMENSIONAL TOLERANCES**

<table>
<thead>
<tr>
<th>Item</th>
<th>Tolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH OF BEAM</td>
<td>±1/4&quot;</td>
</tr>
<tr>
<td>DEPTH OF BEAM</td>
<td>±1&quot;</td>
</tr>
<tr>
<td>FLANGE WIDTH</td>
<td>±1/2&quot;</td>
</tr>
<tr>
<td>FLANGE THICKNESS EXCLUDING FITTINGS</td>
<td>±1/4&quot;</td>
</tr>
<tr>
<td>ANGLE OF BEAM WALLS</td>
<td>±1/2°</td>
</tr>
<tr>
<td>HEIGHT OF BOX</td>
<td>±1/2&quot;</td>
</tr>
<tr>
<td>DEViation FROM VERTICAL</td>
<td>±1/2&quot;</td>
</tr>
<tr>
<td>DEVIATION FROM SKEW</td>
<td>±0.5°</td>
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</table>

**BOX BEAM ACCESSORY TOLERANCES**

<table>
<thead>
<tr>
<th>Item</th>
<th>Tolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSITION OF RAIL POST ANCHORS</td>
<td>±1/4&quot;</td>
</tr>
<tr>
<td>POSITION OF LIFTING DEVICES</td>
<td>±1/2&quot;</td>
</tr>
<tr>
<td>POSITION OF DECK</td>
<td>±1/2&quot;</td>
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</tbody>
</table>

**HORIZONTAL SKEW:**

<table>
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<tr>
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<th>Tolerances</th>
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<tbody>
<tr>
<td>7° PER 10'-0</td>
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</table>

**VERTICAL SKEW DEPARTURE:**

<table>
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<tr>
<th>Item</th>
<th>Tolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMEL DEVIATION FROM DESIGN</td>
<td>±1/2&quot;</td>
</tr>
<tr>
<td>PRECAST STRUCTURE ELEMENT TOLERANCES</td>
<td>±1/4&quot;</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

DECEMBER 2016

B24-02-16
PRECAST CONCRETE ELEMENT NOTES:

A. CONCRETE:

1. Concrete materials for precast concrete elements shall be acquired at a preapproved facility in accordance with the material specifications for precast concrete elements. Materials shall be in accordance with the preapproved specifications. Concrete mix design must be approved by the engineer prior to concrete placement.

2. Self-consolidating concrete for precast elements shall be placed in accordance with the preapproved specifications. Minimum 28-day compressive strength shall be 5000 psi. Minimum 7-day compressive strength shall be 4000 psi. Minimum 6-hour compressive strength shall be 2500 psi.

B. HANDLING AND TRANSPORTATION:

1. After concrete placement, lifting and handling of precast elements shall be by crane. Proper supports and equipment must be provided between individual precast elements. Transportation must be in accordance with applicable state and federal regulations.

2. No more than two shim pads shall be placed at any one location of the precast element. Neoprene shim pads shall be used between the bearing and the precast element. Alignment and grade within specified tolerances. Proper support equipment is required. Alignment and grade shall be checked after installation.

C. TEMPORARY SUPPORTS AND/or BRACINGS:

1. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures. Temporary supports and/or bracings shall be provided to facilitate the contractor's intended temporary placement procedures.

D. CONSTRUCTION:

1. Precast concrete elements shall be constructed by a preapproved contractor in accordance with the preapproved specifications. Precast concrete elements shall be placed in accordance with the preapproved specifications. Precast concrete elements shall be placed in accordance with the preapproved specifications. Precast concrete elements shall be placed in accordance with the preapproved specifications. Precast concrete elements shall be placed in accordance with the preapproved specifications. Precast concrete elements shall be placed in accordance with the preapproved specifications. Precast concrete elements shall be placed in accordance with the preapproved specifications. Precast concrete elements shall be placed in accordance with the preapproved specifications.

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PRECAST CONCRETE ELEMENT NOTES (CONT):
A. GENERAL PROCEDURES FOR INSTALLATION OF PRECAST AND PRESTRESSED BOX BEAM ELEMENTS

1. PRECAST BOX BEAMS SHALL BE PLACED IN THE CASTING BEDS IN THE ORDER DESIGNATED ON THE DESIGN PLANS.

2. ALL REINFORCING STEEL TO BE EMBEDDED IN CONCRETE SHALL BE BURIED IN MOLDED CONCRETE AT THE PLACEMENT LOCATION.

3. CONCRETE PLACEMENT AND CONSOLIDATION:
   a. The producer shall utilize a procedure recommended by the ACI Committee 201 and the producer shall submit a plan to the engineer for approval.
   b. The producer shall ensure that no voids or honeycombs are formed in the concrete.
   c. The producer shall submit a report to the engineer on the frequency and procedures for physical testing of concrete, including air entrainment testing, slump testing, and concrete cylinder production / testing.

4. CONCRETE CURING:
   a. The producer shall submit a plan to the engineer that includes the procedures for curing the precast concrete elements.
   b. The producer shall ensure that the concrete is cured for a minimum of 28 days.
   c. The producer shall ensure that the curing methods used do not cause damage or permanently deform the precast concrete elements.

5. CONCRETE PLACEMENT AND CONSOLIDATION:
   a. The producer shall ensure that the concrete is placed in the casting bed in a manner that avoids voids or honeycombs.
   b. The producer shall submit a report to the engineer on the frequency and procedures for physical testing of concrete, including air entrainment testing, slump testing, and concrete cylinder production / testing.

6. CONCRETE FABRICATION:
   a. The producer shall ensure that all reinforcement is properly placed and fastened.
   b. The producer shall ensure that the concrete is properly cured and that no voids or honeycombs are formed in the concrete.
   c. The producer shall submit a report to the engineer on the frequency and procedures for physical testing of concrete, including air entrainment testing, slump testing, and concrete cylinder production / testing.

7. CONCRETE PLACEMENT AND CONSOLIDATION:
   a. The producer shall ensure that the concrete is placed in the casting bed in a manner that avoids voids or honeycombs.
   b. The producer shall submit a report to the engineer on the frequency and procedures for physical testing of concrete, including air entrainment testing, slump testing, and concrete cylinder production / testing.

ALTERNATE SITE CASTING NOTES:

1. THE CONTRACTOR MAY ELECT TO FABRICATE NON-PRESTRESSED PRECAST CONCRETE BOX BEAMS AT AN ALTERNATE SITE DETERMINED BY THE CONTRACTOR, IN LIEU OF FABRICATING THESE COMPONENTS AT A PREQUALIFIED FABRICATION PLANT. ALTERNATE SITE CASTING SHALL BE SUBJECT TO THE FOLLOWING:
   a. All components fabricated at the alternate site shall meet the requirements of the standard specifications.
   b. The producer shall submit a plan to the engineer for approval.
   c. The producer shall ensure that all reinforcement is properly placed and fastened.
   d. The producer shall ensure that the concrete is properly cured and that no voids or honeycombs are formed in the concrete.
   e. The producer shall submit a report to the engineer on the frequency and procedures for physical testing of concrete, including air entrainment testing, slump testing, and concrete cylinder production / testing.

2. CASTING BEDS SHALL BE PROPERLY CONSTRUCTED AND SUPPORTED SO THAT UNDER THE WEIGHT OF THE CONCRETE AND FORMS, THERE SHALL BE NO VERTICAL DEFORMATION OF THE BED.

3. THE PRODUCER OF THE PRECAST ELEMENTS SHALL PROVIDE TECHNICAL PERSONNEL, EXPERIENCED AND SKILLED IN THE APPLICATION OF PRECAST CONCRETE ELEMENTS, TO OVERSEE THE PRODUCTION, FABRICATION AND CONSTRUCTION OF THE PRECAST CONCRETE BOX BEAMS.

4. THE PRODUCER SHALL SUBMIT A PLAN TO THE ENGINEER THAT INCLUDES THE FREQUENCY AND PROCEDURES FOR PHYSICAL TESTING OF CONCRETE, INCLUDING AIR ENTRAINMENT TESTING, SLUMP TESTING, AND CONCRETE CYLINDER PRODUCTION / TESTING.

5. CONCRETE CURING:
   a. The producer shall ensure that the concrete is properly cured and that no voids or honeycombs are formed in the concrete.
   b. The producer shall submit a report to the engineer on the frequency and procedures for physical testing of concrete, including air entrainment testing, slump testing, and concrete cylinder production / testing.

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   c. The producer shall submit a report to the engineer on the frequency and procedures for physical testing of concrete, including air entrainment testing, slump testing, and concrete cylinder production / testing.
EXAMPLES OF BRIDGE ELEVATION CALCULATIONS:

EXAMPLE NO. 1: Bridge located on a constant grade, for this example the grade is -2.90%, with the elevation of 600.00 and a P.I. elevation of 594.07. The Bridge length is 70'-0 to Abut. Skew angle correction:

- Abutment No. 1:
  - Shift X: 2'-10"
  - Skew angle correction:
    - Top of Abut. Elev. = 594.07
  - Abutment Crown correction:
    - Top of Abut. Elev. = 594.07

EXAMPLE NO. 2: Bridge located on a parabolic vertical curve, for this example, the vertical curve is as shown below.


diagram

EXAMPLE NO. 3: Bridge located on a parabolic vertical curve, for this example, the vertical curve is as shown below.


diagram

NOTES TO DESIGNER:

- The designer shall obtain soil borings at each abutment to evaluate whether the required steel sheet piling embedment can be obtained, and to assess the construction considerations for the project.
- Additionally, the designer shall verify the soil properties obtained from the soil borings for the actual bridge site will not affect the abutment elevations required for the steel sheet piling.
- The following soil conditions were assumed in the design of the steel sheet piling:
  - Backfill material:
    - Small consist of well drained granular material with less than 5% fines.
    - Material shall consist of gradation as noted on backfill details sheet.
    - Backfill shall be placed as noted on abutment backfill details sheet. (see)
  - Unit weight of granular backfill assumed to be 120pcf.
  - Strength and unit weight are considered conservative and applicable if loose alluvial sand comprises the soils.
  - Foundation soils:
    - Consists of either alluvium, loess, or glacial till, all of which will be comprised of clay soils.
    - Unit weight of 120pcf.
  - Design was conservatively modeled assuming a long term effective strength of equal to 29 degrees.

FOUNDATION SOILS
- Backfill shall be placed as noted on abutment backfill details sheet (see)
- Material shall consist of gradation as noted on backfill details sheet, 0° skew.
- Backfill shall be placed as noted on abutment backfill details sheet (see)
- Material shall consist of gradation as noted on backfill details sheet, 0° skew.

ABUTMENT NO. 1 ELEVATIONS DIAGRAM

ABUTMENT NO. 1 ELEVATIONS DIAGRAM
6 BOX BEAMS AT 4'-0 = 24'-0 ROADWAY

SECTION NEAR ABUTMENT WITH SHEET PILE WINGS

SECTION NEAR ABUTMENT WITH CONCRETE WINGS

ANCHOR BOLT SWEDGE DETAIL

ANCHOR BOLT SWEDGE DETAIL

RETAI NER ANGLE NOTES:

ANCHOR BOLTS, NUTS AND WASHERS SHALL MEET THE REQUIREMENTS OF IN 451.08 AND
SHALL BE GR ADE 36 AND GALVANIZED.

ANGLES AND PLATES SHALL COMPLY WITH ASTM A709, GRADE 36.

ANCHOR BOLTS SHALL BE SET IN ACCORDANCE WITH ARTICLE 2405.03, H, 2 OF THE
STANDARD SPECIFICATIONS.

RETAI NER ANGLE ASSEMBLIES SHALL BE GALVANIZED, ALL MOLDING SHALL BE COMPLETED
PRIOR TO GALVANIZING. GALVANIZING SHALL BE IN ACCORDANCE WITH ASTM AZ5 AND
ARTICLE 4100.07, E OF THE STANDARD SPECIFICATIONS.

ALL COSTS FOR FURNISHING AND INSTALLING THE RETAINER ANGLES AND ANCHOR BOLTS
SHALL BE INCLUDED IN THE PRICE BID FOR "STRUCTURAL STEEL".

Weight for four Retainer Angle Assemblies = 72 lbs.

IOWA DOT
Highway Division

STANDARD DESIGN - 24'-0 ROADWAY, SINGLE SPAN
CONCRETE BOX BEAM BRIDGES
DECEMBER, 2016

B24-06-16

TOP OF ABUTMENT

1/4" HOLE IN L6x4x2" WITH HEX NUT & WASHER

E 45° CLIP

SECCIÓN REDONDA

INDENTATIONS MAY BE EITHER
FORMED BY DISPLACEMENT
OF METAL IN A STAGGERED
PATTERN.

INDENTATION SHALL BE
FORMED BY DEFORMATION
IN A STAGGERED PATTERN.
NO CUTTING IS ALLOWED
TO FORM INDENTATIONS.
INDENTATIONS MAY BE EITHER
OBLONG OR ROUND IN SHAPE.

BEAM "A"

BEAM "B"

BEAM "C"

BEAM "D"

BEAM "E"

BEAM "F"

| ROADWAY UNLESS NOTED
SYMMETRICAL ABOUT

CONCRETE BOX BEAM

CONCRETE BOX BEAM

CONCRETE BOX BEAM

CONCRETE BOX BEAM

END OF BEAM

TOP OF ABUTMENT

{` " 45° CLIP
WITH HEX NUT & WASHER

RETAINER ANGLE DETAIL

ANCHOR BOLT SWEDGE DETAIL

(Plan showing skewed case at acute corner)

(Plan showing 0° skew case)

(Plan showing skewed case at obtuse corner)

CONCRETE BOX BEAM

CONCRETE BOX BEAM

CONCRETE BOX BEAM

1"½x1'-0 SWEDGE ANCHOR BOLT

with sheet pile wings

with concrete wings

ELEVATION

TOP OF ABUTMENT

1/4" HOLE IN L6x4x2"

E 45° CLIP

PLAN

PLAN

PLAN

(Showing skewed case at acute corner)

(Showing 0° skew case)

(Showing skewed case at obtuse corner)
Notes:

For detail B, see Sheet B24-08-16. Top of Sheet Piling at Wings to Match Top of Backwall Elevation.
ABUTMENT NOTES:
1. Minimum clear distance from face of concrete to near reinforcing bar is to be 2" unless otherwise noted. Abutment pile caps shall be driven to values shown in the design plans. Construction keyways are to be formed with leveler tool.
2. The backwall shall be placed after the top joints between the beams have been completed.

ABUTMENT PILE PLAN

REAR ELEVATION AT ABUTMENT

PART SECTION THROUGH BACKWALL

PART PLAN VIEW

SECTION A-A

NOTES:
1. 1 1/4" smooth dowels (used) drill a 1 1/4" hole 12" deep into abutment after beams are in place. Use (2) impact rotary drill, place 2 1/2" x 2 1/2" posts (plastic pipe or top of dowel) in mud. Fill hole to depth of 4" with a polymer grout system in accordance with the standard specifications. Fill remainder of hole above plug with non-shrink grout. This dimension may vary. Tilting of the backwall during construction may be necessary to accommodate beam camber and longitudinal space.
2. The spiral at the top of each pile is to be 5 turns of No. 2 bar, 2' diameter, wrapped with 3" x 3" x 3" spacers punched to hold spiral. A for cast-in-place abutment backwall, cast backwall concrete directly against ends of concrete beam.

ABUTMENT DETAILS (CAST-IN-PLACE) 10° SKEW

Sheet Pile Wings 10° Skew

Concrete Box Beam Bridges

Highway Division
## Epoxy Coated Reinforcing Bar List, Cast-in-Place Abutment (Two Abutments)

### Bent Bar Details

| Location | 2'-3 | 3'-0 | 3'-6 | 4'-0 | 5'-0 | 6'-0 | 7'-0 | 8'-0 | 9'-0 | 10'-0 | 11'-0 | 12'-0 | 13'-0 | 14'-0 | 15'-0 | 16'-0 | 17'-0 | 18'-0 | 19'-0 | 20'-0 | 21'-0 | 22'-0 | 23'-0 | 24'-0 | 25'-0 | 26'-0 | 27'-0 | 28'-0 | 29'-0 | 30'-0 |
|----------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 3'-0 | 5g1 | 6d1 | 5c1 | 9c2 | 8f1 | 5p1 | 5c1 | 5c2 | 8f1 | 5p1 | 5c1 | 9c2 | 8f1 | 5p1 | 5c1 | 5c2 | 8f1 | 5p1 | 5c1 | 5c2 | 8f1 | 5p1 | 5c1 | 5c2 | 8f1 | 5p1 | 5c1 | 5c2 | 8f1 | 5p1 | 5c1 | 5c2 |

### Concrete Placement Quantities (Two Abutments)

| Location | 30'-0 | 40'-0 | 50'-0 | 30'-0 | 40'-0 | 50'-0 | 30'-0 | 40'-0 | 50'-0 | 30'-0 | 40'-0 | 50'-0 | 30'-0 | 40'-0 | 50'-0 | 30'-0 | 40'-0 | 50'-0 |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Reinforced Concrete Box Beams | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prestressed Pretensioned Concrete Box Beams | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

* Epoxy coating not required.
ABUTMENT NOTES:

- Minimum clear distance from face of concrete to near beam reinforcing bar is to be 2" unless otherwise noted on plans. Abutment piles shall be driven to values shown in the Design Plans.
- Backwall shall be placed after the UHPC joint(s). Construction keyways are to be formed with beveled 2x6's.
- Reinforcing bar is to be 2" unless otherwise noted or shown.
- Minimum clear distance from face of concrete to near beam reinforcing bar is to be 2" unless otherwise noted on plans.
- Normal strength design load (Kips) is not the value used in the field for driving piles.
- This dimension may vary. Tilting of the backwall during construction may be necessary to accommodate beam camber and longitudinal slope. The spiral at the top of each pile to be threaded. 2" turn, with 3.5" x 3

- Spacings punched to hold spiral.
- A 2½" cast-in-place abutment backwall cast backwall concrete directly against ends of concrete beams.
- The abutment piles shall be driven to values shown in the design plans. Backwall shall be placed after the UHPC joint(s). Construction keyways are to be formed with beveled 2x6's. Reinforcing bar is to be 2" unless otherwise noted or shown. Minimum clear distance from face of concrete to near beam reinforcing bar is to be 2" unless otherwise noted on plans.

- Normal strength design load (Kips) is not the value used in the field for driving piles.
- This dimension may vary. Tilting of the backwall during construction may be necessary to accommodate beam camber and longitudinal slope. The spiral at the top of each pile to be threaded. 2" turn, with 3.5" x 3 stainless steel 6g1 x 8f1 (TYP.) piles, double hoop placement at 5p1 (TYP.) 21" common, 3½" diameter, 3" pitch with 3½" x 3½" spaced punched to hold spiral.
- A 2½" cast-in-place abutment backwall cast backwall concrete directly against ends of concrete beams.

- Normal strength design load (Kips) is not the value used in the field for driving piles. This dimension may vary. Tilting of the backwall during construction may be necessary to accommodate beam camber and longitudinal slope. The spiral at the top of each pile to be threaded. 2" turn, with 3.5" x 3 stainless steel 6g1 x 8f1 (TYP.) piles, double hoop placement at 5p1 (TYP.) 21" common, 3½" diameter, 3" pitch with 3½" x 3½" spaced punched to hold spiral.
- A 2½" cast-in-place abutment backwall cast backwall concrete directly against ends of concrete beams.
### Epoxy-Coated Reinforcing Bar List, Cast-In-Place Abutment (Two Abutments)

<table>
<thead>
<tr>
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<th>Material</th>
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<tr>
<td>1-2</td>
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### Concrete Placement Quantities (Two Abutments)

<table>
<thead>
<tr>
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<th>Length</th>
<th>Material</th>
<th>Size</th>
<th>Corrosion Protection</th>
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</tr>
<tr>
<td>1-2</td>
<td></td>
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</tbody>
</table>

### Bent Bar Details

- Footing to Backwall, Horizontal
- Backwall, Horizontal
- Footing, Longitudinal
- Footing End, Horizontal

### Reinforced Concrete Box Beams

- D=4
- 1'-10"

### Pre-Tensioned Prestressed Concrete Box Beams

- Length: 3'-2" 6'" 8" 8"
- Shape: 3'-10"
- Length: 40'-0"

---

**NOTE:** All dimensions are OUT 5p1 5d5 5d2 5c2 5c1 & 5c2 1/28/2016 10:50:26 AM 11/28/2016 10:50:26 AM PREPARED BY: NAME ENGINEER APPROVED BY: BRIDGE ENGINEER LATEST REVISION DATE: DECEMBER, 2016 B24-13-16
ABUTMENT DATA (15° SKEW)

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ABUTMENT DATA (30° SKEW)

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<th>D</th>
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</tbody>
</table>

NOTES:
- Pu, STRENGTH 1 DESIGN LOAD (KIPS) IS NOT THE VALUE USED IN THE FIELD FOR DRIVING PILES.
- NOTE:
- * THIS DIMENSION MAY VARY.  TILTING GROUT.
- ** THIS DIMENSION MAY VARY.  TILTING GROUT.
- *** THIS DIMENSION MAY VARY.  TILTING GROUT.

Abutment Pile Plan

Notes:
- Use low impact rotary drill.  Prior to setting pile, drill a 7" hole with 8'-0" open hole.  Pipe to setting depth of 4" with a polymer grout system in accordance with the standard specifications.  Fill 5" diameter steel pipe filled with grout and 2 1/2" top of beam.  Fill remainder of hole above grout with non-shrink cement.
- Note: strength 1 design load (Kips) is not the value used in the field for driving piles.

Part Section Through Backwall

Part Plan View

ABUTMENT NOTES:
- Maximum clear distance from face of concrete to nearest reinforcing bar in the UHPC beams.  Spacing noted in table.  Abutment piles shall be driven to values shown in the design plans.  Construction keyways are to be formed with leveled 2x6's.  The backwall shall be placed after the UHPC joints between the beams have been complete.
- Minimum clear distance from face of concrete to nearest reinforcing bar in the UHPC beams.  Spacing noted in table.  Abutment piles shall be driven to values shown in the design plans.  Construction keyways are to be formed with leveled 2x6's.  The backwall shall be placed after the UHPC joints between the beams have been complete.

Highway Division

ABUTMENT DETAILS (CAST-IN-PLACE) CONCRETE BOX BEAMS 15° AND 30° SKEW

B24-14-16
## Epoxy Coated Reinforcing Bar List, Cast-In-Place Abutment (Two Abutments)

<table>
<thead>
<tr>
<th>Location</th>
<th>Span</th>
<th>Reinforced Concrete Box Beams</th>
<th>Prestressed Prestressed Concrete Box Beams</th>
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### BENT BAR DETAILS

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<td>3'-3</td>
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<td>6g1</td>
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### Concrete Placement Quantities (Two Abutments)

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### Additional Concrete

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</table>

### Notes:

The additional concrete table lists the additional concrete volume required in each abutment footing based on the roadway grade at the abutment. Additional concrete should be added to the plans for each abutment footing that has 2'-0 or more. The additional concrete values should be excluded for scenarios that have a roadway grade at the abutment. Additional concrete for abutment footing values may be interpreted for grades between the values shown in the table.
**Epoxy Coated Reinforcing Bar List, Cast-In-Place Abutment (Two Abutments)**

**Reinforced Concrete Box Beams**

| BAR    | LOCATION          | SPAN | R | LENGTH | B | HEIGHT | N1 | LENGTH | B | HEIGHT | N2 | LENGTH | B | HEIGHT | N3 | LENGTH | B | HEIGHT | N4 | LENGTH | B | HEIGHT | N5 | LENGTH | B | HEIGHT | N6 | LENGTH | B | HEIGHT | N7 | LENGTH | B | HEIGHT | N8 | LENGTH | B | HEIGHT | N9 | LENGTH | B | HEIGHT | N10 | LENGTH | B | HEIGHT |
|--------|-------------------|------|---|--------|---|--------|----|--------|---|--------|----|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|
| Sc1    | FOOTING, HOIST, EAST | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc2    | FOOTING, HOIST, EAST | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc3    | BACKWALL, VERTICAL | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc4    | BACKWALL, VERTICAL | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc5    | BACKWALL, VERTICAL | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc6    | BACKWALL, VERTICAL | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc7    | BACKWALL, VERTICAL | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc8    | BACKWALL, VERTICAL | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |
| Sc9    | BACKWALL, VERTICAL | 50  | 1 | 2'-0 | 1 | 3'-9 | 3 | 5'-3 | 5 | 8'-4 | 16 | 9'-8 | 16 | 10'-4 | 16 | 11'-0 | 16 | 12'-2 | 16 | 12'-8 | 16 | 13'-4 | 16 | 13'-6 | 16 | 14'-0 | 16 | 14'-6 | 16 | 15'-2 | 16 | 15'-8 | 16 | 16'-0 | 16 | 16'-6 | 16 | 17'-2 | 16 | 17'-8 | 16 | 18'-0 | 16 | 18'-6 | 16 | 19'-2 | 16 | 19'-8 | 16 |

**Concrete Placement Quantities (Two Abutments)**

- **Location**: Highway Division
- **Span**: 30'-10
- **Concrete Box Beams**: B24-16

**Additional Concrete**

**Roadway Grade at Abutment**

- **Epoxy Coating Required**: No

**Notes:**

- The additional concrete volume values required in each abutment footing based on the roadway grade at each abutment. Additional concrete should be added to the plan for each abutment footing that has over 0.5 cubic yards of additional concrete. Values should be excluded for scenarios that have less than 0.5 cubic yards of additional concrete per abutment. Additional concrete for abutment footing values may be interpolated for grades between the values shown in the table.

**Concrete Box Beam Bridges**

**December, 2016**

**IOHADOT Highway**

**B24-16-16**
### Epoxy Coated Reinforcing Bar List

#### Cast-in-Place Abutment Backwall (Two Abutments)

<table>
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<th>Location</th>
<th>Shape</th>
<th>No.</th>
<th>Length</th>
<th>Height</th>
<th>No.</th>
<th>Length</th>
<th>Height</th>
<th>No.</th>
<th>Length</th>
<th>Height</th>
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<tbody>
<tr>
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<td>Backwall, Horizontal</td>
<td>6d1</td>
<td>12</td>
<td>31'-8</td>
<td>396</td>
<td>12</td>
<td>31'-8</td>
<td>396</td>
<td>12</td>
<td>31'-8</td>
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</table>

**NOTES:**
- All dimensions are out to out, 5/32 in. percent.
- Notes.

#### Precast Abutment Footing (One Footing)

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<th>Length</th>
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<tbody>
<tr>
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<td>Footing End, Vertical</td>
<td>6d1</td>
<td>12</td>
<td>31'-8</td>
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<td>12</td>
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<td>12</td>
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</tbody>
</table>

**NOTES:**
- All dimensions are out to out, 5/32 in. percent.
- Notes.

#### Cast-in-Place Concrete Placement Quantities

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<tr>
<th>Location</th>
<th>Reinforced Concrete</th>
<th>Prestressed Concrete</th>
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<td></td>
</tr>
<tr>
<td>Location 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- High early strength self-consolidating concrete.
CONCRETE BOX BEAM BRIDGES
HIGHWAY DIVISION

STANDARD DESIGN - 24'-0 ROADWAY, SINGLE SPAN
DECEMBER, 2016

ABUTMENT DATA (0° SKEW)

<table>
<thead>
<tr>
<th>REAR ELEVATION AT ABUTMENT</th>
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</thead>
</table>

PART PLAN VIEW

PART SECTION THROUGH BACKWALL

ABUTMENT PILE PLAN

NOTES:
- 1 1/2" SMOOTH DOWELS (A36) TO BE SET INTO TOP OF PILE AFTER BEAMS ARE IN PLACE. FREE CEMENT PLUG ON TOP OF DOWEL, FILL REMAINDER OF HOLE ABOVE PLUG WITH NON-SHRINK GROUT.
- THIS CONDITION MAY VARY. FILLING OF THE BACKWALL DURING CONSTRUCTION MAY BE NECESSARY TO ACOMMODATE BEAM CAMBER AND LONGITUDINAL GRADE.
- CONCRETE WINGS WITH 2" OF GROUT. POLYSTYRENE PLUG ON TOP OF DOWEL.

CONCRETE BOX BEAMS
PRESTRESSED PRESTRESSED CONCRETE BOX BEAMS

|NOTE| 1 1/2" SMOOTH DOWELS (A36) TO BE SET INTO TOP OF PILE AFTER BEAMS ARE IN PLACE. FREE CEMENT PLUG ON TOP OF DOWEL, FILL REMAINDER OF HOLE ABOVE PLUG WITH NON-SHRINK GROUT. THIS CONDITION MAY VARY. FILLING OF THE BACKWALL DURING CONSTRUCTION MAY BE NECESSARY TO ACOMMODATE BEAM CAMBER AND LONGITUDINAL GRADE. CONCRETE WINGS WITH 2" OF GROUT.|

CONCRETE BOX BEAMS

|NOTE| 1 1/2" SMOOTH DOWELS (A36) TO BE SET INTO TOP OF PILE AFTER BEAMS ARE IN PLACE. FREE CEMENT PLUG ON TOP OF DOWEL, FILL REMAINDER OF HOLE ABOVE PLUG WITH NON-SHRINK GROUT. THIS CONDITION MAY VARY. FILLING OF THE BACKWALL DURING CONSTRUCTION MAY BE NECESSARY TO ACOMMODATE BEAM CAMBER AND LONGITUDINAL GRADE. CONCRETE WINGS WITH 2" OF GROUT.|

CONCRETE BOX BEAMS

|NOTE| 1 1/2" SMOOTH DOWELS (A36) TO BE SET INTO TOP OF PILE AFTER BEAMS ARE IN PLACE. FREE CEMENT PLUG ON TOP OF DOWEL, FILL REMAINDER OF HOLE ABOVE PLUG WITH NON-SHRINK GROUT. THIS CONDITION MAY VARY. FILLING OF THE BACKWALL DURING CONSTRUCTION MAY BE NECESSARY TO ACOMMODATE BEAM CAMBER AND LONGITUDINAL GRADE. CONCRETE WINGS WITH 2" OF GROUT.|

CONCRETE BOX BEAMS

**EPOXY COATED REINFORCING BAR LIST, PRECAST ABUTMENT BACKWALL (0° SKEW, ONE UNIT)**  

**INCLUDED IN BID ITYM PRECAST ABUTMENT BACKWALL CONCRETE WINGS, EACH**

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<thead>
<tr>
<th>SPAN</th>
<th>LOCATION</th>
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<th>THREADED PRESTRESSED CONCRETE BOX BEAMS</th>
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<tr>
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<td>10</td>
<td><strong>C</strong></td>
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<tr>
<td>2'-0</td>
<td>12</td>
<td><strong>D</strong></td>
<td><strong>D</strong></td>
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</table>

**ABUTMENT NOTES:**  
Minimum clear distance from face of concrete to rear reinforcing bar is to be 27”.  
Unless otherwise noted or shown, abutment files shall be given to values shown in the design plans.  
The backwall shall be placed after the caps joints between the backwall and abutment concrete.  
Mechanical couplers shall be epoxy coupled.  
The mechanical couplers shall meet the requirements of the mechanical coupler.  
Except where the mechanical splice is required, the mechanical splice size shall be equal to the footing size of the construction joint.  
The precast backwalls shall be fitted to the precast abutments in the precaster's yard or upon arrival at the jobsite.  
In the event that the precast backwalls shall be shipped to the jobsite, the jobsites shall have 48 hours notice to view and approve the connected precast pieces before they are shipped to the field.

---

**FOOTING BENT BAR DETAILS**

**THREADED HEARTICAL COUPLER**

**NOTE:** All dimensions are out to 0.2” or 0.5” dia diameter.

**BACKWALL BENT BAR DETAILS**

**THREADED END**

**LENGTH**

**B37**

---

**STANDARD DESIGN**

24'-0 ROADWAY, SINGLE SPAN

**CONCRETE BEAM BRIDGES**

**DECEMBER, 2016**

**ABUTMENT DETAILS (PRECAST) CONCRETE WINGS QUANTITIES 0° SKEW**

**B24-20-16**
## Epoxy Coated Reinforcing Bar List, Precast Abutment Backwall (One Unit)

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<tr>
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<td>4d4</td>
<td>13</td>
<td>2'-7</td>
<td>50'</td>
</tr>
</tbody>
</table>

**Notes:**
- The epoxy coated reinforcing bars are included in the bid item “Precast Abutment Backwall Concrete Rings.”
- The quantities shown in the table are based on 8d6 bars.

## Epoxy Coated Reinforcing Bar List, Precast Abutment Footing (One Footing)

<table>
<thead>
<tr>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
<th>No.</th>
<th>Length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>4d1</td>
<td>Footing End, Vertical</td>
<td>4d1</td>
<td>13</td>
<td>2'-7</td>
<td>50'</td>
</tr>
<tr>
<td>4d2</td>
<td>Footing End, Vertical</td>
<td>4d2</td>
<td>13</td>
<td>2'-7</td>
<td>50'</td>
</tr>
</tbody>
</table>

**Notes:**
- The epoxy coated reinforcing bars are included in the bid item “Precast Footing Concrete Rings.”

---

## Backwall Bent Bar Details

<table>
<thead>
<tr>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
<th>No.</th>
<th>Length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>4d1</td>
<td>Backwall Vertical Stirrups</td>
<td>4d1</td>
<td>13</td>
<td>2'-7</td>
<td>50'</td>
</tr>
<tr>
<td>4d2</td>
<td>Backwall Vertical Stirrups</td>
<td>4d2</td>
<td>13</td>
<td>2'-7</td>
<td>50'</td>
</tr>
</tbody>
</table>

**Notes:**
- The epoxy coated reinforcing bars are included in the bid item “Precast Abutment Backwall Concrete Rings.”

## Footing Bent Bar Details

<table>
<thead>
<tr>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
<th>No.</th>
<th>Length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>4d1</td>
<td>Footing End, Vertical</td>
<td>4d1</td>
<td>13</td>
<td>2'-7</td>
<td>50'</td>
</tr>
<tr>
<td>4d2</td>
<td>Footing End, Vertical</td>
<td>4d2</td>
<td>13</td>
<td>2'-7</td>
<td>50'</td>
</tr>
</tbody>
</table>

**Notes:**
- The epoxy coated reinforcing bars are included in the bid item “Precast Footing Concrete Rings.”

## Additional Concrete

**Notes:**
- The additional bar lengths listed are used to reinforce the precast concrete elements.
- The quantities shown in the table are based on 8d6 bars.

---

## Backwall Setting Notes

- The bar sleeves shall be set as shown in prebored holes. The sleeve shall be installed in a position that
  aligns with the dowel. The sleeves shall be set before the dowels are installed. The dowels shall be set
  in accordance with the grout manufacturer’s recommendations. The dowels shall be set in accordance
  with the epoxy coated reinforcing bars.

---

## Precast Concrete Quantities

**Notes:**
- The quantities shown in the table are based on 8d6 bars.
- The quantities shown in the table are based on 8d6 bars.

---

## CMP Pile Pocket

**Notes:**
- The CMP pile pockets are included in the bid item “Precast Footing Concrete Rings.”
- The quantities shown in the table are based on 8d6 bars.

---

## Abutment Details (Precast Concrete Rings)

**Notes:**
- The quantities shown in the table are based on 8d6 bars.
- The quantities shown in the table are based on 8d6 bars.
ABUTMENT FOOTING LIFTING LOOP DETAILS

ABUTMENT BACKWALL LIFTING LOOP DETAILS

NOTES:
- Alternate lifting devices and/or attachment points shall be submitted for approval.
- Lifting operations shall be performed in a manner that lifting loops carry loads equally.
- Lifting devices shall be removed after installation and recesses shall be filled with grout.
- All costs associated with lifting devices and filling recesses shall be included in the price bid for the precast components.
**UHPC JOINT NOTES:**

Longitudinal joints between beams shall be constructed of Ultra High Performance Concrete (UHPC). The contractor shall be required to batch and place all UHPC material in accordance with the manufacturer's recommendations and the Ultra High Performance Concrete notes on sheets B24-25-16.

The contractor shall be required to coordinate with the(184,255),(806,348)

**UHPC FORMWORK NOTES:**

Material properties of UHPC vary considerably from conventional concrete, both during the plastic state and at the hardened state. Therefore, these notes shall not apply to additional forms required to enclose the UHPC joint, which are properly sealed and capable of resisting the anticipated form pressures.

The contractor shall ensure that UHPC placement on grade typically requires top forms for containment of the material within the designated placement area. Top forms should resist high hydrostatic pressures due to UHPC materials, unless means to resist the hydrostatic pressure are feasible and may be proposed by the contractor for review. Mechanical inserts in the top of the beams are not allowed. If steel ties are used to tie the forms to the top of the joint, the ties shall be stainless steel.

If dead weight is used to resist the hydrostatic force, a triangular load with a maximum value at the low end of the span shall be applied along the length of the joint, as shown in Table 1. Additionally, point loads with a maximum value of 5% as shown in Table 2 shall be applied at each block-out location. Point loads of other block-outs shall be applied proportionally depending on their location along the span. Dead weights for joints are computed assuming a maximum height of 156 PCF. Dead weights shall be applied to all joints concurrently and shall not be removed until the UHPC joints have attained a minimum required strength of 10 KSI.

**TYPICAL SECTION THRU UHPC JOINT**

Beam strips shown uncompressed for clarity.

| TABLE 1: TRIANGULAR LOAD DEAD WEIGHT "A" ALONG JOINT (PLF) |
|------------------|-------------|-------------|-------------|-------------|-------------|
| BEAM SPAN | 30'-0 | 40'-0 | 50'-0 | 60'-0 | 70'-0 |
| GRADE | 21 | 22 | 23 | 24 | 25 |
| 32 | 22 | 23 | 24 | 25 | 26 |
| 44 | 23 | 24 | 25 | 26 | 27 |
| 52 | 24 | 25 | 26 | 27 | 28 |

**TABLE 2: POINT LOAD DEAD WEIGHT "B" AT JOINT BLOCKOUTS (LBS)**

| BEAM SPAN | 30'-0 | 40'-0 | 50'-0 | 60'-0 | 70'-0 |
| GRADE | 21 | 22 | 23 | 24 | 25 |
| 32 | 22 | 23 | 24 | 25 | 26 |
| 44 | 23 | 24 | 25 | 26 | 27 |
| 52 | 24 | 25 | 26 | 27 | 28 |

**DEAD WEIGHT LOADING DIAGRAM**

**UHPC JOINT QUANTITY TABLE**

<table>
<thead>
<tr>
<th>SPAN FT</th>
<th>TOTAL LBS</th>
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</thead>
<tbody>
<tr>
<td>30</td>
<td>206</td>
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<tr>
<td>40</td>
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<tr>
<td>50</td>
<td>206</td>
</tr>
<tr>
<td>60</td>
<td>206</td>
</tr>
</tbody>
</table>

**DETAIL A**

Shown at roadway crown.

NOTES:

For location of detail A, see sheet B24-06-16.

For keyway joint preparation notes and block-out detail, see sheet B24-26-16.

A thin foam strip with adhesive back.

Maximum distance between foam strips.

**UHPC JOINT DETAILS (SHEET 1 OF 2)**

B24-25-16
ULTRA HIGH PERFORMANCE CONCRETE JOINT FOR CONCRETE BOX BEAM BRIDGE NOTES:

DESCRIPTION:
- Provide all materials, tools, and labor necessary for the performance of the work described in this specification. The Contractor is responsible for the proper placement and curing of Ultra High Performance Concrete (UHPC). The Contractor shall ensure that all testing required for the UHPC meets the specified requirements.

MATERIALS:
- All UHPC shall meet the following requirements at 28 days, unless noted otherwise.

- Minimum compressive strength (C39) 2000 psi
- Flexural strength (C39) 2000 psi
- Chloride ion penetration (AASHTO T259; 1/5 in. depth) <= 200 MM
- Chloride ion penetration (ASTM C1202) <= 200 MM
- Heat-treated
- Heat-treated at a temperature of 1073°C ± 2°C
- Water: Free from foreign materials in amounts harmful to concrete and meeting the following requirements:
  - pH (AASHTO T26) 7.0 - 8.5
  - Calcium carbonate (ASTM C121) 2000 MM
  - Total dissolved solids (ASTM C121) 2000 MM
  - Sulfate content (ASTM C121) 2000 MM
- Potable water obtained from a municipal supply, suitable for drinking, may be accepted without testing.
- Free from rust, scale, and other foreign matter.
- Materials testing:
  - Concrete surface profile texture as required in the design plans.
  - Corrosion procedures, including mixing, casting, and finishing techniques.
  - Quality control / quality assurance procedures for verification of mix uniformity.

QUALIFICATION:
- The Contractor shall submit to the Engineer a UHPC mix design and related specifications in accordance with the requirements of this specification.

TESTING:
- All UHPC shall be tested in accordance with the following test procedures:
  - Flexural strength
  - Chloride ion penetration
  - Heat-treated
- Results of all compressive and pullout tests shall be submitted to the Engineer for review and approval. Results shall be used in the field.

CONSTRUCTION:
- UHPC placement plan:
  - The UHPC placement plan shall include the following:
    - List of similar bridge projects:
    - List of compressive and pullout test results, conducted by an AASHTO accredited testing laboratory.
    - Previous experience with similar UHPC projects.
  - The UHPC placement plan shall be submitted to the Engineer for review and approval. The Engineer reserves the right to reject any UHPC material which lacks a proven track record for similar projects.

- Concrete surface profile texture as required in the design plans.
- Materials testing:
  - Concrete surface profile texture as required in the design plans.
  - Corrosion procedures, including mixing, casting, and finishing techniques.
  - Quality control / quality assurance procedures for verification of mix uniformity.
- Testing:
  - All UHPC shall be tested in accordance with the following test procedures:
    - Flexural strength
    - Chloride ion penetration
    - Heat-treated
- Results of all compressive and pullout tests shall be submitted to the Engineer for review and approval. Results shall be used in the field.

ORDER AND TIME OF INTRODUCTION OF THE MATERIALS AND THE MIXING TIME:
- The Contractor shall provide all materials, tools, and labor necessary for the performance of the work described in this specification. The Contractor shall ensure that all testing required for the UHPC meets the specified requirements.

QUALIFICATION:
- The Contractor shall submit to the Engineer a UHPC mix design and related specifications in accordance with the requirements of this specification.

TESTING:
- All UHPC shall be tested in accordance with the following test procedures:
  - Flexural strength
  - Chloride ion penetration
  - Heat-treated
- Results of all compressive and pullout tests shall be submitted to the Engineer for review and approval. Results shall be used in the field.

CONSTRUCTION:
- UHPC placement plan:
  - The UHPC placement plan shall include the following:
    - List of similar bridge projects:
    - List of compressive and pullout test results, conducted by an AASHTO accredited testing laboratory.
    - Previous experience with similar UHPC projects.
  - The UHPC placement plan shall be submitted to the Engineer for review and approval. The Engineer reserves the right to reject any UHPC material which lacks a proven track record for similar projects.

- Concrete surface profile texture as required in the design plans.
- Materials testing:
  - Concrete surface profile texture as required in the design plans.
  - Corrosion procedures, including mixing, casting, and finishing techniques.
  - Quality control / quality assurance procedures for verification of mix uniformity.
- Testing:
  - All UHPC shall be tested in accordance with the following test procedures:
    - Flexural strength
    - Chloride ion penetration
    - Heat-treated
- Results of all compressive and pullout tests shall be submitted to the Engineer for review and approval. Results shall be used in the field.
CONSTRUCTION:

A. WATERTIGHT INTEGRITY TESTING:

- Please refer to the plans and these notes for equipment, materials and testing to complete the work for UHPC water integrity test as described in the plans and these notes.

B. LEAKING JOINT REPAIR:

- If leakage occurs, repair entire length of leaking joint as follows using high molecular weight methacrylate:
  - Slab edge clean the area to be treated, removing all contaminants from the surface. Clean adjacent surfaces of the leaking joint using compressed air free of oil and moisture.
  - Do not apply resin if rain is expected within 12 hours of completion. Apply resin to cleared surfaces and surface temperature is at least 60°F, and if near 50°F temperature shall be higher, mix and apply resin according to manufacturer's instructions and no more than 5 gallons at a time. Pour resin over joints.

- When methacrylate surface will be used as a driving surface, apply and to provide adhesion, allow at least 30 minutes after methacrylate has been applied before applying additional pavement material and testing to complete the work for UHPC water integrity test as described in the plans and these notes.

- Payment will be based on field measurement of linear feet at the contract price for UHPC water integrity test and shall be full compensation for all labor, equipment, materials and testing to complete the work for UHPC water integrity test as described in the plans and these notes.

- Payment will be based on field measurement of linear feet at the contract price for UHPC water integrity test and shall be full compensation for all labor, equipment, materials and testing to complete the work for UHPC water integrity test as described in the plans and these notes.
### ESTIMATED QUANTITIES (WITH CAST-IN-PLACE ABUTMENTS)

<table>
<thead>
<tr>
<th>SPAN</th>
<th>NO.</th>
<th>RCBB</th>
<th>NO.</th>
<th>PPCBB</th>
</tr>
</thead>
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<tr>
<td>30'-0</td>
<td>6-27&quot;x48&quot;x30'-0</td>
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<td>32.4</td>
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<tr>
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<tr>
<td>50'-0</td>
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<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>60'-0</td>
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<tr>
<td>70'-0</td>
<td>6-33&quot;x48&quot;x70'-0</td>
<td>12</td>
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<td></td>
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</tbody>
</table>
ESTIMATED QUANTITIES (WITH CAST-IN-PLACE ABUTMENTS)

<table>
<thead>
<tr>
<th>Span</th>
<th>30'-0</th>
<th>40'-0</th>
<th>50'-0</th>
<th>60'-0</th>
<th>70'-0</th>
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<tbody>
<tr>
<td>Reinf. Concrete Box Beam</td>
<td>6-27&quot;x48&quot;x30'-0</td>
<td>6-27&quot;x48&quot;x40'-0</td>
<td>6-33&quot;x48&quot;x50'-0</td>
<td>6-33&quot;x48&quot;x60'-0</td>
<td>6-33&quot;x48&quot;x70'-0</td>
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<tr>
<td>Pretensioned Prestressed Concrete Box Beam</td>
<td>6-27&quot;x48&quot;x30'-0</td>
<td>6-27&quot;x48&quot;x40'-0</td>
<td>6-33&quot;x48&quot;x50'-0</td>
<td>6-33&quot;x48&quot;x60'-0</td>
<td>6-33&quot;x48&quot;x70'-0</td>
</tr>
</tbody>
</table>

NOTES:
- # Includes two abutment footings and two abutment backwalls.
- ** Includes four retainer angle assemblies and bridge rail posts.

ESTIMATED QUANTITIES (WITH PRECAST ABUTMENTS)

<table>
<thead>
<tr>
<th>Span</th>
<th>30'-0</th>
<th>40'-0</th>
<th>50'-0</th>
<th>60'-0</th>
<th>70'-0</th>
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</thead>
<tbody>
<tr>
<td>Reinf. Concrete Box Beam</td>
<td>6-21&quot;x48&quot;x30'-0</td>
<td>6-21&quot;x48&quot;x40'-0</td>
<td>6-27&quot;x48&quot;x50'-0</td>
<td>6-27&quot;x48&quot;x60'-0</td>
<td>6-33&quot;x48&quot;x70'-0</td>
</tr>
<tr>
<td>Pretensioned Prestressed Concrete Box Beam</td>
<td>6-21&quot;x48&quot;x30'-0</td>
<td>6-21&quot;x48&quot;x40'-0</td>
<td>6-27&quot;x48&quot;x50'-0</td>
<td>6-27&quot;x48&quot;x60'-0</td>
<td>6-33&quot;x48&quot;x70'-0</td>
</tr>
</tbody>
</table>

NOTES:
- # Includes four retainer angle assemblies and bridge rail posts.
- ** Includes four retainer angle assemblies and bridge rail posts.
- *** Includes High Early Strength Self-Consolidating Concrete for CMP Pile Pockets. See Sheet B24-20-16 for volume of High Early Strength Self-Consolidating Concrete required for each box beam type and span length.

NOTES:
- Quantities shown only include quantities covered by these standards. Other quantities as required may also need to be computed by the user of these standards such as UHPC Joint, Bridge Wing Armoring, etc.
- Other quantities, as required, may also need to be computed by the user of these standards such as UHPC Joint, Bridge Wing Armoring, etc.

QUANTITY SUMMARIES

<table>
<thead>
<tr>
<th>Concrete Wings</th>
<th>0° Skew</th>
<th>B24-29-16</th>
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IOWA DOT
Highway Division

STANDARD DESIGN - 20'-0 ROADWAY, SINGLE SPAN
CONCRETE BOX BEAM BRIDGES
DECEMBER, 2016
## ESTIMATED QUANTITIES (WITH CAST-IN-PLACE ABUTMENTS)

<table>
<thead>
<tr>
<th>Span (ft)</th>
<th>Reinforced Concrete Box Beams</th>
<th>Prestressed Prestressed Concrete Box Beams</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>306</td>
<td>206</td>
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<tr>
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<td>206</td>
</tr>
<tr>
<td>70</td>
<td>306</td>
<td>206</td>
</tr>
</tbody>
</table>

### Notes:
- **Includes** two abutment footings and two abutment backwalls; see Sheet B24-15-16 for additional concrete required in abutment footings.
- **Includes** four retainer angle assemblies and bridge rail posts.

## ESTIMATED QUANTITIES (WITH PRECAST ABUTMENTS)

<table>
<thead>
<tr>
<th>Span (ft)</th>
<th>Reinforced Concrete Box Beams</th>
<th>Prestressed Prestressed Concrete Box Beams</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
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<td>60</td>
<td>306</td>
<td>206</td>
</tr>
<tr>
<td>70</td>
<td>306</td>
<td>206</td>
</tr>
</tbody>
</table>

### Notes:
- **Includes** four retainer angle assemblies and bridge rail posts.
- **Includes** high early strength self-consolidating concrete for CMP pile pockets; see Sheet B24-12-16 for volume of high early strength self-consolidating concrete required for each box beam type and span length.
**Concrete Box Beam Bridges**

**ESTIMATED QUANTITIES (WITH CAST-IN-PLACE ABUTMENTS)**

<table>
<thead>
<tr>
<th>SPAN</th>
<th>L.F.</th>
<th>C.Y.</th>
<th>LBS.</th>
<th>NO.</th>
<th>PPCB</th>
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<tbody>
<tr>
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<td>1,726</td>
<td>1,478</td>
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<tr>
<td>50'-0</td>
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<td>2,718</td>
<td>3,112</td>
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<td>10</td>
</tr>
<tr>
<td>60'-0</td>
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<td>4,442</td>
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<td>5,385</td>
<td>4,442</td>
<td>6,569</td>
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<td>10</td>
</tr>
</tbody>
</table>

**NOTES:**
- ** INCLUDES FOUR RETAINER ANGLE ASSEMBLIES AND BRIDGE RAIL POSTS.
- ** INCLUDES TWO ABUTMENT FOOTINGS AND TWO ABUTMENT BACKWALLS; SEE SHEET B24-16-16 FOR ADDITIONAL CONCRETE REQUIRED IN ABUTMENT FOOTINGS.

**PRECAST ABUTMENT BACKWALL**

<table>
<thead>
<tr>
<th>NO.</th>
<th>PPCB</th>
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</thead>
<tbody>
<tr>
<td>6-21&quot;x48&quot;x30'-0</td>
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<td>6-27&quot;x48&quot;x40'-0</td>
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<td>6-45&quot;x48&quot;x70'-0</td>
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<td>6-51&quot;x48&quot;x80'-0</td>
<td>PPCB</td>
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</table>

**NOTES:**
- ** INCLUDES FOUR RETAINER ANGLE ASSEMBLIES AND BRIDGE RAIL POSTS.
- ** INCLUDES TWO ABUTMENT FOOTINGS AND TWO ABUTMENT BACKWALLS; SEE SHEET B24-16-16 FOR ADDITIONAL CONCRETE REQUIRED IN ABUTMENT FOOTINGS.

**ESTIMATED QUANTITIES (WITH PRECAST ABUTMENTS)**

<table>
<thead>
<tr>
<th>SPAN</th>
<th>L.F.</th>
<th>C.Y.</th>
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**NOTES:**
- ** INCLUDES FOUR RETAINER ANGLE ASSEMBLIES AND BRIDGE RAIL POSTS.
- ** INCLUDES TWO ABUTMENT FOOTINGS AND TWO ABUTMENT BACKWALLS; SEE SHEET B24-16-16 FOR ADDITIONAL CONCRETE REQUIRED IN ABUTMENT FOOTINGS.

**PRECAST ABUTMENT BACKWALL**

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<tr>
<td>6-51&quot;x48&quot;x80'-0</td>
<td>PPCB</td>
</tr>
</tbody>
</table>

**NOTES:**
- ** INCLUDES FOUR RETAINER ANGLE ASSEMBLIES AND BRIDGE RAIL POSTS.
- ** INCLUDES TWO ABUTMENT FOOTINGS AND TWO ABUTMENT BACKWALLS; SEE SHEET B24-16-16 FOR ADDITIONAL CONCRETE REQUIRED IN ABUTMENT FOOTINGS.

**NOTES:**
- QUANTITIES SHOWN ONLY INCLUDE QUANTITIES COVERED BY THESE STANDARDS. OTHER QUANTITIES AS REQUIRED MAY ALSO NEED TO BE COMPUTED BY THE USER OF THESE STANDARDS SUCH AS UHPC JOINT ZONE, INTEGRITY TEST, EXCAVATION, ETC. OTHER QUANTITIES, AS REQUIRED, MAY ALSO NEED TO BE COMPUTED BY THE USER OF THESE STANDARDS SUCH AS UHPC JOINT ZONE, INTEGRITY TEST, EXCAVATION, ETC.
- QUANTITIES SHOWN ONLY INCLUDE QUANTITIES COVERED BY THESE STANDARDS. OTHER QUANTITIES AS REQUIRED MAY ALSO NEED TO BE COMPUTED BY THE USER OF THESE STANDARDS SUCH AS UHPC JOINT ZONE, INTEGRITY TEST, EXCAVATION, ETC. OTHER QUANTITIES, AS REQUIRED, MAY ALSO NEED TO BE COMPUTED BY THE USER OF THESE STANDARDS SUCH AS UHPC JOINT ZONE, INTEGRITY TEST, EXCAVATION, ETC.
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**CONCRETE BOX BEAM BRIDGES**

**QUANTITY SUMMARIES**

**Concrete Wings**

**30° Skew**
KEYWAY JOINT PREPARATION NOTES:

Keved joint surfaces of concrete box beams for longitudinal and transverse joints shall receive a textured finish consisting of
micro-texture and macro-texture.

Joint surfaces shall be textured to "Concrete Surface Profile 6" or rougher, as established by the International Concrete Repair
Institute (ICRI). Joint texture may be achieved by one or more of
the following means:

- Metal resting
- Use of a textured form liner
- Use of a form retarder at the joint surface, followed by
- Pressure washing after initial set to provide an exposed
aggregate finish

Other means subject to engineer's approval.

In addition to the above joint preparation requirements, the
requirements of Section 2403.20.4.1 of the Standard Specifications
shall apply (includes sandblast and air blast cleaning of joint
surfaces).

KEYWAY SURFACES SHALL RECEIVE A TEXTURED FINISH CONSISTING OF
MICRO-TEXTURE AND MACRO-TEXTURE.

KEYWAY SURFACES SHALL BE WETTED TO A SATURATED SURFACE DRY
CONDITION PRIOR TO CASTING THE UHPC JOINT.

All work for preparation and texturing of keyed joint surfaces
for longitudinal beam connections shall be included in the price
bid for the beams.

KEYWAY BLOCK-OUT DATA

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<th>SPAN FT.</th>
<th>&quot;A&quot; EQUAL SPACES</th>
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PARTIAL PLAN

SECTION A-A

DETAIL A

CONCRETE BOX BEAM BRIDGES

Highway Division

STANDARD DESIGN - 20'-0" ROADWAY, SINGLE SPAN

DECEMBER, 2016

BEAM KEYWAY AND BLOCK-OUT DETAILS

B24-32-16
CONCRETE BOX BEAM BRIDGES

DECEMBER, 2016

BEAM CHAMFER DETAILS

FOR BEVELED KEYWAY DETAILS, SEE BEAM DETAILS SHEETS.

NOTE:

SEE SHEET B24-32-16.

FOR KEYWAY DETAILS, SEE SHEET B24-30-16.
**EPOXY COATED REINFORCING BAR LIST**

21" x 48" x 30'-0 PPCBB, 0° SKEW

<table>
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<tr>
<th>BEAM LINE</th>
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</tr>
<tr>
<td>BEAM LINE</td>
<td>NO.</td>
<td>LENGTH</td>
<td>WEIGHT</td>
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**BENT BAR DETAILS**

10

20

92

37

14

141

BEAM LINE "F"

26

1

158

144

20

NO. 12

D=3

NO. 1

NO.-1

1'-4

4

94

45

2

9

10

110

13

SHAPE

NOTE: ALL DIMENSIONS ARE OUT TO OUT.  D= PIN DIAMETER.

20

1

37

LENGTH

2

4 

10

4

37

10

4 

WEIGHT

116

82

82

116

10

105

82

8

WEIGHT

WEIGHT

92

4 

598

147

92

37

116

NO. 25

4

WEIGHT

WEIGHT

20

20

9

12

14

NO. 42

30'-10

581

-82

47

10

9

4

34

14

BEAM LINES "B" AND "D"

11/28/2016    10:51:24 AM

INCLUDED IN THE PRICE BID FOR THE BEAMS.  THE WEIGHT OF THE THREADED END IS NOT INCLUDED IN THE QUANTITY SHOWN.

**SEE BENT BAR DETAILS.  THE LENGTHS SHOWN DO NOT INCLUDE AN ALLOWANCE FOR THE THREADED END.  BAR LENGTHS MAY NEED TO INCREASE DEPENDING ON THE MECHANICAL COUPLER ASSEMBLY.  THE COST OF THE THREADED PORTION OF THESE BARS IS TO BE INCLUDED IN THE PRICE BID FOR THE BEAMS. THE WEIGHT OF THE THREADED END IS NOT INCLUDED IN THE QUANTITY SHOWN.**
TABLE OF DIMENSION DATA

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<td>14</td>
</tr>
<tr>
<td>B</td>
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<td>14</td>
</tr>
<tr>
<td>C</td>
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NOTE: FOR VIEW B-B, SEE SHEET B24-33-16.

FOR VIEW C-C, SEE SHEET B24-34-16.

FOR VIEW D-D, SEE SHEET B24-35-16.

NOTES:
- 15° AND 30° SKEW
- 14 STRANDS
- PRESTRESSING STRANDS IN BOTTOM SLAB AND 4c2 BARS NOT SHOWN FOR CLARITY
- (30° SKEW SHOWN, 15° SKEW SIMILAR)
- (INTERIOR BEAM SHOWN, EXTERIOR BEAM SIMILAR)
- NOTE: FOR BEAM LINE DESIGNATIONS, SEE SHEET B24-06-16.
- FOR VIEW B-B, SEE SHEET B24-33-16.
- FOR VIEW C-C, SEE SHEET B24-34-16.
- FOR VIEW D-D, SEE SHEET B24-35-16.

FOR VIEW B-B, SEE SHEET B24-33-16.

FOR VIEW C-C, SEE SHEET B24-34-16.

FOR VIEW D-D, SEE SHEET B24-35-16.

NOTES:
- 15° AND 30° SKEW
- 14 STRANDS
- PRESTRESSING STRANDS IN BOTTOM SLAB AND 4c2 BARS NOT SHOWN FOR CLARITY
- (30° SKEW SHOWN, 15° SKEW SIMILAR)
- (INTERIOR BEAM SHOWN, EXTERIOR BEAM SIMILAR)
- NOTE: FOR BEAM LINE DESIGNATIONS, SEE SHEET B24-06-16.
- FOR VIEW B-B, SEE SHEET B24-33-16.
- FOR VIEW C-C, SEE SHEET B24-34-16.
- FOR VIEW D-D, SEE SHEET B24-35-16.
NOTE: ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.

INCLUDED IN THE PRICE BID FOR THE BEAMS. THE WEIGHT OF THE THREADED END IS NOT INCLUDED IN THE QUANTITY SHOWN.

* INCLUDES MECHANICAL COUPLER(S). SEE BENT BAR DETAILS.

TOTAL (LBS.)
27" x 48" PRESTRESSED Prestressed Concrete Box Beam Data

Beam

<table>
<thead>
<tr>
<th>Beam</th>
<th>Span Length (ft)</th>
<th>Overall Beam Length (ft)</th>
<th>Concrete Strength (psi)</th>
<th>Strand Size</th>
<th>No. of Strands</th>
<th>Total Initial Prestress (kips)</th>
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<tr>
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<td>50'-2</td>
<td>5200</td>
<td>2&quot;½</td>
<td>22</td>
<td>5200</td>
</tr>
<tr>
<td>PB24</td>
<td>50'-0</td>
<td>50'-4</td>
<td>5200</td>
<td>2&quot;½</td>
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<tr>
<td>PB24</td>
<td>60'-0</td>
<td>60'-2</td>
<td>5200</td>
<td>2&quot;½</td>
<td>22</td>
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</tr>
<tr>
<td>PB24</td>
<td>60'-0</td>
<td>60'-4</td>
<td>5200</td>
<td>2&quot;½</td>
<td>22</td>
<td>5200</td>
</tr>
</tbody>
</table>

Specifications:
- Construction: Standard Specifications of the Iowa Department of Transportation, Current Series, with current applicable special provisions and supplemental specifications.
- Live Load Distribution Factor Notes: Live load distribution factors used for the flexural design of the beams was based on past studies conducted by IADOT. However, AASHTO equations including shear effects were used for determining the live load distribution factor for shear. Controlling live load distribution factors are: 50.0% (50%); 0.6% (0.6%); 0.6% (0.6%); 0.5% (0.5%).

Design Stresses:
- Design stresses for the following materials are to be in accordance with AASHTO Load and Bridge Design Specifications, 7th Ed., Series of 2014.
- Prestressing steel in accordance with Section 5, Grade 270.
- Concrete in accordance with Section 5.

Notes:
- These beams are designed for 100 lb. per square foot of roadway for gravel or future wearing surface.
- All prestressing strands shall conform to ASTM A 416 Grade 270 Low Relaxation Strands.
- Top of beams are to be struck off level and longitudinally tined in accordance with Article 22 of the Standards Specifications. Reinforcement shall be as detailed on other design sheets. All beams are to be increased in length to compensate for elastic, shrinkage, and creep.
- Camber is applied at 2'-10" intervals at top of beams.
- All prestressing strands stressed to not more than 5,000 lbs.
- Lifting operations shall be performed in a manner that lifting loops carry loads equally.

27" x 48" PPCBB Details

Concrete Box Beam Bridges

Iowa DOT

Highway Division

December 2016

B24-41-16

27" x 48" PPCBB Details

For Beam Details, See Sheet B24-44-16
For Beam Details, See Sheet B24-45-16
For Beam Details, See Sheet B24-41-16

27" x 48" PPCBB Details

For Beam Details, See Sheet B24-44-16
For Beam Details, See Sheet B24-45-16
For Beam Details, See Sheet B24-41-16
CONCRETE BOX BEAM BRIDGES

Highway Division

STANDARD DESIGN - 20'-0' ROADWAY, SINGLE SPAN
DECEMBER, 2016

B24-42-16

27' x 48' x 50'-0' PPCBB DETAILS
0° SKEW

NOTE: KEYWAY, MECHANICAL COUPLERS, AND 4c2 BARS ON EXTERIOR FACE OF EXTERIOR BEAMS.

FOR BEAM DESIGNATIONS, SEE SHEET B24-06-16.

FOR VIEW B-B, SEE SHEET B24-41-16.

FOR BEAM CHAMFER DETAILS, SEE SHEET B24-33-16.

KEYWAY BLOCK-OUT, FOR DETAILS, SEE SHEET B24-32-16.

NOTE:
EXTERIOR FACE OF EXTERIOR BEAMS.

OMIT KEYWAY, MECHANICAL COUPLERS, AND 4c2 BARS ON

NOTE:
STRANDS IN BOTTOM SLAB AND 4c2 BARS NOT SHOWN FOR CLARITY.

PRESTRESSING STRANDS IN BOTTOM SLAB AND 4c2 BARS NOT SHOWN FOR CLARITY.

FOR VIEW B-B, SEE SHEET B24-41-16.

FOR REBAR SHAPE DETAILS, SEE SHEET B24-33-16.

TABLE OF DIMENSION DATA

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NOTE:
FOR BEAM DESIGNATIONS, SEE SHEET B24-06-16.
NOTE: ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.

** SEE BENT BAR DETAILS. THE LENGTHS SHOWN DO NOT INCLUDE AN ALLOWANCE FOR THE THREADED END. BAR LENGTHS MAY NEED TO INCREASE DEPENDING ON THE MECHANICAL COUPLER ASSEMBLY USED. THE COST OF THE THREADED PORTION OF THESE BARS IS TO BE INCLUDED IN THE PRICE BID FOR THE DEAM, THE WEIGHT OF THE THREADED END IS NOT INCLUDED IN THE QUANTITY SHOWN.

* INCLUDES MECHANICAL COUPLER(S). SEE BENT BAR DETAILS.

NOTE: ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.
EPOXY COATED REINFORCING BAR LIST
27" x 48" x 60'-0 PPCBB, 0° SKEW

<table>
<thead>
<tr>
<th>BEAM LINE</th>
<th>BEAM LINE &quot;A&quot; AND &quot;B&quot;</th>
<th>BEAM LINE &quot;C&quot; AND &quot;D&quot;</th>
<th>BEAM LINE &quot;E&quot; AND &quot;F&quot;</th>
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<tr>
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<tr>
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<td>3'-6</td>
<td>3'-2</td>
<td>4'-8</td>
<td>3'-2</td>
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<td>SHAPE</td>
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<tr>
<td>WEIGHT</td>
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</table>

_BENT BAR DETAILS_

**NOTES:**
- ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.

**BEAM LINES "A" AND "F"**
- THREADED END
- THREADED MECHANICAL COUPLER (TYP.)
- OMIT ON THREADED MECHANICAL COUPLER (TYP.). Omit on the exterior face for beam lines "A" and "F".

**BEAM LINES "B", "C", "D", "E"**
- THREADED END
- THREADED MECHANICAL COUPLER (TYP.)
- OMIT ON THREADED MECHANICAL COUPLER (TYP.). Omit on the exterior face for beam lines "A" and "F".

**EPOXY COATED REINFORCING BAR LIST**
27" x 48" x 60'-0 PPCBB, 15° SKEW

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<td>4'-8</td>
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<td>SHAPE</td>
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_BENT BAR DETAILS_

**NOTES:**
- ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.

**BEAM LINES "A" AND "F"**
- THREADED END
- THREADED MECHANICAL COUPLER (TYP.)
- OMIT ON THREADED MECHANICAL COUPLER (TYP.). Omit on the exterior face for beam lines "A" and "F".

**BEAM LINES "B", "C", "D", "E"**
- THREADED END
- THREADED MECHANICAL COUPLER (TYP.)
- OMIT ON THREADED MECHANICAL COUPLER (TYP.). Omit on the exterior face for beam lines "A" and "F".

**EPOXY COATED REINFORCING BAR LIST**
27" x 48" x 60'-0 PPCBB, 30° SKEW

<table>
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<tr>
<td>WEIGHT</td>
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_BENT BAR DETAILS_

**NOTES:**
- ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.

**BEAM LINES "A" AND "F"**
- THREADED END
- THREADED MECHANICAL COUPLER (TYP.)
- OMIT ON THREADED MECHANICAL COUPLER (TYP.). Omit on the exterior face for beam lines "A" and "F".

**BEAM LINES "B", "C", "D", "E"**
- THREADED END
- THREADED MECHANICAL COUPLER (TYP.)
- OMIT ON THREADED MECHANICAL COUPLER (TYP.). Omit on the exterior face for beam lines "A" and "F".

**EPOXY COATED REINFORCING BAR LIST**
27" x 48" x 60'-0 PPCBB DETAILS

**NOTES:**
- INCLUDES MECHANICAL COUPLERS, SEE BENT BAR DETAILS.
- SEE BENT BAR DETAILS. THE LENGTHS SHOWN DO NOT INCLUDE AN ALLOWANCE FOR THE THREADED END, BAR LENGTHS MAY NEED TO INCREASE DEPENDING ON THE MECHANICAL COUPLERS USED. THE COST OF THE THREADED PORTION OF THESE BARS IS TO BE INCLUDED IN THE PRICE BID FOR THE BEAMS. THE WEIGHT OF THE THREADED END IS NOT INCLUDED IN THE QUANTITY SHOWN.
CONCRETE BOX BEAM BRIDGES

Highway Division

STANDARD DESIGN - 20'0 ROADWAY, SINGLE SPAN

DECEMBER, 2016

B24-50-16

TABLE OF DIMENSION DATA

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<td>1'-7&quot;</td>
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<tr>
<td>B</td>
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<td>1'-6&quot;</td>
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<tr>
<td>C</td>
<td>1'-5&quot;</td>
<td>1'-5&quot;</td>
</tr>
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<td>D</td>
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<td>E</td>
<td>1'-3...</td>
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<td>G</td>
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<tr>
<td>H</td>
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NOTE: FOR VIEW B-B, SEE SHEET B24-32-16. 4A AND 4A2 BARS SHALL BE LAP SPICED 1'-7" MINIMUM AT MIDSPAN, FOR BEAM CHAMFER DETAILS, SEE SHEET B24-33-16.

FOR VIEW A-A, SEE SHEET B24-4-4-16. (TOP SLAB) PRESTRESSING STRAND, (PRESTRESSING STRANDS IN BOTTOM SLAB AND 4C2 BARS NOT SHOWN FOR CLARITY)

FOR VIEW B-B, SEE SHEET B24-4-4-16. 4A AND 4A2 BARS SHALL BE LAP SPICED 1'-7" MINIMUM AT MIDSPAN, FOR BEAM CHAMFER DETAILS, SEE SHEET B24-33-16.

NOTE: FOR VIEW A-A, SEE SHEET B24-4-4-16. (TOP SLAB) PRESTRESSING STRAND, (PRESTRESSING STRANDS IN BOTTOM SLAB AND 4C2 BARS NOT SHOWN FOR CLARITY)

PLAN

(15° SKIN DETAILS SIMILAR TO EXTERIOR BEAM. EXTERIOR BEAM DETAILS SIMILAR)

FOR VIEW B-B, SEE SHEET B24-32-16. 4A AND 4A2 BARS SHALL BE LAP SPICED 1'-7" MINIMUM AT MIDSPAN, FOR BEAM CHAMFER DETAILS, SEE SHEET B24-33-16.
### EPOXY COATED REINFORCING BAR LIST

#### 27" x 48" x 30'-0 RCBB, 0° SKEW

<table>
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<th>Weight</th>
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<td>101</td>
</tr>
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<td></td>
<td></td>
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<td>3'-2</td>
<td>17</td>
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<td>212</td>
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</tr>
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<td>1'-4</td>
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#### 30'-10 BEAM LINES "B", "C", "D", "E"

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<th>Weight</th>
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<td>6</td>
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<td>30'-10</td>
<td>6</td>
</tr>
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</table>

#### 17 LENGTH

<table>
<thead>
<tr>
<th>Beam Line</th>
<th>Shape</th>
<th>No.</th>
<th>Length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1'-0</td>
<td>18</td>
</tr>
</tbody>
</table>

**BEAM LINES "A" AND "F"**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>4'-7</td>
<td>20</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>6</td>
</tr>
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</table>

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<table>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1'-10</td>
<td>110</td>
</tr>
</tbody>
</table>

**NOTE:** ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.

#### BENT BAR DETAILS

**INCLUDED IN THE PRICE BID FOR THE BEAMS. THE WEIGHT OF THE THREADED END IS NOT INCLUDED IN THE QUANTITY SHOWN.**

**SEE BENT BAR DETAILS. THE LENGTHS SHOWN DO NOT INCLUDE AN ALLOWANCE FOR THE THREADED END. BAR LENGTHS MAY NEED**

---

### EPOXY COATED REINFORCING BAR LIST

#### 27" x 48" x 30'-0 RCBB, 15° SKEW

<table>
<thead>
<tr>
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<th>Weight</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>4'-9</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>6</td>
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<tbody>
<tr>
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<td></td>
<td></td>
<td>1'-1</td>
<td>11</td>
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### Diagrams

**BENT BAR DETAILS**

- Illustrations of bar and connector details.

---

### Additional Notes

- For mechanical coupler, see bent bar details.
- From one end for beam coupler (typ.). Omit on exterior face for threaded mechanical coupler (typ.).
Concrete Box Beam Bridges

**Plan**

- Interior beam shown, exterior beam similar
- 10a4 bars in bottom slab and 4c2 bars not shown for clarity

**Elevation**

- Keyway not shown for clarity

**Section A-A**

- Notes: Unit keyway, mechanical couplers, and 4c2 bars on exterior face of exterior beam.

**Table of Dimension Data**

<table>
<thead>
<tr>
<th>Beam Line</th>
<th>(Inches)</th>
<th>Spacing SPACES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>60</td>
</tr>
</tbody>
</table>

**Notes**

- For beam line designation, see sheet B24-06-16.
- For beam chamfer details, see sheet B24-33-16.
- For beam chamfer details, see sheet B24-33-16.
- For view B-B, see sheet B24-52-16.

**Details**

- 27" x 48" x 40'-0" RCBB Details
- 0° Skew

**Drawing Information**

- Iowa DOT
- Highway Division
- Standard Design - 20'-0" Roadway, Single Span
- December, 2016
- B24-56-16
**Lifting Loop Detail**

Alternate types of lifting loops may be submitted for approval.

**Notes:**
- These beams are designed for west loading with an allowance of 50 lb. per square foot of roadway for gravel or future wearing surface.
- Tops of beams are to be struck off level and longitudinally tined in accordance with Article 2301.03, H, 3 of the Standard Specifications.
- Reheating shall be as detailed in other design sheets. Alternate types of lifting loops may be submitted for approval if used to produce a shorter curing time if approved by the Bridge Engineer.
BEARING PAD PLAN - 0° SKREW
(24 BEARING PADS REQUIRED)

BEARING PAD PLAN - 15° SKREW
(24 BEARING PADS REQUIRED)

BEARING PAD PLAN - 30° SKREW
(24 BEARING PADS REQUIRED)

SECTION THROUGH BEARING PAD

BEARING TAPER TABLE

BEARING NOTES:
MATERIAL FOR NEOPRENE PADS TO BE OF 70 DUROMETER NEOPRENE.
THE NEOPRENE BEARING PADS SHALL BE MOUNTED AS SHOWN IN THE
BEARING TAPER TABLE.
IF NECESSARY, BEARING SEAT SURFACES SHALL BE ADJUSTED BY SHIMMING
TO ACCURATELY LIMIT EACH END OF THE BOX BEAMS, TWO "BEARINGS" ADJUSTING GASKETS WITH A THICKNESS OF THE BEARING PAD SHALL BE
PROVIDED FOR ADJUSTING EACH BEARING.
COST OF NEOPRENE PADS AND SHIMS SHALL BE INCLUDED IN THE PRICE ON
FOR THE BEAMS.

BEARING DETAILS

CONCRETE BOX BEAM BRIDGES
DECEMBER, 2016
BRIDGE RAIL POST SPACING DATA TABLE

<table>
<thead>
<tr>
<th>SPAN</th>
<th>&quot;A&quot; DIMENSION</th>
<th>&quot;B&quot; POST SPACES AT &quot;A&quot;</th>
<th>TOTAL NUMBER OF POSTS ON BRIDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>1'-6&quot;</td>
<td>2'-8&quot;</td>
<td>3'-10&quot;</td>
</tr>
<tr>
<td>15°</td>
<td>0'-1&quot;</td>
<td>2'-6&quot;</td>
<td>3'-10&quot;</td>
</tr>
<tr>
<td>30°</td>
<td>0'-1&quot;</td>
<td>2'-6&quot;</td>
<td>3'-10&quot;</td>
</tr>
</tbody>
</table>

BRIDGE RAIL POST NOTES:
- All material, including bolts, nuts, and washers shall be galvanized.
- All structural steel shall conform to ASTM A572 Grade 50, unless otherwise noted or shown.
- All bolts shall be ASTM A325, unless otherwise noted or shown.
- Post sockets shall be ASTM A500 Grade B.
- All nuts, including coupling nuts, shall be ASTM A563, Grade DH, unless otherwise noted or shown.
- All material, including bolts, nuts, and washers shall be galvanized.
- Drawings of the steel posts showing layout and details shall be submitted for review.
- All costs for furnishing and installing the steel posts, including the cost of 8"-deep back-up plates, shall be included in the price bid for structural steel.

Highway Division

Sheet: 1 of 2
OUTLET DETAILS

1. Use an inside fit reducer coupler.  
2. Insert 1'-0 of the 4½ subdrain into the 6½ metal outlet pipe, then fully seal the entire opening with grout.  
3. Seal the entire opening with grout.
OUTLET DETAILS

- DRILLED HOLES FOR ATTACHMENT
- REMOVABLE RODENT GUARD DETAILS
- GUARD DETAILS
- REMOVABLE RODENT GUARD, SEE DETAILS

OUTLET DETAILS

- TYPICAL SECTION OF SUBDRAIN OUTLET
- SLOPE PROTECTION (IF REQUIRED)

OUTLET DETAILS

- SUBDRAIN OUTLET
- ROADWAY
- SLOPED DOWNWARD FROM THE 
  ABUTMENT FACE AND UNDERNEATH THE 
  SUBDRAIN OUTLET AS INDICATED. RATE OF SLOPE SHALL 
  NOT BE FLATTER THAN 2%

SUBDRAIN OUTLET

NOTE:
- SEE BRIDGE WING ARMORING SHEET AND ABUTMENT FACE DETAILS SHEET
- FOR DETAILS NOT SHOWN ON THIS SHEET WHICH ARE PERTINENT TO THIS
  STRUCTURE.
- THE SUBDRAIN OUTLET SHALL CONSIST OF A 6'-0 LENGTH OF PIPE WITH A
  REMOVABLE RODENT GUARD AS DETAIL ON THIS SHEET.
- FOR WING ARMORING DETAILS, SEE SHEET B24-68-16.
**Erosion Stone Armor Notes:**

Erosion stone shall be placed along the sides of the wings as shown. This is typical at each corner of the bridge unless otherwise noted in the plans. The erosion stone at these locations shall be underlaid with engineering fabric in accordance with Article 4161, b, of the standard specifications. The erosion stone shall be in accordance with Section 4143.01, b of the Standard Specifications. Material passing the 3-inch screen but held retained on a 1-inch screen may be used as coarse stone. The erosion stone shall be deposited, spread, consolidated, and shaped by mechanical or hand methods that will provide uniform depth and density and provide uniform surface appearance.

**Payment for the bridge wing armor** will be bid per square yard. Cost will include engineering fabric, erosion stone, excavation, shaping, and compaction to dimensions shown in these plans. Bid items shall be "bridge wing armor - erosion stone.

---

**Subdrain Notes:**

See B24-66-16 and B24-67-16 sheets for details of placing all subdrains and subdrain outlets required for this structure. The bridge contractor is to install subdrains behind the abutments. The subdrain shall be 4" in diameter and meet the requirements of Section 4040.02 of the current I.D.O.T. Standard Specifications. The subdrain outlet shall consist of a 6'-0 length of pipe with a removable rodent guard.

**Subdrain**

A 6'-0 length of pipe with a removable rodent guard. The subdrain outlet shall consist of 3-inch screen but 100% retained on a 1-inch screen may be used as coarse stone.

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**Bridge Wing Armoring B24-68-16**

**Concrete Box Beam Bridges**

December, 2016
CONCRETE BOX BEAM BRIDGES

HIGHWAY DEPARTMENT

STANDARD DESIGN - 24'-0 ROADWAY, SINGLE SPAN

DECEMBER, 2016

THIS STRUCTURE.

SHOWN ON THIS SHEET WHICH ARE PERTINENT TO
SEE SUBDRAIN DETAILS SHEET FOR DETAILS NOT
NOTE:

BACKFILL DETAIL
(SECTION THRU ABUTMENT)

NOTE:
SUBDRAIN SHALL SLOPE DOWNWARD 2% FROM E. APPROACH ROADWAY.
A OR FLATTER AS REQUIRED FOR STABILITY.

ABUTMENT BACKFILL NOTES:

THE GRANULAR BACKFILL SHALL CONSIST OF IOWA DOT
GRADATION NO. 1 (4110-PCC FINE AGGREGATE).
PLACE BACKFILL BETWEEN ABUTMENTS SIMULTANEOUSLY
SO THAT THE TWO FILLS ARE KEPT AT APPROXIMATELY THE SAME
DEPTH AT ALL TIMES.

THE COST OF FURNISHING AND PLACING SUBDRAINS INCLUDING
EXCAVATION, SUBDRAIN OUTLETS, AND ENGINEERING FABRIC SHALL BE
INCLUDED IN THE CONTRACT UNIT PRICE FOR GRANULAR BACKFILL.
NO EXTRA PAYMENT WILL BE MADE.

NOTE:
THE GRANULAR BACKFILL SHALL SLOPE DOWNWARD 2% FROM
APPROACH ROADWAY.

NOTES:

* OR FLATTER AS REQUIRED FOR STABILITY.
SUBDRAIN SHALL SLOPE DOWNWARD 2% FROM | APPROACH ROADWAY.

ABUTMENT BACKFILL DETAILS

SHEET PILE WINGS

CONCRETE BOX BEAM BRIDGES

DECEMBER, 2016

ABUTMENT BACKFILL DETAILS

STANDARD DESIGN - 24'-0 ROADWAY, SINGLE SPAN

DECEMBER, 2016
ABUTMENT BACKFILL PROCESS:

1. Before placing backfill, the geotextile fabric shall be installed. The fabric shall be pinned against the excavation face. The fabric shall be placed directly on the subgrade behind the abutment. The fabric shall be pinned to the abutment by using lath folded in fabric. The fabric shall be pinned against the excavation face in accordance with the standard specifications.

2. The subdrain shall be placed and secured to the concrete with shallow concrete nails. The fabric shall be pinned to the face of the abutment footing and abutment backfill process.

3. The subdrain shall be placed and secured to the concrete with shallow concrete nails. The fabric shall be pinned against the excavation face in accordance with the standard specifications.

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