STANDARD R.C. BOX CULVERT

FOR DETAILS SEE RC-52M

FLOW BD-632M

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

THREADED INSERTS
A S R E Q 'D.

SHEET 4

EACH FACE
BOTTOM SLAB

RISE SLAB

NOTES:

STRAPS

GALVANIZED

HAUNCH

~

PARTIAL PLAN

PRECAST WINGWALL CONNECTION DETAILS

KEYED JOINT

DISCONTINUOUS IF POST TENSIONING IS REQUIRED

NOTES:

1. NO BOLT THROUGH CONNECTIONS CAN BE USED.
2. EITHER SHIP LAP OR KEYWAY JOINTS CAN BE USED.
3. ONE (1) ROW OF JOINT SEALING FLEXIBLE FOAM MATERIAL NO FLUSH BUTT JOINTS.
4. FOR T < 11", USE SHIP LAP DETAIL.

NOTE 11, SHEET 1

VARIES, SEE SHEET 9 FOR DETAILS.

OPTIONAL KEYED CONSTRUCTION JOINT, SEE SHEET 9 FOR DETAILS.

PROFILE

PRECAST CULVERT WITH PRECAST END SECTION

NOTES:

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PRECAST CULVERT WITH PRECAST END SECTION

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4. FOR T < 11", USE SHIP LAP DETAIL.
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY

PLAN BY DESIGN OR AS REQUIRED

REINFORCEMENT BY DESIGN.

STANDARD R.C. BOX CULVERT PRECAST

RECOMMENDED APR. 29, 2016

NOTE: DESIGNER TO MODIFY AMOUNT OF COMPACTED NO. 2A COARSE AGGREGATE OR FLOWABLE BACKFILL TO PROVIDE ADEQUATE PROTECTION AGAINST PIPING OF STREAM FLOW THROUGH FILL AT INLET END OF CULVERT.

ALTERNATIVE CUTOFF WALL WITH GROUTED ROCK

DETAIL A (WITHOUT APRON) * TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICH EVER IS DEEPER 3'-0" MIN. TOP OF ROCK LINING SHOULDER IS 1'-0" MIN. DEPRESS 1'-0" MIN. FROM RISE TO COLLAR OR BARRIER CURB.

DETAIL B (WITH APRON) * TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICH EVER IS DEEPER 3'-0" MIN. TOP OF ROCK LINING SHOULDER IS 1'-0" MIN. DEPRESS 1'-0" MIN. FROM RISE TO COLLAR OR BARRIER CURB.

PRECAST CULVERT WITH CAST-IN-PLACE WINGWALLS

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY

STANDARD R.C. BOX CULVERT PRECAST

RECOMMENDED APR. 29, 2016

NOTE: DESIGNER TO MODIFY AMOUNT OF COMPACTED NO. 2A COARSE AGGREGATE OR FLOWABLE BACKFILL TO PROVIDE ADEQUATE PROTECTION AGAINST PIPING OF STREAM FLOW THROUGH FILL AT INLET END OF CULVERT.

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DETAIL B (WITH APRON) * TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICH EVER IS DEEPER 3'-0" MIN. TOP OF ROCK LINING SHOULDER IS 1'-0" MIN. DEPRESS 1'-0" MIN. FROM RISE TO COLLAR OR BARRIER CURB.
**POST-TENSIONING NOTES:**

1. EXTEND BOTTOM ROW OF POST-TENSIONING STRANDS THROUGH THE BOTTOM SLAB OF PRECAST INLET AND OUTLET END SECTIONS.

2. BOX SEGMENTS AND END SECTIONS ARE POST-TENSIONED IN STAGES. THE CONTRACTOR IS REQUIRED TO SUBMIT A PLAN FOR POST-TENSIONING SEQUENCE TO THE DEPARTMENT FOR APPROVAL PRIOR TO SETTING ANY SEGMENTS.

3. POST-TENSION BOX END SEGMENTS FIRST, THEN PROVIDE:
   - MECHANICAL SPACERS ON BOTTOM STRANDS TO CONNECT WITH THE INLET AND OUTLET END SEGMENTS AND POST-TENSION BOTTOM STRANDS THROUGH THE END SECTIONS.
   - STRAPS ON SIDES OF END SECTIONS AS SHOWN ON BC-798M.

4. AFTER POST-TENSIONING IS APPROVED, CUT STRANDS TO PROVIDE A MINIMUM OF 2" CLEAR FROM OUTSIDE FACE OF CONCRETE AND COAT RECESS WITH EPOXY BONDING COMPOUND AND FILL WITH NON-SHRINK GROUT.

5. PRECAST CONCRETE SEGMENT LENGTH TO BE DETERMINED BY THE FABRICATOR.

6. STAGING, SPACING AND POST-TENSION FORCE TO BE SHOWN ON FABRICATOR'S SHOP DRAWINGS.

7. CAST-IN-PLACE CONCRETE IS PERMITTED IN ANY PORTION OF THE PRECAST END SECTIONS, ONLY IF HEIGHT OR WIDTH OF END SECTIONS ARE RESTRICTED DUE TO SHIPPING CONSTRAINTS.

8. WALL REINFORCEMENT CAN BE ADJUSTED TO ACCOMMODATE REQUIREMENTS. DO NOT CUT REINFORCEMENT.

**GENERAL NOTES:**

1. EPOXY COAT REINFORCEMENT AS PER R.C. BOX CULVERT DESIGN, SPACING AS PER DESIGN.

2. REBAR SHOWN IS FOR ORIENTATION ONLY, REBAR SIZE AND IF WIDTH IS RESTRICTED DUE TO SHIPPING RESTRAINTS.

3. POST-TENSION BOX SEGMENTS FIRST, THEN PROVIDE:
   - MECHANICAL SPACERS ON BOTTOM STRANDS TO CONNECT WITH THE INLET AND OUTLET END SEGMENTS AND POST-TENSION BOTTOM STRANDS THROUGH THE END SECTIONS.
   - STRAPS ON SIDES OF END SECTIONS AS SHOWN ON BC-798M.

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8. WALL REINFORCEMENT CAN BE ADJUSTED TO ACCOMMODATE REQUIREMENTS. DO NOT CUT REINFORCEMENT.

**COMMONWEALTH OF PENNSYLVANIA**

**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF PROJECT DELIVERY**

**R.C. BOX CULVERT**

**PRECAST**

**POST-TENSIONED END SECTIONS**

**STANDARD**

**BD-632M**

**Recommended APR. 30, 2016**

**Recommended APR. 30, 2016**

Sheet 7 of 13
PA STRUCTURE MOUNTED GUIDE RAIL

ELEVATION ALONG TOP SLAB OF CULVERT

SECTION F-F

NOTE 1: SEE BAR DETAIL
NOTE 2: SEE ANCHOR BOLT

SECTION F-F

NOTE: #7, 4 EA. POST
RAILTUBE TS 4"x3"
6" LONG
TUBULAR BLOCKOUT TS 7"x3"x'

NOTE: ALL VERTICAL REINFORCEMENT #4, SEE REINF.
2" CLR.

NOTE: CURB REINFORCEMENT SHOWN FOR CLARITY, SEE BD-609M.
* SEE BULLETIN FOR TYPE 2 STRING POST GUIDE RAIL DETAILS
* S7 REINFORCEMENT REQUIRED AT POST LOCATIONS ONLY.
SEE SLAB REINFORCEMENT BAR DETAILS THIS SHEET.

NOTE: REDUCED EDGE DISTANCE PERMITTED IF ADEQUATE CONCRETE (T=TOP SLAB THICKNESS OF BOX CULVERT)
FOR T  10": T-2"

NOTE: FOLLOW RAIL AT END OF DECK AND CURB
END OF DECK AND CURB

NOTE: PIPES SLEEVE 1" ODx2"" LONG

NOTE: Pipe sleeve 1" Odx2" long

NOTE: CRUSH REINFORCEMENT FOR CLARITY, SEE BD-609M.
* SEE BULLETIN FOR TYPE 2 STRING POST GUIDE RAIL DETAILS
* S7 REINFORCEMENT REQUIRED AT POST LOCATIONS ONLY.
SEE ANCHOR BOLT BAR DETAILS THIS SHEET.

NOTE: FOLLOW RAIL AT END OF DECK AND CURB
END OF DECK AND CURB

NOTE: PIPES SLEEVE 1" ODx2"" LONG

NOTE: Pipe sleeve 1" Odx2" long

NOTE: CRUSH REINFORCEMENT FOR CLARITY, SEE BD-609M.
* SEE BULLETIN FOR TYPE 2 STRING POST GUIDE RAIL DETAILS
* S7 REINFORCEMENT REQUIRED AT POST LOCATIONS ONLY.
SEE SLAB REINFORCEMENT BAR DETAILS THIS SHEET.

NOTE: REDUCED EDGE DISTANCE PERMITTED IF ADEQUATE CONCRETE (T=TOP SLAB THICKNESS OF BOX CULVERT)
FOR T  10": T-2"
**Commonwealth of Pennsylvania**

**Department of Transportation**

**R.C. Box Culvert**

**Miscellaneous Details**

**PreCast**

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**Section G-G**

**Elevation**

**Typical Haunch Section Detail**

**Alternate Haunch Section Detail**

**Construction Joint**

**Keyed Construction Joint**

**Alternate Ship-Lap Construction Joint**

**Detail E**

**Configuration for Slab/Wall with Post-Tensioning**

- **Key 5″ x 3″ for T 12″**
- **Key 2″ x 1″**

---

**Recess for Post-Tensioning**

- **4″ x 5″ x 6″**

**Annular Space**

- **G ƒ″**

**Recommended April 29, 2016**

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**Notes**

- Place post-tensioning ducts only in corner
- Min. slab/wall thicknesses are 11 3/4″
- Min. slab/wall thickness:
  - **11 3/4″**

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**Data**

- **BC-798M, Sht. 1**

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**RECOMMENDED**

- **APR. 29, 2016**

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**Details**

- **ELEVATION**
- **SECTION G-G**
- **TYPICAL HAUNCH SECTION DETAIL**
- **ALTERNATE HAUNCH SECTION DETAIL**
- **CONSTRUCTION JOINT DETAIL**
- **KEYED CONSTRUCTION JOINT**
- **ALTERNATE SHIP-LAP CONSTRUCTION JOINT**
- **DETAIL E**

---

**Configuration for Slab/Wall with Post-Tensioning**

- **Min. slab/wall thickness: **
- **T = A + B + C + D + E + F + G + H**
- **Min. slab/wall thickness: **
- **T = A + B + C + D + E + F + G + H**

---

**PRECAST**

**R.C. BOX CULVERT**

---

**COMMONWEALTH OF PENNSYLVANIA**

**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF PROJECT DELIVERY**

**STANDARD**

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**Sheet 9 of 13**
TYPICAL BAFFLE DETAIL

CAST-IN-PLACE BAFFLE/WEIR REINFORCEMENT

#5 @ 9" WITH 3/4" THREADED INSERTS

DETAIL F

CAST-IN-PLACE BAFFLE/WEIR REINFORCEMENT

#5 @ 1'-0"

TWIN CELL BOX CULVERTS

CAST-IN-PLACE BOX CULVERT

TYPICAL BAFFLE

PRECAST BOX CULVERT

TYPICAL BAFFLE DETAIL

CAST-IN-PLACE BOX CULVERT

ALTERNATE BAFFLE DETAIL

TYPICAL Baffle

CAST-IN-PLACE REINFORCEMENT SHOWN, CAST-IN-PLACE REINFORCEMENT SIMILAR SELFT AS SHOWN ON THIS STANDARD.

CAST-IN-PLACE BOX CULVERT

TYPICAL Baffle

PRECAST BOX CULVERT

TYPICAL Baffle DETAIL

CAST-IN-PLACE BOX CULVERT

ALTERNATE Baffle DETAIL

TYPICAL Baffle

CAST-IN-PLACE REINFORCEMENT SHOWN, CAST-IN-PLACE REINFORCEMENT SIMILAR SELFT AS SHOWN ON THIS STANDARD.
Stream Grades: 4%

2-#5

1'-0"

R.C. Box Culvert

Bottom slab

#5 @ 1'-0"

Bureau of Project Delivery

2-#5

90° Hooks

Department of Transportation

For Cast-In-Place Baffle

L Baffle and See Detail F on Sheet 10

2-#5

90° Hooks

L Baffle and See Detail F on Sheet 10

2-#5

3" Min. CLR.

Baffle Opening

Box Culvert

3" Min.

L Box Culvert and Bottom slab of C

3" Min.

1'-3" Min.

W Wing Wall Footings or Rock Lining whichever is deeper

Beneath the Culvert. Bottom of Cutoff Wall is to equal 1/2 of Rock Lining Depression Depth. Streambed depressed the entire length and choked with natural streambed material. The rock should be flush with the streambed material. The average normal width of the stream. The rock lining width or width of the Culvert.

4. The opening in the interior baffles should be equal to 6" baffle height at opening

5. The opening in the apron baffles should be equal to 1'-0" baffle height

6. The baffle spacing should be set in accordance with Table 1. The average normal width of the stream. Streambed material from excavation may be used for the baffle configurations.

7. The slope of the new structure should match the natural stream slope. The average normal width of the stream. The stream exhibits normal, stable conditions. An average of the 6 measurements should then be used for the baffle configurations.

8. The stream height in the apron baffles should be equal to the average normal height of the stream. The stream height in the apron baffles should be equal to the average normal height of the stream. Streambed material from excavation may be used for the baffle configurations.

9. The stream height in the apron baffles should be equal to 3' 6" min. Whereas the stream height in the apron baffles should be equal to 3' 6" min. The rock lining would then be used for the baffle configurations.

10. The stream height in the apron baffles should be equal to 3' 6" min. Whereas the stream height in the apron baffles should be equal to 3' 6" min. The rock lining would then be used for the baffle configurations.

11. The stream height in the apron baffles should be equal to 3' 6" min. Whereas the stream height in the apron baffles should be equal to 3' 6" min. The rock lining would then be used for the baffle configurations.

TYPICAL BAFFLE DETAIL

OF BOX CULVERT

1'-3" Min.

Bottom slab

6"

1'-3" Min.

W Wing Wall Footings or Rock Lining whichever is deeper

Beneath the Culvert. Bottom of Cutoff Wall is to equal 1/2 of Rock Lining Depression Depth. Streambed depressed the entire length and choked with natural streambed material. The rock should be flush with the streambed material. The average normal width of the stream. The stream exhibits normal, stable conditions. An average of the 6 measurements should then be used for the baffle configurations.

TYPICAL INTERIOR BAFFLE

Precast Box Culvert

Typical Interior Baffle

Cast-In-Place Box Culvert

Twin Cell Box Culverts

1. Baffle Spacing and Openings should be based on the normal channel width upstream of the structure. 1/4 edge of water to 1/4 edge of water grading is typical, and 3'-0" to 4'-0" is typical. All baffles should be designed to be equal to the average normal width of the stream. Streambed material from excavation may be used for the baffle configurations.

2. Stream height in the apron baffles should be equal to 1'-0" baffle height. The stream height in the apron baffles should be equal to 1'-0" baffle height. Streambed material from excavation may be used for the baffle configurations.

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**COMMONWEALTH OF PENNSYLVANIA**
**DEPARTMENT OF TRANSPORTATION**

**STANDARD**

**R.C. BOX CULVERT**

**MISCELLANEOUS TWIN CELL DETAILS**

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**PREFACE:**

The {GREEN} PRECAST BOX CULVERT {RED} is recommended for use in this standard. This recommendation is based on the performance of similar structures and the characteristics of the materials and methods used in their construction. The {GREEN} CAST-IN-PLACE BOX CULVERT {RED} is also recommended, but only when the {GREEN} PRECAST BOX CULVERT {RED} is not feasible due to specific site conditions or other factors.

**RECOMMENDED USE:**

The {GREEN} PRECAST BOX CULVERT {RED} is recommended for use in all stream grades. The {GREEN} CAST-IN-PLACE BOX CULVERT {RED} is recommended for use in stream grades where the {GREEN} PRECAST BOX CULVERT {RED} is not feasible.

---

**DESIGN NOTES:**

- **For PRECAST BOX CULVERTS:**
  - Use {GREEN} PRECAST REINFORCEMENT {RED} shown. Cast-in-place reinforcement is similar except as noted on this standard.
  - Use {GREEN} THREADED INSERTS {RED} where indicated.

- **For CAST-IN-PLACE BOX CULVERTS:**
  - Use {GREEN} CONCRETE PLUGS {RED} where indicated.

---

**PLAN AND SECTION:**

- **PRECAST BOX CULVERT:**
  - Use {GREEN} PRECAST REINFORCEMENT {RED} shown. Cast-in-place reinforcement is similar except as noted on this standard.

- **CAST-IN-PLACE BOX CULVERT:**
  - Use {GREEN} CONCRETE PLUGS {RED} where indicated.

---

**PROFILE:**

- **WEIR DETAIL:**
  - Use {GREEN} PRECAST REINFORCEMENT {RED} shown. Cast-in-place reinforcement is similar except as noted on this standard.

---

**NOTES:**

- Use {GREEN} THREADED INSERTS {RED} where indicated.

---

**RECOMMENDED:**

- {GREEN} APR. 29, 2016 {RED}