COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

R.C. BOX CULVERT
HEADWALL DETAILS

CAST-IN-PLACE

STANDARD

NOV. 26, 2013

SHEET 2 OF 13

ANCHOR BOLTS SHALL BE INSTALLED WITH ANCHOR BOLT ALIGNMENT & PLACEMENT W/BASEPLATE INSTALLED TO ENSURE PROPER EITHER A TEMPLATE OR ACTUAL POST

NOTE:

PA STRUCTURE MOUNTED GUIDE RAIL
ELEVATION ALONG TOP SLAB OF CULVERT

AIR DRY MATERIAL, STORAGE OF GEOTECHNICAL SAMPLING HINTS ON COMPLIANCE SOILS OF NONCOHESIVE SOIL WITH LEAVES AND DIRT COUNTED

#4 EQUALLY SPACED (TYP.)

SECONDARY CASTING
(CAST-IN-FIELD OR PRECAST)

END OF BRIDGE DETAILS

BOLTS W/ LEVELING NUTS OR F1554 GALV. ANCHOR HEX NUTS BOLT WITH HEXHEAD DIA.

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SECONDARY CASTING
(CAST-IN-FIELD OR PRECAST)

END OF BRIDGE DETAILS

BOLTS W/ LEVELING NUTS OR F1554 GALV. ANCHOR HEX NUTS BOLT WITH HEXHEAD DIA.
PRECAST CULVERT FOR DETAILS SEE RC-52M.

30° OPTIONAL APRON SEE DETAIL TOP, INLET ONLY. ALTER REBARS AS REQUIRED.

THREAD INSERTS SHEET 1 EACH FACE 2" CLR. (TYP.)

RISE TO TOP SLAB SLAB BOTTOM WALL FOOTER TOP OF WING ON SHT. 1. SEE NOTE 12 BOND BREAKER. 2 PLY BITUMINOUS EXISTING STREAMBED EL.

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION PLAN BY DESIGN AS REQUIRED REINFORCEMENT BY DESIGN. AS REQUIRED.

#6 AS SHOWN OR AS REQUIRED #6 AS SHOWN 6" 1'-0" 3" 3" CHAMFER @ 6" 3" 90° 1'-6" 2'-0" MAX. #3 @ 9" #5 @ 12" TYP. #4 @ 12" TYP. #4 1'-0" BEDDING MIN. 2" CLR. @ 9" 1'-6" COLLAR 2" CLR. #6 6" 2'-0" 3'-0" MIN. 2'S GUIDE RAIL 2'-0" MIN. 2'SC GUIDE RAIL 1'-0" MIN. 2'SC GUIDE RAIL 1'-0" MIN. 1'-0" COLLAR 2" CLR. #6 6" 2'-0" MAX. 3"x3" CHAMFER @ 110° 1'-0" BEDDING MIN. 2" CLR. #5 1'-0" MIN. #4 1'-0" MIN. DEPRESS STREAMBED EL. EXISTING 3'-6" MIN. TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICHER IS DEEPER. TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING MATERIAL IS DEEPER. TO BOTTOM OF APRON MATERIAL IS DEEPER.

ALTERNATIVE CUTOFF WALL WITH GROUTED ROCK DETAIL A (WITHOUT APRON) DETAIL B (WITH APRON) SEE NOTE 12 ON SHEET 4. ROCK LINING WHICHER IS DEEPER 3'-6" MIN. TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICH EVER IS DEEPER (3'-6" MIN.). FILL TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK.

R.C. BOX CULVERT PRECAST

Section Q-Q

DETAIL A (WITHOUT APRON) TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING MATERIAL IS DEEPER 3'-6" MIN. FILL ROCK MATERIAL STREAMBED MATERIAL TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING MATERIAL IS DEEPER 3'-6" MIN. THE 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.

DETAIL B (WITH APRON) ROCK TOP OF APRON COLLAR OR BARRIER CURB NOT SHOWN 5'-0" PROTECTION 5'-0" MIN. ROCK R-6 MIN. ROCK (USE ONLY IN THE ABSENCE OF AN APRON) SEE DETAIL A THIS SHEET. WITH GROUTED ROCK IS PERMITTED, AN ALTERNATIVE CUTOFF WALL OF ROCK LINING WHICHER IS DEEPER.
STANDARD R.C. BOX CULVERT

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SECTION D-D
POST-TENSION END SECTION
SPAN >12 FEET

SECTION E-E
POST-TENSION END SECTION
SPAN ≤ 12 FEET

POST-TENSIONING NOTES:

1. EXTEND BOTTOM ROW OF POST-TENSIONING STRANDS THROUGH THE BOTTOM SLAB OF PRECAST CONCRETE 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 SECTIONS.
3. POST-TENSION END SECTIONS FIRST, THEN PROVIDE:
   • MECHANICAL SPACERS ON BOTTOM STRANDS TO CONNECT WITH THE INLET/OUTLET AND BOX SEGMENTS AND POST-TENSION BOTTOM STRANDS THROUGH THE END SECTIONS.
   • STRAPS ON TIME OF END SECTION AS SHOWN ON 80-TYPE BOX CONCRETE END SECTIONS, AND POST-TENSION BOTTOM STRANDS THROUGH THE END SECTIONS.
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. POST-TENSIONED 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 HEAT OR WIDTH OF END SECTIONS ARE RESTRICTED DUE TO SHIPPING RESTRAINTS.
8. WALL THICKNESS CAN BE ADJUSTED TO ACCOMMODATE DIAPHRAGM. DO NOT CUT REINFORCEMENT.

GENERAL NOTES:

1. EPOXY COAT REINFORCEMENT AS PER R.C. BOX CULVERT DESIGN.
2. REBAR SHOWN IS FOR ORIENTATION ONLY, REBAR SIZE AND IF WIDTH IS RESTRICTED DUE TO SHIPPING RESTRAINTS. SPECIFY JOINT AND ADDITIONAL END SECTION POST TENSION STRAND DESIGN (TYP.)

POST-TENSION MODIFICATIONS:

SLAB STRAND LOCATION FOR SPANS 2-12" USE ONLY IF REQUIRED

TYPICAL STRAND LOCATION
LOCATION IS BASED ON DESIGNER'S REQUIREMENTS

TYP. BOX END SECTION
SHOWING STRAND LOCATIONS
The opening in the interior baffles should be equal to 1/3 the average normal width of the stream.

The opening in the apron baffles should be equal to the entrance of the stream to the channel at the end of the structure. The first interior baffles are located at the end of the structure. The first set of baffles at the end of the structure. Hence, the baffles should be at least 1'-0" long, a second set of baffles are placed in the geometry to be set at one-eighth of the distance from the end to the face of the structure.

The openings in the interior baffles should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream.

The openings in the interior baffles should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream. The openings should be equal to 1/3 the average normal width of the stream.
1. The opening spacing and openings should be based on the normal channel width upstream and downstream of the structure. The structure must be wide enough to prevent overflow and maintain the normal flow. The structure must be designed to prevent erosion and ensure stability.

2. The opening spacing in the upstream direction should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

3. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

4. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

5. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

6. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

7. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

8. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

9. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

10. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

11. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

12. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

13. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

14. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

15. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.

16. The opening in the interior baffles should be equal to the average channel width. The opening spacing should be at least 1'-0" at the end of the culvert. If the structure is greater than 5'-0" long, a second set of opposing baffles may be required to prevent erosion.
PRECAST BOX CULVERT

TYPICAL WEIR DETAIL
ALL STREAM GRADES

CAST-IN-PLACE BOX CULVERT
ALTERNATE WEIR DETAIL
ALL STREAM GRADES

**

TYP. PRECAST SECTION (NORMAL)
SYMMETRICAL

1'-0" + 1'-0"

2'-3" MIN.

L WEIR AND 50° WORKS

W9 50" WORKS; ROTATE ALTERNATING WORKS 180°

1/4" THREADED INSERT (TYP.)

PREFABRICATED BOX CULVERT

TYPICAL WEIR

PROFILE - TYPICAL WEIR

1'-0"

2'-3" MIN.

L WEIR AND 50° WORKS

W9 50" WORKS; ROTATE ALTERNATING WORKS 180°

1/4" THREADED INSERT (TYP.)

PRECAST REINFORCEMENT SIMILAR EXCEPT AS NOTED ON THIS STANDARD.
**COMMONWEALTH OF PENNSYLVANIA**

**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF PROJECT DELIVERY**

**STANDARD**

**R.C. BOX CULVERT WITHOUT APRONS**

**MISCELLANEOUS DETAILS**

**STREAM GRADES ≤ 4%**

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**TWIN CELL BOX CULVERTS**

**PLAN VIEW**

- **Note:** Top of baffle shall be min. 4" below existing streambed elev.

**SECTION K-K**

- **Note:** Top of baffle shall be min. 4" below existing streambed elev.

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**OPPOSING BAFLES LESS THAN 1'-0"**

1. **Pre LEG** measurement shown. Each to place reinforcement shown calculated on Sheet 10.
2. **Note:** Opposing baffles less than 1'-0", cast segment shown on note 2.
3. **Pre LEG:** Opposing baffles less than 1'-0", oppose 2'-0" bars with a 4" steel supported. 2'-0" bars not opposed to alternate 5'-0" hook bar.

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**OPPOSING BAFLES LESS THAN 2'-0"**

1. **Pre LEG** measurement shown. Each to place reinforcement shown calculated on Sheet 10.
2. **Note:** Opposing baffles less than 2'-0", cast segment shown on note 2.
3. **Pre LEG:** Opposing baffles less than 2'-0", oppose 4'-0" bars with a 4" steel supported. 4'-0" bars not opposed to alternate 5'-0" hook bar.

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**DESIGN NOTES**

1. The baffle spacing and openings should be based on the normal channel width as determined by the road width, inlets, and outlets. The opening should be equal to one-third the normal width of the stream. The opening may be adjusted to suit the condition of the stream.
2. Opposing baffles should be placed at the inlet and outlet ends of the culvert. The baffle spacing should be equal to the normal width of the stream when the stream has a natural channel.
3. The opening in the interior baffles should be a distance equal to 1/3 the normal width of the stream.
4. Opposing baffles should be spaced to ensure equal spacing between the inlets and outlets of the culvert.
5. The slope of the new structure should match the existing streambed slope. The slope of the new structure should be equal to the normal profile grade of the stream.
6. The stream width should be measured at the middle of the stream. The stream width should be measured at the middle of the stream.
7. The slope of the new structure should match the existing streambed slope. The slope of the new structure should be equal to the normal profile grade of the stream.
8. The stream width should be measured at the middle of the stream. The stream width should be measured at the middle of the stream.
9. The slope of the new structure should match the existing streambed slope. The slope of the new structure should be equal to the normal profile grade of the stream.
10. Additional twin cell details are shown on Sheet 12.
11. For typical baffle plan, profile and reinforcement details see Sheet 12.