1. \*Precast Reinforced Box Culverts [603] (Revised 2-18-16)
	1. Description. Precast reinforced concrete box culvert (RCB) is specified at locations shown on the plans.
	2. Materials.
		1. RCB. Furnish RCB that meet the requirements HL-93 live loading. RCB must also meet the requirements of ASTM C1577, except the aggregate gradations must meet Subsection 701.01 or a Department approved optimized gradation. Refer to ASTM special design provisions for RCB sizes that are not included in the ASTM table or for any changes in wall thickness. Use Type V cement unless otherwise specified.
		2. Joint Sealant. Install flexible plastic gaskets between culvert sections meeting the requirements of Subsection 707.02. Provide joint material that is 1.25 inch (31.75 mm) equivalent diameter (1 inch (25.4 mm) x 1.23 inch (31.12 mm) actual dimensions).
		3. External Joint wrap. Furnish Type III, chemically bonded adhesive butyl bands for all joints between box sections meeting the requirements of ASTM C877. Use Type A designation with a sealing bandwidth of 12 inch (300 mm). Apply joint wrap material externally around each joint over semi-liquid paintable butyl rubber-based adhesive primer. Begin each joint wrap at haunch, extend up and over the top of the culvert, and terminate at the other haunch. Extend joint wrap under the haunches as far as possible on each side of the box culvert while maintaining seal with adhesive primer. If two or more pieces are required, lap a minimum of 6 inches (150 mm). Replace punctured or torn joint wrap damaged by culvert installation at Contractor expense.
		4. Bedding material. Use granular bedding material for bedding material. Provide a 12-inch (300 mm) thick base. Compact granular bedding by proof rolling with vibratory compactor or by using a method approved by the Project Manager.
		5. Flared or Tapered End Section. Furnish precast flared or tapered end sections according to the RCB detail.
		6. Optional Cutoff Walls. Cast-in-place or precast cutoff walls are acceptable for the ends of RCB.
		7. Reinforcing Steel. Use rebar dowels meeting the requirements of AASHTO M 31, Grade 60 (Grade 420).
		8. Epoxy Resin Bonding Adhesive. Meet the requirements of AASHTO M 235 Type 4.
	3. Construction Requirements.
		1. Joint Tolerance. When placing RCB sections in final position, the gaps between sections must not exceed 0.75 inch (19 mm). Check for misalignment by measuring normal to the walls and slabs. Correct misalignment between sections before adding the next section.
		2. Lift Holes. Plug all lift holes and fabrication holes before placing backfill. Use the manufacturer supplied plugs for filling holes in the top slab. Grout all holes in the side and floor slabs.
		3. Tie Bolt Holes. Fill the annular area by injecting silicone caulking in tie bolt holes or fill with joint material after installation of the bolt and before placing the washer.
		4. Manufacturer’s Installation Procedure. Follow the recommended installation procedure provided by the manufacturer. Provide the Project Manager one copy of the recommended procedure ten calendar days before installation.
		5. Welding Requirements. Perform all welding on precast member connections in accordance with AWS D1.1 Structural Welding Code.

Alternate Connection – Concrete Edge Protection. Drill holes in RCB end sections at locations shown on the plans. Epoxy bond #6 (#19) rebar dowels with 8 inches (203 mm) minimum protrusion. The required depth of embedment is RCB wall thickness minus 2 inches (50 mm). Minimum distance from edge of RCB to center of hole is 4 inches (100 mm). Follow adhesive manufacturer’s recommendations for hole diameter and other installation requirements.

Precast Concrete Curb Connection. When precast concrete curbs are required at the RCB ends, connect the curbs to the RCB using the precast holes in the curb. Mark the hole locations and drill and epoxy bond #6 x 12 inch (#19 x 305 mm) rebar dowels into the RCB a depth of 5 inches. Follow manufacturer’s recommendations for hole diameter and other installation requirements. Install curb, centering the dowels in the holes and fill the curb holes with non-shrink grout.

Precast Cut-off Wall Connection. If precast cut-off walls are used, connect the RCB end to the cut-off wall using the precast holes provided in the RCB. Drill 1.5 inch diameter x 6 inch (40 mm x 150 mm) holes in the cut-off wall at each location. Clean hole of loose debris, fill hole in cut-off wall with approved non-shrink grout and install #6 x 12 inch (#19 x 305 mm) long rebar into the hole keeping the rebar centered. Fill remaining hole in RCB with grout.

Fillets. Reinforce fillets with a minimum of #3 grade 60 rebar at 12-inch centers.

* + 1. Submittals. Submit five sets of shop drawings and all supporting hand and computer design calculations to the Project Manager for approval prior to fabrication. Shop drawings may be furnished in Adobe Acrobat Reader (.pdf) format or 11”x17” sheets. All design plans and calculations must be signed and sealed by a Professional Engineer registered in the State of Montana. Calculations are to include load rating factors for design vehicle. Calculate rating factors in accordance with the latest version of the AASHTO Manual of Bridge Evaluation. Submit all welding procedure specifications and welder qualification records to the Project Manager for approval prior to welding precast connections. Submit epoxy bonding system to the Project Manager for approval prior to installation.
	1. Method of Measurement. Precast Reinforced Concrete Box Culvert is measured in accordance with Subsection 603.04.
	2. Basis of Payment. Include all costs associated with this item, as well as all pumping, bailing, and drainage necessary for foundation preparation, in the unit price bid per foot (meter) for Reinforced Concrete Box Culvert.

Payment at the contract unit price is full compensation for all necessary resources to complete the item of work under the contract.