

SECTION 027404
CONCRETE BOX CULVERTS

1. DESCRIPTION

This specification shall govern all work required for constructing, furnishing, and installing reinforced concrete box culverts required to complete the project.

All reinforced concrete boxes for this project shall be precast concrete in accordance with TxDOT Standards for precast box culverts and the details shown on the drawings for the appropriate height of fill, and design shall conform to ASTM C1577.

Alternate designs of precast boxes will be considered for approval upon submission of shop drawings detailing the box and certifications that the box, as designed, is structurally comparable to or better than the box shown in the contract drawings and is designed to support HL93 loading per ASHTO M273. The shop drawings and certifications shall be signed and sealed by a Texas registered professional engineer.

2. MATERIALS

1. Concrete. Unless otherwise shown on the plans, Class "C" concrete shall be used for cast-in-place boxes, conforming to the requirements of City Standard Specification Section 030020 "Portland Cement Concrete" and City Standard Specification Section 038000 "Concrete Structures", except that Class "S" concrete will be required for top slabs of direct traffic cast-in-place boxes.

Concrete for precast (machine-made) boxes shall meet the requirements of ASTM C76 Sections: "Cement", "Aggregates" and "Mixture", and shall have a minimum 28-day compressive strength of 5,000 psi.

2. Reinforcement. Reinforcing steel shall conform to the requirements of City Standard Specification Section 032020 "Reinforcing Steel" and the details shown on the plans.
3. Jointing. Materials for jointing shall conform to the requirements of City Standard Specification Section 027402 "Reinforced Concrete Pipe Culverts".
4. Membrane Curing. Materials for membrane curing shall conform to City Standard Specification Section 038000 "Concrete Structures".
5. Geotextile. Geotextile fabric for wrapping joints shall be Class 2 geotextile for subsurface drainage with an average opening size (AOS) of 0.22mm and in accordance with AASHTO M288.

3. FABRICATION

The requirement of City Standard Specification Section 030020 "Portland Cement Concrete" and City Standard Specification Section 038000 "Concrete for Structures" shall govern for cast-in-place

concrete box culverts and for precast (formed) boxes except where otherwise specified herein.

Forms for precast (machine-made) boxes shall be made of steel. Forms for cast-in-place boxes and precast (formed) boxes may be either wood or steel.

Forms shall be mortar-tight and of sufficient strength to prevent excessive bulging or misalignment of adjacent boxes. They shall be constructed to permit their removal without damage to the concrete. Offsets at form joints shall not exceed 1/8". Forms shall be clean and free of extraneous matter when concrete is placed.

Positive means of supporting steel cages in place throughout forming and concrete placement shall be required and subject to the approval of the OAR. Welding of reinforcing steel will be permitted only where shown on the plans. Welding shall be done by a qualified welder and shall conform to industry standards.

Precast (machine-made) boxes shall be cast by a process which will provide for uniform placement of the concrete in the forms and compaction by mechanical devices which will assure dense concrete. Concrete shall be mixed in a central batch plant or other approved batching facility from which the quality and uniformity of the concrete can be assured. Transit mixed concrete shall not be acceptable for use in precast (machine-made) boxes.

4. TESTING AND CERTIFICATION

1. Physical Requirements. Precast boxes shall meet the requirement of ASTM C1577. Testing shall be done by a materials engineering testing laboratory which meets the requirements for membership in the American Council of Independent Laboratories.
2. Fabrication Tolerances. Precast boxes shall conform to the following tolerances: When two box sections are fitted together on a flat surface, in proper alignment and in the position they will be installed, the longitudinal opening at any point shall not exceed 1".

Not more than four lifting holes may be provided in each box to facilitate handling. They may be cast-in, cut into the fresh concrete after form removal or drilled, and shall not be more than 2" in diameter or 2" square. Cutting or displacement of the reinforcement will not be permitted. Spalled areas around the holes shall be repaired. Concrete boxes shall be given an "Ordinary Surface Finish" in accordance with Section 038000 "Concrete Structures".

3. Certification. Certification of quality shall be provided with each delivery of materials to the job site by the manufacturer. Certification shall be a written report by the materials engineering testing laboratory.

5. DEFECTS AND REPAIRS

Fine cracks or checks on the surface of the member which do not extend to the plane of the nearest reinforcement will not be cause for rejection unless they are numerous and extensive. Cracks which extend into the plane of the reinforcing steel but are acceptable otherwise, shall be repaired in an

approved manner.

Small damaged or honeycombed areas which are purely surficial in nature may be repaired. Excessive damage, honeycombing or cracking will be subject to structural review. Repairs shall be sound, properly finished, and cured in conformance with the pertinent specifications. When fine cracks or hairline cracks on the surface indicate poor curing practices, further production of precast boxes shall be discontinued until corrections are made and proper curing provided.

6. CONSTRUCTION METHODS

Excavation and backfill shall be in accordance with City Standard Specification Section 022020 "Excavation and Backfill for Utilities" and City Standard Details for Stormwater. Bedding for precast concrete box culverts located under pavements shall consist of 6" of uniformly moistened and mixed cement-stabilized sand containing a minimum of 1.5 sacks of Standard Type I or Type II Portland cement per cubic yard of sand and compacted to not less than 95% Standard Proctor density.

Unless otherwise shown on the plans, the Contractor may use any of the jointing materials, except rubber gaskets, and shall comply with the jointing requirements specified in the City Standard Specification Section 027402 "Reinforced Concrete Pipe Culverts".

All box joints shall be wrapped with geotextile fabric. The wrap shall be at least 2' wide and centered on the joints.

Minimum clearance between parallel RCBs is 6", and the space between the boxes shall be filled with uniformly moistened and mixed cement stabilized backfill.

Lifting holes shall be filled with mortar or concrete and cured to the satisfaction of the OAR.

It shall be the responsibility of the Contractor(s) to adhere to all applicable OSHA rules and regulations while performing any and all City-related projects or jobs, to include, but not necessarily limited to 'Confined Space Entry.'

7. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, concrete box culverts shall be measured by the linear foot for each size of box installed. The measurement will be made between the ends of the box along the centerline. For boxes used in the multiple barrel structures, the measured length will be the sum of the lengths of all barrels.

Payment shall be made at the contract bid price and shall fully compensate the Contractor for furnishing, transporting and installing the box culverts; for bedding materials and bed preparation including compaction; for excavation and backfill of trenches; for all connections to existing and new structures; and for all labor, materials, tools, equipment and incidentals required to complete the work as shown on the contract drawings and as specified herein.

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