

## 504 Culverts, Retaining Walls, and Endwalls

### 504.1 Description

- (1) This section describes providing culverts whether defined as a culvert or bridge under [101.3](#), retaining walls, and endwalls. This work does not include providing pipe culverts.

### 504.2 Materials

- (1) Furnish steel reinforcement conforming to [505](#).
- (2) For cast in place structures, furnish grade A concrete conforming to [501](#) as modified in [700](#). Where the contract specifies or the engineer allows, the contractor may use high early strength concrete. Provide QMP for concrete as follows:
  - For culverts and retaining walls as specified in [715](#) for class I structure concrete.
  - For endwalls as specified in [716](#) for class III ancillary concrete.
- (3) For precast structures, conform to [ASTM C1577](#). Manufacture in a plant listed under precast concrete fabricators on the [APL](#). Conform to the specified ASTM materials requirements for the structure specified except as follows:
  - Use concrete with 565 pounds or more cementitious material per cubic yard.
  - The contractor may use cement conforming to [501.2.4.1](#) or may substitute for portland cement at the time of batching conforming to [501.2.4.2](#) for fly ash, slag, or other SCMs, or conforming to [501.2.4.3](#) for ASCMs. In either case the maximum total supplementary cementitious content is limited to 30 percent of the total cementitious content by weight.
  - For wet cast use air-entrained concrete with 7.0 percent +/- 1.5 percent air content.

### 504.3 Construction

#### 504.3.1 General

- (1) Construct culverts, retaining walls, and endwalls conforming to [502.3](#).

#### 504.3.2 Placing Concrete

- (1) For constructing concrete box culverts, unless specified otherwise, place the curtain walls, base slab, and the barrel sidewalls as a single unit to an approximate height of 6 inches and allow to set before constructing the remaining culvert. If constructing the sidewalls and top slab of box culverts as a monolith, allow not less than one hour or more than 3 hours to elapse between completing placement of the sidewalls and beginning placement of the top slab.

#### 504.3.3 Removing Falsework and Applying Load

- (1) For culvert spans less than 12 feet, the engineer may allow falsework removal based on one of the following:
  - Absent compressive strength information, the minimum equivalent days specified in [502.3.10.1](#).
  - With compressive strength information, a strength of 2000 psi or greater.
- (2) For culvert spans of 12 feet and greater, the engineer may allow falsework removal after 7 equivalent days as defined in [502.3.10.1](#).
- (3) The contractor may backfill culverts, retaining walls, and end walls that have attained the specified compressive strength or upon expiration of the minimum times as specified in [206.3.13](#). Do not apply additional loads on culverts until attaining a compressive strength of 3500 psi or, absent compressive strength information, for at least 21 days.

#### 504.3.4 Name Plates

- (1) Install nameplates on culverts and retaining walls conforming to [506.2.4](#) at the locations the plans show. Embed in concrete as specified in [502.3.11](#).

#### 504.3.5 Curing

- (1) Cure concrete in culverts, retaining walls, and end walls by any of the methods specified in [502.3.8](#).
- (2) Cure retaining wall parapets with pigmented cure and seal conforming to [502.2.11](#). If applying architectural or other surface treatments, use a curing method compatible with those treatments.

### 504.4 Measurement

- (1) The department will measure the several bid items that constitute the completed and accepted structure according to the provisions of the contract for those bid items and in the units the contract specifies.
- (2) The department will measure the Concrete Masonry Culverts and the Concrete Masonry Retaining Walls bid items by the cubic yard acceptably completed.
- (3) The department will measure Concrete Masonry Endwalls by the cubic yard acceptably completed.

### 504.5 Payment

- (1) The department will pay for measured quantities at the contract unit price under the following bid items:

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
504.0100	Concrete Masonry Culverts	CY
504.0200	Concrete Masonry Culverts HES	CY
504.0500	Concrete Masonry Retaining Walls	CY
504.0600	Concrete Masonry Retaining Walls HES	CY
504.0900	Concrete Masonry Endwalls	CY

- (2) Payment for the Concrete Masonry Culverts and the Concrete Masonry Retaining Walls bid items is full compensation for materials, forms, falsework, placing, finishing, curing, protecting, and heating; and for providing nameplates.
- (3) Payment for Concrete Masonry Endwalls is full compensation for excavating; for materials, including reinforcement; for forms; for placing, including reinforcement; and for finishing, curing, protecting and heating.