

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS**  
**SECTION 02633 CONCRETE CHANNEL LINING AND CONCRETE DITCH PAVING**

**PART 1 – SCOPE**

This work shall consist of the construction of reinforced concrete channel lining, plain concrete ditch paving and reinforced concrete ditch paving of the dimensions, details, and sections presented in the Plans, stipulated in the Contract Documents, or as directed by the Owner. It shall also consist of the removal and replacement of existing portions of concrete channel lining wall or bottom. The construction shall be accomplished in accordance with these Specifications and in conformity with the lines, grades, cross-sections, and details shown on the Plans and directions furnished by the Owner. The work shall include such labor, material and equipment required to successfully complete the work.

**PART 2 – MATERIALS AND EQUIPMENT**

2.01 MATERIAL

A. New Material.

All materials shall be subject to sampling, testing, and approval or rejection by the Owner. Unless otherwise specified, all materials incorporated into the work shall be new and unused in previous construction. Used materials, acceptable to the Owner, may be used for trench bracing, forms, falsework, and similar uses.

B. Manufacturer's Qualifications.

The source of supply for each material to be supplied by the Contractor shall be subject to approval by the Owner before delivery.

C. Inspection and Testing.

1. Representative samples of materials intended for incorporation in the work shall be submitted for examination when so specified or requested by the Owner. All materials to be used in the work shall be sampled, inspected, and tested in accordance with current ASTM specifications, or other specified standard specifications. The Contractor shall furnish the Owner with three copies of certified reports from a reputable testing laboratory showing the results of the tests carried out on representative samples of materials delivered and to be used in the project. The performance or cost of all testing is incidental to the work and shall be done at no cost to the City.

2. The Contractor shall notify the Owner in advance of any deliveries of the materials and shall make whatever provisions are necessary, including the furnishing of such labor as may be required to aid the Owner in the examination, inspection and culling of the materials on the site prior to installation in the work.

3. All materials not conforming to the requirements of these Specifications shall be considered as defective and rejected for use and shall be removed from the site of the work.

D. Storage.

The Contractor shall provide such storage facilities and exercise such measures as will insure the preservation of the specified quality and fitness of materials to be incorporated in the work.

E. Concrete.

Channel lining and ditch paving shall be constructed of Class A S concrete as defined in Specification Section 03050.

F. Steel Reinforcement.

Deformed steel reinforcing bar shall conform to ASTM A 615 for Grade 40 or Grade 60 and shall be of the grades, sizes, and dimensions and at the designated spacings and locations shown on the Plans or as directed by the Owner. Welded wire fabric conforming to ASTM A 185 shall have a minimum yield strength of 65,000 psi and fabric conforming to ASTM A 497 shall have a minimum yield strength of 70,000 psi and shall be of the size, design, and weight and at the

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS**  
**SECTION 02633 CONCRETE CHANNEL LINING AND CONCRETE DITCH PAVING**

locations shown on the Plans or as directed by the Owner. All steel reinforcement and its storage and handling shall be as specified in Specification Section 03310.

G. Filter Cloth and Fasteners.

The filter cloth material and fasteners for weep hole drainage system shall conform to the requirements of Specification Section 02641.

H. Washed Gravel.

Washed gravel for weep hole drainage system shall conform to the requirements of Specification Section 02641.

I. Weep Hole Drain Pipe.

Perforated and nonperforated tubing and fittings for weep hole drainage system shall conform to the requirements of Specification Section 02641.

2.02 EQUIPMENT

All equipment required for the satisfactory performance of the work shall be on the project and approved before work will be permitted to begin.

**PART 3 – CONSTRUCTION REQUIREMENTS**

3.01 CONCRETE CHANNEL LINING.

A. General.

The requirements for concrete formwork, falsework, reinforcement, placing concrete, removal of forms and falsework, removal of defective concrete, and curing and protection of concrete as defined in Specification Section 03310, "Concrete Structures" shall apply to the construction of concrete channel lining except as modified in this section of the Specifications. Concrete materials, proportioning, mixing, and delivery shall conform to Specification Section 03050, "Portland Cement Concrete". The subgrade shall be carefully shaped to the channel section shown on the Plans and compacted to provide a firm foundation for the structure in conformance with Specification Section 02631.

B. Weep Hole Drainage System.

The weep hole drainage system shall be constructed as shown on the Design Standards, or as directed by the Owner. The weep holes and weep hole drainage system shall be constructed in conformance with the requirements of Specification Section 02641 Paragraph 3.01.G.

C. Expansion Joints.

Transverse expansion joints shall be provided at 30 foot intervals. Expansion joints shall be constructed at right angles to the centerline of the channel, throughout channel bottom and sidewalls in conformance with Design Standards. Preformed expansion joint material shall be ¾ inch thickness and full depth of slab and walls.

D. Connecting Storm Drains.

Existing and new storm drains intercepted by the channel shall be formed into sidewalls and cut off flush and smooth with the inside face of the wall so as to not leave an obstruction along the wall. Channel sidewalls shall be poured monolithically around pipe sections. Intercepted drains shall be oriented at right angles to the wall or skewed in the direction of flow. The steel reinforcement shall be placed around each pipe end as it intersects the channel wall in accordance with the Design Standards. Existing pipes 12 inches in diameter or smaller intercepted by the box culvert shall be extended as required for proper connection at no additional compensation. Existing pipes larger than 12 inches in diameter shall be extended as required for proper connection and paid for at the appropriate price per linear foot for the pipe. Pipe extensions shall be of the same material as the existing pipe to which it is connected, except

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS**  
**SECTION 02633 CONCRETE CHANNEL LINING AND CONCRETE DITCH PAVING**

for pipe larger than 12 inches in diameter which shall be reinforced concrete pipe unless otherwise directed by the Owner.

E. Finish.

Sidewalls shall be given a Class 1 ordinary surface finish and the bottom slab shall be given a Class 3, float finish except for brushing as defined in Specification Section 03310 Paragraph 3.11. Sidewalls and slab shall be cured in accordance with Specification Section 03310 Paragraph 3.13.

F. Invert.

The bottom slab of the channel shall be constructed with a “V” shaped invert as shown on the Plans and Design Standard.

G. Fence Sleeves.

Manufactured 3 inch diameter sleeves in accordance with Specification Section 02820 Paragraph 3.01 shall be provided in the channel walls for fence posts as shown on the Plans.

H. Test Specimens.

The Contractor shall furnish the concrete necessary for casting test specimens in the field. The City will supply all molds and labor necessary to cast and test the specimens. The Owner will designate the frequency of sampling the fresh concrete. The method of making and curing test specimens will be in accordance with AASHTO Designation T 23. Test cores shall be drilled by the Contractor at his expense if required by the Owner at locations selected by the Owner.

I. Backfilling.

Full backfill shall not be placed until representative test samples of the concrete used in the channel lining attains a compressive strength of 3,000 pounds per square inch. In addition, the concrete shall have been placed a minimum of 7 days (not counting days of 24 hours each when the temperature is below 40 degrees F.) or 21 calendar days whichever comes first. Backfill shall be placed by means which insures proper compaction. Backfill above filter cloth closure shall be of suitable nonporous material. Placement and compaction of the backfill and final cleanup shall be in accordance with Specification Section 02631.

J. Access Ramp.

Access ramps for maintenance vehicles shall be constructed at the locations and to the details shown on the Plans. Location of contraction and expansion joints in channel lining shall be adjusted to fall outside of the ramp connection area. Longitudinal channel wall reinforcement shall be bent and tied to ramp wall reinforcement. Longitudinal ramp bottom reinforcement shall extend into the channel bottom area a minimum of 30 inches.

K. Channel Transitions.

Transitions in wall height and/or channel width shall be constructed within the limits shown on the Plans or as directed by the Owner. The full height of wall or width of channel, including the transition portion, shall be poured monolithically. Continuous vertical reinforcement as required in the Plans and Design Standards for the full wall height constructed shall be placed to insure structural adequacy for the higher wall segment. The transition from one wall height to another shall be accomplished with a smooth and uniform slope on the top of wall.

3.02 CONCRETE DITCH PAVING.

A. General.

Site preparation work and grading work shall be performed in accordance with Specification Sections 02630 and 02631, respectively. The subgrade shall be carefully shaped to the trapezoidal section shown on the Plans and compacted to provide a firm foundation for the concrete.

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS**  
**SECTION 02633 CONCRETE CHANNEL LINING AND CONCRETE DITCH PAVING**

B. Reinforcement.

Welded wire fabric (10 gauge 6" x 6") shall be used in reinforced concrete ditch paving unless otherwise specified on the Plans. Fabric shall be sufficiently supported to maintain 2 inches of clearance between fabric and bottom surface of concrete ditch paving, for 4 inch thick ditch paving, and 3 inches of clearance for 6 inch thick ditch paving.

C. Joints.

Formed or sawed transverse contraction joints (1/4 inch wide by 1 inch deep) will be required at 10 foot maximum intervals. Transverse expansion joints; 3/4 inch width preformed expansion material full depth of slab, will be required at 30 foot intervals.

D. Placing and Finishing Concrete.

1. Immediately before placing the concrete, the subgrade shall be thoroughly wetted, and the forms given a coating of light oil. The forms shall be thoroughly cleaned and oiled each time before using.

2. The concrete shall be placed immediately after mixing; the edges shall be spaded and the concrete thoroughly consolidated, after which the surface shall be finished smooth and even by means of a wooden float. A final finish of a rough uniform texture shall be obtained by brushing with a fiber brush.

3. The edges of the paved ditch shall be rounded to a radius of 1/2 inch, and edges along expansion joints shall be finished with an edging tool with a radius of not over 1/4 inch and then all edging marks removed with a float and brush.

E. Protection and Curing.

1. Immediately after finishing the concrete, it shall be cured as specified under Specification Section 03310 Paragraph 3.13.

2. The Contractor shall protect the ditch paving until final acceptance of the project. Any concrete that is damaged prior to acceptance shall be repaired by removing and reconstructing the damaged sections between joints. Such reconstruction shall be at the Contractor's expense.

F. Test Specimens.

The Contractor shall furnish the concrete necessary for casting test specimens in the field. The City will supply all molds and labor necessary to cast and test the specimens. The Owner will designate the frequency of sampling the fresh concrete. The method of making and curing test specimens will be in accordance with AASHTO Designation T 23. Test cores shall be drilled by the Contractor at his expense if required by the Owner at locations selected by the Owner.

G. Backfilling.

Immediately after the concrete has set sufficiently and the forms have been removed, the spaces on each side of the ditch paving shall be filled with suitable material and thoroughly compacted; or when sod is specified, it shall be placed as shown on the Plans.

**PART 4 – MEASUREMENT**

4.01 CONCRETE CHANNEL LINING.

Concrete channel lining will be measured for payment per linear foot measured along the centerline of the channel for the various wall heights, invert depths, and channel width sections included in the Contract Documents. Transition sections will be measured and paid for as the larger of the sections connected. Wingwalls and aprons when required will be measured for payment in conformance with Specification

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS**  
**SECTION 02633 CONCRETE CHANNEL LINING AND CONCRETE DITCH PAVING**

Section 02640 Paragraph 4.09. Fence for concrete channel lining when required will be measured for payment in conformance with Specification Section 02820 Paragraph 4.01.

**4.02 ACCESS RAMP.**

No measurement of the access ramp structure will be made. Fence gates when required will be measured for payment in conformance with Specification Section 02820 Paragraph 4.01.

**4.03 CONCRETE DITCH PAVING.**

Concrete ditch paving will be measured for payment per square foot for the various thicknesses specified in the Contract Documents.

**4.04 REINFORCED CONCRETE DITCH PAVING.**

Reinforced concrete ditch paving will be measured for payment per square foot for the various thicknesses specified in the Contract Documents.

**4.05 CONCRETE CHANNEL LINING BOTTOM REMOVAL AND REPLACEMENT.**

Concrete channel lining bottom removal and replacement will be measured for payment per square foot for the various thicknesses specified in the Contract Documents. This measurement shall include any portion of concrete-lined channel extending below the construction joint (denoted on Civil Standard Drawings). Any steel reinforcing which may extend vertically to tie into a concrete channel lining wall shall be included in this item.

**4.06 CONCRETE CHANNEL LINING WALL REMOVAL AND REPLACEMENT.**

Concrete channel lining wall removal and replacement will be measured for payment per linear foot measured along the centerline of the channel lining wall for the various heights included in the Contract Documents. This measurement shall include any portion of concrete channel lining extending above the construction joint (denoted on Civil Standard Drawings). Steel reinforcement required to tie into the existing concrete lined channel bottom will not be paid by this item. If any reinforcement is damaged during demolition, it shall be replaced at the contractor's expense. Transitions in heights will be measured and paid for as the larger of the sections connected. Wingwalls when required will be measured for payment in conformance with Specification Section 02640 Paragraph 4.09. Fence for concrete channel lining when required will be measured for payment in conformance with Specification Section 02820 Paragraph 4.01.

**PART 5 – PAYMENT**

**5.01 CONCRETE CHANNEL LINING.**

The accepted quantities of concrete channel lining will be paid for at the contract unit price per linear foot for the various sizes specified. Their unit price shall be full compensation for excavation, foundation preparation, bedding, utility protection, materials and materials' testing, formwork, steel reinforcement, fence post sleeves, drain connections 12 inches in diameter and smaller, concrete placement, form removal, finishing, curing, weep hole drainage system, joints, backfilling, and all other incidental labor, material and equipment necessary to complete the work.

**5.02 ACCESS RAMP.**

Access ramp construction will be paid for at the lump sum price specified in the Contract Documents which price will be full compensation for excavation, foundation preparation, utility protection, materials and materials' testing, formwork, steel reinforcement, fence post sleeves, drain connections 12 inches in diameter and smaller, concrete placement, form removal, finishing, curing, weep hole drainage system, backfilling, and all other incidental labor, materials, and equipment necessary to complete the work.

**5.03 CONCRETE DITCH PAVING.**

The accepted quantities of concrete ditch paving will be paid for at the contract unit price per square foot complete in place for the various thicknesses specified in the Contract Documents. This unit price will be full compensation for excavation, subgrade preparation, utility protection, forming, placing concrete,

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS**  
**SECTION 02633 CONCRETE CHANNEL LINING AND CONCRETE DITCH PAVING**

materials and materials' testing, form removal, finishing, curing, joints, backfilling, and all other incidental labor, material and equipment necessary to complete the work.

**5.04 REINFORCED CONCRETE DITCH PAVING.**

The accepted quantities of reinforced concrete ditch paving will be paid for at the contract unit price per square foot complete in place for the various thicknesses specified in the Contract Documents. This unit price will be full compensation for excavation, subgrade preparation, utility protection, forming, furnishing and placing reinforcement, placing concrete, materials and materials' testing, form removal, finishing, curing, joints, backfilling and all other incidental labor, material and equipment necessary to complete the work.

**5.05 CONCRETE CHANNEL LINING BOTTOM REMOVAL AND REPLACEMENT.**

The accepted quantities of concrete channel lining bottom removal and replacement will be paid for at the contract unit price per square foot for the various thicknesses specified in the Contract Documents. This unit price shall be full compensation for the removal/disposal of existing concrete and associated debris, any excavation, subgrade preparation, utility protection, forming, furnishing and placing reinforcement, placing concrete, materials, and materials' testing, form removal, finishing, curing, joints, backfilling, and other incidental labor, materials, and equipment necessary to complete the work.

**5.06 CONCRETE CHANNEL LINING WALL REMOVAL AND REPLACEMENT.**

The accepted quantities of concrete channel lining wall removal and replacement will be paid for at the contract unit price per linear foot for the various heights specified. The unit price shall be full compensation for the removal/disposal of existing concrete and associated debris, and excavation, bedding, utility protection, materials, and materials' testing, formwork, steel reinforcement, fence post sleeves, drain connections 12 inches in diameter and smaller, concrete placement, form removal, finishing, curing, weep hole drainage system, joints, backfilling, and all other incidental labor, materials, and equipment necessary to complete the work.

**5.07 PAYMENT WILL BE MADE UNDER:**

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
02633-01	CONCRETE CHANNEL LINING	Linear Foot
02633-01.____.	H / I x W Concrete Channel Lining	Linear Foot
02633-02	ACCESS RAMP	Lump Sum
02633-03	CONCRETE DITCH PAVING	Square Foot
02633-03.____	____" Thickness Concrete Ditch Paving	Square Foot
02633-04	CONC. CHANNEL LINING BOTTOM REMOVAL/REPL.	Square Foot
02633-04.____	____" Thickness Concrete Channel Lining Bottom Removal and Replacement	Square Foot
02633-05	CONC. CHANNEL LINING WALL REMOVAL/REPL.	Linear Foot
02633-05.____	____' Height Concrete Channel Lining Wall Removal Removal and Replacement	Linear Foot
02641-04	REINFORCED CONCRETE DITCH PAVING	Square Foot
02640-04.____	____" Thickness Reinforced Concrete Ditch Paving	Square Foot

**END OF SECTION 02633**