

## SECTION 727 FENCES AND GATES

**727.01 Description.** This work consists of furnishing and erecting chain-link and right-of-way fence and gates, and resetting and repairing chain-link fence.

**727.02 Materials.** All materials for fences and gates shall conform to the requirements of the following Section and Subsections:

Portland Cement Concrete, Class B	812
Right-Of-Way Fence:	
Metal Posts	825.02
Barbed Wire	825.02
Woven Wire Fabric	825.02
Chain-Link Fence:	
Chain-Link Fabric	825.03
Posts	825.03
Top Rails	825.03
Horizontal Braces	825.03
Gate Frames	825.03
Undersized Members	825.03
Alternate Coating	825.03
Tension Wire	825.03
Miscellaneous Hardware	825.03

**727.03 Fabrication.** Fabrication of materials furnished under this Section shall conform to the sizes, shapes, dimensions, and other factors shown on the Plans and shall show careful, finished workmanship in all respects.

**727.04 Markings.** Each roll of fence fabric shall carry a tag showing the type of base metal (steel or aluminum alloy number), type of coating, class of coating, the diameter of the wire, the length of fencing in the roll, and the name or mark of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, type of base metal (steel or aluminum alloy number), class or coating, and other pertinent data sufficient for proper identification and verification of conformance to the requirements of [Section 825](#)

**727.05 Inspection.** Each product or item furnished shall be subject to inspection at the factory and the fabricating plant, in laboratories of the Department's choosing, and at all other points of delivery.

### CONSTRUCTION METHODS.

**727.06 Removal of Obstructions.** Before starting fence construction, all trees, brush, old fences, and other obstacles that interfere with the proper construction of the fence shall be removed in accordance with [Section 201](#).

**727.07 Concrete Footings.** Concrete footings shall be constructed in accordance with the dimensions shown on the Standard Construction Details. All posts, except line posts for right-of-way fence, shall be set in concrete. Posts shall be centered in the footing. The concrete shall be thoroughly compacted around the posts by tamping or vibrating, and shall be slightly higher than the ground line. The top surface of the footings shall be smooth and sloped to drain moisture away from the posts. No attachments shall be placed on the posts, and no posts shall be disturbed in any manner, within 72 hours after the concrete footing is completed. Hand mixed concrete shall not be used, unless approved.

**727.08 Rock Excavation.** When rock is encountered at a depth less than the planned concrete footing depth, a hole 2O (50 mm) in diameter larger than the greatest dimension of the post cross-section shall be drilled to a depth of 12O (300 mm), into the rock. After the post is set, the remainder of the drilled hole shall be filled with grout, composed of one part portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described in [Subsection 727.07](#) for post footings. All excess excavation from footings shall be disposed of in a manner satisfactory to the Engineer.

**727.09 Posts, Rails, and Braces.**

- a. *Chain-Link Fence.* Posts for chain-link fence shall be plumb and spaced at 10N (3 m) centers maximum, with a tolerance of -2N (-0.6 m). Spacing of posts shall be as uniform as practicable under local conditions. Terminal posts shall be installed at all abrupt changes in grade, at changes in line direction over 15 degrees, and at all ends. In no case shall the distance between terminal posts exceed 500N (150 m).

Top rail shall pass through intermediate post tops and form a continuous brace from end to end of each stretch of fence. Top rail is to be fastened to terminal posts with heavy pressed steel connectors.

Couplings used to join the top rail segments shall allow for expansion. Expansion devices shall be approved by the Engineer. Couplings are to be placed approximately every 20N (6 m).

Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts. Sufficient braces shall be applied to allow complete bracing from each terminal post to adjacent line posts. Roll formed rail and brace shall be installed 2N (600 mm) apart and the tubular rail and brace shall be installed 2N - 6O (750 mm) apart. Rail and brace shall extend from the terminal post to the first adjacent line post. Braces shall be fastened to the posts by heavy pressed steel connections, then trussed from the line posts back to the terminal post with round rods as shown on the Standard Construction Details.

When barbed wire is required, posts shall be equipped with extension arms. The arms shall extend at a 45 degree angle. Lock-wires, securely fastening the barbed wire, shall be equally spaced along the extension arm. The top strand shall be located 12O (300 mm) above the fabric and 12O (300 mm) out from the fence line. Extension arms shall be capable of supporting a dead load of 200 lb (90 kg) at the top strand attachment point, without permanently deforming.

- b. *Right-Of-Way Fence.* Metal posts for right-of-way fence shall be plumb and spaced 12N (3.5 m) apart, unless otherwise shown on the Plans. Posts shall be firmly embedded in the ground to a depth of at least 2N - 6O (750 mm).

Metal post braces shall be firmly attached to metal end posts, intermediate end posts, corner posts, and gate posts. Metal posts and braces shall be set in concrete footings, as indicated on the Standard Construction Details. Corner posts and intermediate end posts shall be provided with two braces, one each way from the post in the main line of the fence. End posts and gate posts shall be provided with one brace in the line of the fence. Line posts shall be braced in both directions as described above at intervals of not more than 500N (150 m).

**727.10 Gates.**

- a. *Chain Link Fence.*
1. *Vehicular Gates.* Gate frames shall be made of steel pipe according to the requirements of ASTM A 53, with an outside diameter of 1.90O (48.3 mm) and a nominal weight of 2.72 lb/ft

(4.05 kg/m). Corners shall be heavy malleable iron or pressed steel fittings, securely riveted or welded. Welds shall be painted with aluminum base or zinc base paint.

Fabric to match the fence shall be installed in the frame by means of tension bars and hook bolts. Each frame shall be equipped with 3/8O (10 mm) diameter adjustable truss rods. Bottom hinges shall be ball and socket type, designed to carry the weight of the gate on the post footing. The upper hinge shall be a wrap-around adjustable type. All gates shall be equipped with a positive type latching device, with a provision for padlocking. All drive gates are to be provided with a center plunger rod, and catch and semi-automatic outer catches to secure the gate in the opened position. Vehicular gates shall be capable of being operated by one person and shall be able to swing open 180 degrees.

The bottom of vehicular gates shall be 3 to 5O (75 to 125 mm) above the ground when closed and shall be at least 3O (75 mm) above ground at all points of swing. The Contractor shall modify the existing grade within the area of the swing, if necessary, to meet this requirement, when directed.

2. *Walk Gates.* Walk gates shall be 4N (1.2 m) in width. The walk gate height shall be as shown on the Standard Construction Details or as indicated in the Special Provisions.

Walk gates shall be equipped with approved latches, stops, locking devices, and approved devices to allow for padlocking.

The bottom of walk gates shall be 3 to 5O (75 to 125 mm) above the ground when closed and shall be at least 3O (75 mm) above ground at all points of swing. The Contractor shall modify the existing grade within the area of the swing, if necessary, to meet this requirement, when directed.

- b. *Right-Of-Way Fence.*

1. *Vehicular Gates.* Vehicular gates shall be equipped with approved latches, stops, locking devices, and approved devices to allow for padlocking and for securing and supporting the free end of vehicular gates in the open position to prevent damage to the gates or fence by over-swing. All gate stops shall be of the type shown on the Plans or an alternative as approved by the Engineer and shall be set in concrete as shown on the Standard Construction Details. Hinges shall be of the pivot type, heavy duty, with large bearing surfaces. Hinges shall clamp onto posts and shall not twist or turn under the action of gates. Hinges shall be configured such that closed gates cannot be lifted off their hinges. Vehicular gates shall be capable of being operated easily by one person and shall be able to swing open 180 degrees.

The bottom of vehicular gates shall be 3 to 5O (75 to 125 mm) above the ground when closed and shall be at least 3O (75 mm) above ground at all points of swing. The Contractor shall modify the existing grade within the area of the swing, if necessary, to meet this requirement, when directed.

2. *Walk Gates.* Walk gates shall be 4N (1.2 m) in width. The walk gate height shall be as shown on the Standard Construction Details or as specified in the Special Provisions.

Walk gates shall be equipped with approved latches, stops, locking devices, and approved devices to allow for padlocking.

The bottom of walk gates shall be 3 to 5O (75 to 125 mm) above the ground when closed and shall be at least 3O (75 mm) above ground at all points of swing. The Contractor shall

modify the existing grade within the area of the swing, if necessary, to meet this requirement, when directed.

#### **727.11 Fence Construction.**

- a. *General.* Fence shall be erected at the locations indicated on the Plans. The fence shall be true to line, taut, and shall comply with the best practice for fence construction. Fence fabric shall be installed on the roadway side of posts. The bottom of the fabric shall be placed a nominal distance of 3O (75 mm) above the ground line; however, over irregular ground a minimum clearance of 1O (25 mm) and a maximum clearance of 6O (150 mm) will be permitted for a horizontal distance not to exceed 8N (2.4 m). Any excavation and backfilling required to comply with these provisions shall be made.

Tension wire shall be secured to fence posts using chain-link bands. The wire shall be attached to the fence using hog rings spaced at approximately 24O (600 mm) on center as shown on the Standard Construction Details.

At locations of small natural swales or drainage ditches, and where it is not practical to have the fence conform to the general contour of the ground surface, such that the distance between the bottom of the fence and the ground surface exceeds 6O (150 mm), the opening below the fence shall be spanned with barbed wire as shown on the Standard Construction Details.

Existing fences shall be permanently fastened to terminal posts of the new fence, at the location indicated on the Plans.

- b. *Chain-Link Fence.* Fabric shall be attached to the line posts with 6 gage (5 mm) wire clips spaced approximately 14O (350 mm) apart, and attached to the top rail and brace rail with 9 gage (3 mm) tie wires on approximately 24O (600 mm) centers. End connectors shall be as close to the ends of the fabric as possible. The chain-link fabric shall be securely fastened to all terminal posts with 3/16 by 3/4O (5 by 19 mm) tension bars and 11 gage (3 mm) pressed bands spaced approximately 14O (350 mm) apart, or the fabric shall be woven integrally into lock loops on roll form sections.
- c. *Right-Of-Way Fence.* Fabric shall be installed according to the Standard Construction Details.

**727.12 Chain-Link Fence Resetting.** Chain-link fence resetting shall conform as close as practical to the requirements of this Section. Fences shall be reset true to the line and grade shown on the Plans, or as determined by the Engineer. The elevation of the top of the fences shall be uniform. Chain-link fence material shall be new and conform to the requirements of [Subsection 727.02](#), unless older types are necessary to maintain good appearances. Lost or damaged materials shall be replaced. Necessary grading to accomplish these requirements shall be performed by the Contractor.

**727.13 Electrical Grounds.** Electrical grounds shall be installed at intervals of no more than 2000N (600 m) in all lines of fence and directly below all locations where a power line passes over the fence. Grounding shall be accomplished with a copper clad rod 8N (2.4 m) long and a minimum of 5/8O (16 mm) in diameter. The rod shall be driven vertically until the top is approximately 6O (150 mm) below the top of the soil surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence, in such a manner that each element of the fence is grounded.

#### **727.14 Method of Measurement.**

- a. *Fence.* The quantity of fence will be measured by the linear foot (linear meter) along the actual fence, excluding gates, constructed and accepted.

- b. *Reset Fence.* The quantity of chain-link fence reset and repaired will be measured as the actual number of linear feet (linear meters) of fence repaired and reset by the Contractor, measured along the fence.
- c. *Gates.* The quantity of gates will be measured as the number of each type fabricated, installed, and accepted.

**727.15 Basis of Payment.**

- a. *Fence.* The quantity of fence will be paid for at the Contract unit price per linear foot (linear meter) for each type of fence.
- b. *Resetting Fence.* The quantity of chain-link fence reset and repaired, including all posts and gates, will be paid for at the Contract unit price per linear foot (linear meter) for fence reset. Portions of fence which are entirely new will be paid for at the Contract unit price for new fence.
- c. *Gates.* The quantity of gates will be paid for at the Contract unit price for each type of gate.

Price and payment for work in Subsection [727.15](#) (a), (b), and (c) will constitute full compensation for clearing and grading the line of fence; for furnishing and erecting new fences, gates, and all posts; for excavating and backfilling for footings; for furnishing and placing concrete for footings; for furnishing and installing all materials, including fittings, hardware, and grounds; and for all labor, equipment, tools, and incidentals required to complete the work