SECTION 02721

TRAFFIC BARRIERS

02721.01 GENERAL

A. Description

This work will include, but not necessarily be limited to, the construction of W beam or concrete traffic barriers at locations indicated on the Plans or established by the Engineer, of the types stipulated, and in accordance with the Contract Documents.

B. Related Work Included Elsewhere

Subgrade preparation; Section 02610.

C. Quality Assurance

1. The Engineer will inspect all materials and work to ensure compliance with the Contract Documents.

2. Quality assurance requirements for Portland cement concrete shall be as specified in Section 03310.01.

3. Finished Surface

   The completed barrier shall not vary more than 1/4 inch from the horizontal and vertical lines shown on the Plans or as directed by the Engineer. It shall present a smooth, uniform appearance. When a 10-foot long straightedge is laid on the top and faces of the barrier, the surfaces shall not vary more than 1/4 inch from the edge of the straightedge except at grade changes and curves. It shall be free from bumps, sags, or other irregularities.

D. Submittals

1. Shop Drawings

   Shop drawings shall be submitted as specified in the "General Provisions" for all traffic barrier components. The shop drawings shall include dimensional information, coating details, reinforcing placement, and such other information as may be required to verify compliance with these Specifications.

2. Certificates of Compliance

   Certificates of compliance shall be submitted in accordance with the "General Provisions" for W beam traffic barrier, barrier posts, and hardware stating that these components meet the requirements specified in Section 02721.02.

02721.02 MATERIALS

A. Materials Furnished by the County

The County will not furnish any materials for W beam or concrete traffic barriers.

B. Contractor's Options

Concrete barriers may be cast-in-place or precast unless otherwise noted. The Contractor may construct the barriers from higher strength Portland cement concrete than specified herein.

C. Detailed Material Requirements

1. W Beam Traffic Barrier Posts

   Posts shall meet the requirements of AASHTO M 183 for steel and AASHTO M 111 for galvanized coating, and, if welded, ASTM A 769.

2. W Beam Traffic Barrier

   Rail elements shall meet the requirements of AASHTO M 180, Type 2.

3. Hardware For W Beam Traffic Barriers

   Hardware shall meet the requirements of AASHTO M 183 for quality of steel and AASHTO M 232 for galvanized coating.

4. Portland Cement Concrete

   Portland cement concrete for concrete barriers shall be Mix No. 2 as specified in Section 03310.

5. Form Release Compound

   Form release compound shall be as specified in Section 02660.02.

6. Curing Materials

   Curing materials shall be as specified in Section 02651.02.

7. Preformed Joint Filler

   Preformed joint filler shall be as specified in Section 02651.02.

8. Reinforcing Steel

   Reinforcing steel shall be as specified in Section 02651.02.

9. Epoxy Protective Coatings

Epoxy protective coatings for concrete shall be as specified in Section 09900.02.

02721.03 EXECUTION

A. W Beam Barriers

1. Post Erection

Posts shall be driven unless otherwise directed by the Engineer. The manner of driving shall avoid battering or distorting the posts. Posts not driven shall be set in hand or mechanically dug holes of sufficient diameter to allow tamping of the backfill. Postholes shall be backfilled with acceptable materials placed in 6-inch layers and thoroughly compacted. When it is necessary to place posts in existing paving, all loose material shall be removed and the paving replaced in kind. Prior to erection of the rail elements, the posts shall be properly aligned and be within a 1/4 inch tolerance of line and grade. Posts shall be set plumb.

2. Rail Assembly

Rail elements shall be erected in accordance with the Standard Details and in a manner resulting in a smooth, continuous installation with laps in the direction of traffic flow. All bolts except adjustment bolts shall be drawn tight.

B. Concrete Barriers

Concrete barriers shall be either precast or cast-in-place. Excavation for concrete barriers shall be made to the required depth and to a width that will permit the installation and bracing of forms where necessary. All soft and unsuitable material shall be removed and replaced with suitable material.

The subgrade shall be properly shaped and compacted as specified in Section 02610.03.

1. Cast-in-Place Barriers

When casting in place, the forming may be by either the slip-form or conventional fixed form method.

Cast-in-place concrete barriers shall be in accordance with the following:

a. Conventional Fixed Form Method

The barriers shall be cast-in-place in sections having a uniform length of 20 feet.

Forms shall be steel and of such construction that there shall be minimum interference to inspection for grade and alignment. The condition and the stability of the forms shall be such that they will produce a barrier that meets the required tolerance of deviations not exceeding 1/4 inch in 10 feet in either grade or alignment. Before concrete is placed against the forms, they shall be thoroughly cleaned and coated with form release compound each time they are used.

Concrete shall be placed in accordance with Section 03300.03. Volumetric batching and continuous mixing will be permitted on this work. Concrete shall be vibrated by means of an approved immersion type mechanical vibrator.

Construction or contraction joints shall be constructed every 20 feet. However, sections of 10 foot length may be constructed if necessary to make use of delivered concrete. Expansion joints shall be placed when indicated on the Plans or as directed by the Engineer.

When finished, the top of barrier shall show no deviations from grade and alignment in excess of 1/4 inch in 10 feet.

The minimum time required before removal of forms will depend on the temperature at the time of pour and shall be as follows:

Temperature	Hours
Greater than 50°F	12
Between 40°F and 50°F	24
Less than 40°F	72

All honeycomb and damaged areas shall be repaired to the satisfaction of the Engineer immediately after the removal of the forms.

b. Slip-Form Method

Slip-form construction shall not be used when the concrete aggregate is gravel.

Slip-form equipment shall be approved by the Engineer and include the incorporation of automatic guidance controls to follow line and grade reference. The use of manual control on slip-form equipment will not be permitted. Line and grade reference shall consist of taut lines or wire suspended from supports set in the subgrade or adjacent pavement. The references shall be at 25 foot intervals on uniform grades and tangent sections. On vertical and horizontal curves, an additional intermediate support shall be set in the field to establish a reference line acceptable to the

Engineer. The use of ski or shoe sensors reflecting variations in grade of existing roadway surface will not be permitted.

The concrete shall be of such consistency that after extrusion it will maintain the shape of the barrier without support. The surface shall be free of surface pits larger than 3/16 inch in diameter. The concrete shall require no further finishing other than light brushing with water only. Finishing with a brush application of grout will not be permitted.

If during the operation of the slip-form equipment a tear occurs, it shall be repaired immediately. The repair shall be made in accordance with good concrete practices that are acceptable to the Engineer. It will be at the sole discretion of the Engineer as to whether the tear can be repaired or whether the areas will require removal and replacement.

Contraction joints shall be sawed or formed at 20 foot intervals in the barrier and footer. Each joint shall be a minimum of 2 inches in depth and 1/8 inch in width. Expansion joints will be required when shown on the Plans or as directed by the Engineer. However, sections of 10 foot length may be constructed if necessary to make use of delivered concrete. At the terminus of any pour less than 20 feet, a bulkhead form shall be placed; and six No. 8 dowels, 2 feet long, shall be placed through the bulkhead. No joint material is required.

The concrete footer may be constructed by the conventional fixed form or the slip-form method. The construction of the footer and the barrier section as a monolithic pour is not permitted.

2. Precast Concrete Barriers

Precast concrete barriers shall be in accordance with the following:

a. Fabrication work shall meet the requirements of Section 03400.03.

b. Precast concrete barriers will not be permitted on curves of short radius.

c. Barriers shall be cast in sections having a uniform length of 10 feet. The concrete shall be placed, cured, and protected in accordance with Section 03400.03. Lifting holes, rings, hooks, or other handling devices, as approved by the Engineer, may be inserted in the precast sections. Holes exposed to completed work shall be filled with mortar. Other handling devices shall be removed to the satisfaction of the Engineer.

d. The supporting concrete base shall be constructed by the conventional fixed form method and shall have joints constructed at 10 foot intervals. The joint shall be constructed by sawing or other methods for the width of the base to a

minimum depth of 3 inches. The base section shall be doweled to the barrier section as shown on the Plans.

e. Precast barriers shall be placed in such a manner that there will generally be a joint opening, of 1/4 inch between sections. To this specified joint opening, a tolerance of 1/8 inch plus or minus will be permitted throughout the plane of the joint.

f. All surfaces shall have an ordinary finish as specified in Section 03300.03.

3. Curing

Concrete shall be cured and protected in accordance with Section 03300.03 and 03400.03.

When liquid membrane-forming compound is used to cure concrete for precast, cast-in-place, or slip-form construction, a waiting period of 60 days will be required prior to the application of epoxy protective coating. This shall also be supplemented with a visual inspection to determine that the concrete is free of curing compound or other foreign substance.

02721.04 METHOD OF MEASUREMENT

A. W Beam Traffic Barrier

1. Measurement for W beam traffic barrier will be made of the length of the barrier between terminals.

2. Measurement for end flares will be made of the number of end flares installed.

B. Concrete Traffic Barrier

1. Measurement for concrete traffic barrier will be made of the length of the barrier between terminals.

2. Measurement for terminal end sections will be made of the number of terminal end sections installed.

02721.05 BASIS OF PAYMENT

A. General

1. Payment will be made at the unit prices bid. The prices bid shall include foundation preparation and the assembly and erection of all component parts and cover furnishing all labor, tools, equipment, and materials necessary to complete the work

as shown and specified, in strict accordance with the Contract Documents, and accepted by the Engineer.

2. Payment will be made for contingent items when ordered by the Engineer. Payment will be as specified in Sections 02951, 02952, 02953, 02954, 02955, 02956, and 02957.

B. W Beam Traffic Barrier

1. Payment for W beam traffic barrier will be made at the price bid per linear foot.

2. Payment for end flares, end anchorages, and other treatments for W beam barriers will be made at the price bid per each for the type treatment specified.

C. Concrete Traffic Barrier

1. Payment for concrete traffic barrier will be made at the price bid per linear foot.

2. Payment for terminal end sections will be made at the price bid per each.