

**DIVISION 8  
INCIDENTALS**

**SECTION 800  
MOBILIZATION**

**800-1 DESCRIPTION**

This work consists of preparatory work and operations, including but not limited to the movement of personnel, equipment, supplies, and incidentals to the project site, for the establishment of offices, buildings, and other facilities necessary for work on the project; the removal and disbandment of those personnel, equipment, supplies, incidentals, or other facilities that were established for the prosecution of work on the project; and for all other work and operations which must be performed for costs incurred prior to beginning work on the various items on the project site.

**800-2 COMPENSATION**

All work covered by this section will be paid for at the contract lump sum price for "Mobilization."

Partial payments for the item of "Mobilization" will be made with the first and second partial pay estimates paid on the contract, and will be made at the rate of 50% lump sum price for "Mobilization" on each of these partial pay estimates, less than the retainage provided for in Article 109-4, provided the amount bid for "Mobilization" does not exceed 5 percent of the total amount bid for the contract. Where the amount bid for the item of "Mobilization" exceeds 5 percent of the total amount bid for the contract 2 1/2 percent of the total amount bid will be paid on each of the first two partial pay estimates, and that portion exceeding 5 percent will be paid on the last partial pay estimate. All such payments will be made less the retainage provided for in Article 109-4.

As an exception to the above, where the work covered by the contract is limited exclusively to the resurfacing of an existing pavement, payment of the entire lump sum price for the item of "Mobilization," less the retainage provided for in Article 109-4, will be made with the first partial pay estimate paid on the contract, provided the amount bid for "Mobilization" does not exceed 5 percent of the total amount bid for the contract. Where the amount bid for the item of "Mobilization" exceeds 5 percent of the total amount bid for the contract, 5 percent of the total amount bid will be paid on the first partial pay estimate, and that portion exceeding 5 percent will be paid on the last partial pay estimate. All such payments will be made less the retainage provided for in Article 109-4.

Payment will be made under:

Mobilization ..... Lump-Sum

**SECTION 801  
CONSTRUCTION STAKES, LINES AND GRADE**

**801-1 DESCRIPTION**

When required by the Contract, provide all construction layout, surveying, stakeout, supplemental surveying, and engineering necessary for the proper control of construction operations in accordance with this Section and the most current version of the *Manual for Construction Layout*. The work includes furnishing personnel; all surveying equipment, stakes, layout drawings, calculations, and stakeout records; and any materials and equipment necessary to perform the surveying and engineering work.

The *Manual for Construction Layout* and the *Guidelines for Drainage Studies and Hydraulic Design* may be obtained from the Design Services Unit.

**801-2 CONSTRUCTION METHODS****(A) General**

Furnish personnel who are under the direct supervision of a North Carolina Registered Professional Engineer and/or Professional Land Surveyor in conformance with GS 89C.

Furnish personnel who are experienced in highway construction surveying and are capable of accurately establishing all line and grade points necessary to complete the work in accordance with the plan dimensions within the precision established in the most current version of the *Manual for Construction Layout*.

Consult the Engineer for clarifications of the Plans.

Perform work in safe manner. Wear approved safety vest, shirt, or coat when performing work adjacent to an active travel lane. Approved colors are orange, yellow, strong yellow-green, or fluorescent versions of these colors.

Install in accordance with Section 1110, the appropriate advance warning signs as detailed in the most current version of the *Manual for Construction Layout*.

Perform all flagging operations in accordance with the provisions of Section 1150.

The Contractor may elect to utilize Global Positioning System (GPS) surveying, either static or kinematic. Perform GPS surveys with same or higher order of accuracy as conventional surveys detailed in the most current version of the *Manual for Construction Layout*. NCDOT projects utilize a localized coordinate system developed by the Location and Surveys Unit specifically for each individual project. Obtain the control information which the Location and Surveys Unit utilized in establishing the localized coordinate system, specifically the Rotation, Scaling, Translation and coordinates for the azimuth pairs. Newly developed GPS procedures and techniques, which do not conform to the Specifications in this Section, may be used if approved.

Investigate the plan horizontal alignment, vertical profile, and superelevation of existing facilities which tie to proposed roadways. Investigate 100 feet (30 meters) beyond all paving limits and advise the Engineer if revisions are needed to establish smooth transitions to the existing facilities. When directed, further investigation will be considered Supplemental Surveying.

Tie existing driveways to proposed facilities within the limits detailed in the Plans and within the gradients detailed in the Standard Drawings.

Surveying and office calculations performed specifically for the relocation of utility conflicts are considered Supplemental.

The Engineer reserves the right to check, correct where necessary, or require any layout work to be revised. The Engineer will perform checks to ensure the roadway, structure and incidental items are surveyed in accordance with the Plans and the most current version of the *Manual for Construction Layout*.

The Department's review of the Contractor's work in no way relieves the Contractor of responsibility for conformance with the Plans and Specifications. Failure by the Engineer or inspector to point out unsatisfactory work, from lack of discovery or for any other reason, in no way prevents later rejection or corrections to the unsatisfactory work, when discovered, at no cost to the Department. No claims will be allowed for losses suffered due to any necessary removals or repairs resulting from the unsatisfactory work.

When requested by the Engineer, check the accuracy of the stakeout. When the original stakeout is found to be correct, the surveying required to check the accuracy will be considered Supplemental Field Surveying. When the original stakeout is found to be in error, perform the work required to check and correct the stakeout at no cost to the Department.

Correct all inaccuracies in the construction stakeout prior to performing the affected work.

When the Contractor proposes an alteration to the Plans to rectify a construction stakeout error, submit alterations to the Engineer for review and approval. Include design calculations and drawings sealed by an appropriate registered professional along with a narrative describing justification for the alteration.

When surveying is required, which in the Contractor's opinion could not have been reasonably anticipated and is not customary or inherent to the construction industry, notify the Engineer in writing prior to beginning such surveying. After investigation, the following will occur:

1. When the Engineer determines that the surveying could not have been anticipated or is not customary or inherent to the construction industry, the Contractor will be notified in writing that the work is considered Supplemental and compensation will be made in accordance with Subarticle 801-4.
2. When the Engineer determines that the surveying could have been anticipated or is customary or inherent to the construction industry, he will notify the Contractor, in writing, of his determination. If the Contractor intends to file a claim for additional compensation by reason of such surveying, notify the Engineer in writing of such intent prior to beginning any of the alleged supplemental surveying. Strictly adhere to the provisions of Subarticle 104-8(B).

**(B) Records**

Submit proposed method for setting up survey books or electronic data files to the Engineer before beginning work to assure clarity and adequacy.

In a timely manner, make available to the Engineer all requested survey records.

On a monthly basis, provide to the Engineer updated electronic and/or manuscript survey records. Submit remaining records upon completion of the work. Attest the work was performed in accordance with the Contract by providing all receivable information signed by the Professional Engineer and/or Professional Land Surveyor in responsible charge.

**(C) Horizontal and Vertical Control**

The Department will furnish and set horizontal baseline control on approximate 1000 foot (300 meter) intervals and vertical control on 2500 foot (765 meter) intervals within the project limits.

Obtain text of baseline control from Engineer.

Clearing limits may be established during original traverse of baseline control provided the accuracy ratio does not exceed 1 foot per 5000 feet (1 meter per 5000 meters) of perimeter (1:5,000) and all Department established baseline control is protected and preserved during clearing operations. Prior to performing any additional construction layout, verify the horizontal baseline control by a closed traverse survey or alternate approved method. The accuracy ratio must not exceed an error of closure of 1 foot per 20,000 feet (1 meter per 20,000 meters) of perimeter (1:20,000). Verify the vertical control by performing a closed loop survey utilizing differential leveling. For the error of closure, do not exceed 0.05 feet  $\sqrt{(x)miles}$  (15.24 mm  $\sqrt{.62137(x)km}$ ). Notify the Engineer of any discrepancies in either the horizontal or vertical control. Reference, outside of the proposed construction limits and evenly distributed throughout the project limits, fifty percent of the Department's horizontal and vertical control. Provide reference information to the Engineer.

If GPS is utilized, occupy the azimuth pairs with the base station during verification of baseline control, otherwise, occupy baseline. Verify remaining baseline control utilizing a

Rover. Submit coordinate data showing differences between supplied baseline coordinates and field obtained GPS coordinates. Include report detailing the use of preliminary input data, specifically Rotation, Scaling, and Translation.

Utilizing the horizontal and vertical control established by the Department, provide surveying necessary to construct all roadway, structure, and miscellaneous items as detailed in the Plans. Perform staking in accordance with the most current version of the *Manual for Construction Layout*. Layout the work and provide all measurements that may be required for the execution of the construction in conformity with the Plans, Specifications and authorized revisions.

**(D) Right of Way and Easements**

The Department will establish the location of all proposed Right of Way monuments and permanent drainage easements.

Reference the location of all proposed Right of Way monuments and permanent drainage easements. Restore Right of Way monument positions after completion of construction. Set a Right of Way monument cap on an 18 inch (450 mm) long #5 reinforcing bar and a carsonite witness stake unless concrete Right of Way markers are specified in the Contract. The Department will provide the monument cap and witness stake. Re-establish location of permanent drainage easements after completion of construction and install an 18 inch (450 mm) long #5 reinforcing bar for monumentation.

Validate the position of the Right of Way and permanent drainage easement locations with those detailed in the Plans. Provide any discrepancies to the Engineer.

**(E) Cross-sections for Earthwork Quantities**

The Engineer may elect to obtain cross sections either by hand or aerial methods. If the Engineer elects to obtain cross sections by aerial methods, furnish materials and install photogrammetric control panels in accordance with the most current version of the *Manual for Construction Layout* or as otherwise directed.

**1. Borrow Pits**

Establish a baseline alignment within each borrow pit, as necessary, to allow the Engineer to obtain measurement of quantities for payment. Stake these alignments just before field cross-sections are taken by the Engineer for original, intermediate, and final cross-sections. Establishment of baseline alignments within each borrow pit is considered incidental to Construction Surveying.

**2. Roadway**

Unless otherwise directed, stakeout the survey lines for original and final cross-sections. The stakeout of the survey lines will consist of surveying and staking all alignments within the plans on 50 foot (15 meter) intervals, including all cardinal points. When the alignments are inaccessible, install offset alignments. Begin the staking of these alignments within 48 hours of the Engineer's notice to proceed. Upon the completion of the entire project, with the exception of the survey line for final cross-sections, and upon request by the Contractor, the project may be accepted for maintenance by the Department, excluding the survey line.

If the Engineer determines intermediate cross-sections are necessary for computing partial payments, perform the stakeout of the survey line for intermediate cross-sectioning as Supplemental Field Surveying; otherwise the intermediate stakeout of the survey line is incidental to the work.

**(F) Drainage and Utility Construction Systems**

**1. General**

Where underground conflicts are suspected, contact utility owners and locate all utilities horizontally and vertically. Consider the utilities' locations and elevations in

the layout of the drainage systems and utility construction systems. Utilities may exist which are not depicted on the Plans.

Submit two copies of all layout drawings for drainage systems and utility construction systems to the Engineer for his review and approval. The review and approval will be noted by the Engineer adding an appropriate note to the drawings along with the date and his signature. A copy of the drawings will be retained by the Engineer and a copy will be returned to the Contractor.

## **2. Drainage Systems**

Provide construction layout of drainage systems, as depicted in the Plans and in accordance with the *Guidelines for Drainage Studies and Hydraulic Design*. Consider the locations and elevations of all existing and proposed utilities, proposed utility construction, and existing and proposed drainage systems, in the layout of the drainage system. Modifications of the drainage plan may be necessary to properly collect and transport water. Advise the Engineer if modifications are needed to achieve the original design functionality and the intent of the drainage plans, such as adjusting the location of a drainage structure, adding a drainage structure, and increasing or decreasing pipe lengths. Any major modifications should be reviewed by the Engineer of Record.

Provide layout drawing of the drainage system including calculations of flow line elevations for all drainage structures; pipe invert elevations, both inlet and outlet of the drainage structure; grade of each pipe within the drainage system; elevation of any existing facility connection, such as stream or pipe; pipe camber, if necessary; headwall location, if depicted in the plans; and locations and elevations of any existing or proposed utilities to the Engineer for review and approval a minimum of seven days prior to beginning work on the drainage system. Modification of the submitted drainage layout drawing by the Engineer will not eliminate the Contractor's liability for the accuracy of the information submitted. Any restaking or additional staking required to conform with the approved drainage layout drawing is considered incidental to the work.

## **3. Utility Construction**

Provide utility construction layout as detailed in the Plans and in accordance with the Standard Specifications. Consider the locations and elevations of all existing and proposed utilities, proposed utility construction, and existing and proposed drainage systems, in the layout of the utility construction. Advise the Engineer if modifications to the utility construction plans are necessary. Any major modifications should be reviewed by the Engineer of Record.

Provide layout drawing of the utility construction system including elevations of any existing utilities, drainage systems, and/or proposed drainage systems to the Engineer for review and approval a minimum of seven days prior to beginning work on the utility construction system. Modification of the submitted utility construction layout drawing by the Engineer will not eliminate the Contractor's liability for the accuracy of the information submitted. Any restaking or additional staking required to conform with the approved utility layout drawing is considered incidental to the work.

## **(G) Structures**

Provide surveying and calculations necessary to construct structures in accordance with the Plans. Provide staking in accordance with the most current version of the *Manual for Construction Layout*. Establish horizontal alignment of entire structure. Set a minimum of one benchmark adjacent to the structure site which will be retained throughout the structure construction. The Engineer will furnish the finished construction elevations for use in determining the required construction elevations for bridges. Provide method for

computing buildups over beams, screed grades, and overhang form elevations to the Engineer for review prior to staking these items to assure clarity and adequacy.

Submit two copies of structure layout drawings to the Engineer for his review and approval. The Engineer will independently verify and accept the structure layout before the structure construction may begin. The Engineer will note the review and approval by adding an appropriate note to the drawings along with the date and his signature. The Engineer will retain a copy of the drawings and a copy will be returned to the Contractor.

If structure phasing or damaged stakes require significant resurveying during the life of the structure, provide revised layout drawing for the Engineer's verification and acceptance.

**(H) Signs**

Stake horizontal location of all overhead and type A and B ground mounted signs for Engineer's verification prior to obtaining s-dimensions. Measure or calculate overhead and ground mounted sign s-dimensions in accordance with the Plans and the most current version of the *Manual for Construction Layout*. Perform investigation of proposed sign locations and notify the Engineer of any obstructions, either existing or proposed, which may interfere with the proposed sign installation. Provide an 11-1/2 inch x 17 inch (288 mm x 425 mm) drawing depicting the theoretical finished section at each proposed overhead sign assembly location. Include within the submittal the roadway, shoulder, and slope gradients. Also include the proposed finish elevations of the edges of pavement, each lane line, and the ground at each proposed sign footing location. Set a slope stake at each proposed overhead sign location to ensure the slopes are constructed as calculated and detailed in the above submittal. Submit sign information to the Engineer.

**801-3 METHOD OF MEASUREMENT**

The quantity of Supplemental Field Surveying to be paid for will be the actual number of hours the Contractor's survey crew actively engaged in performing the following:

1. Investigative surveying, in excess of 100 feet (30 meters), of horizontal alignment, vertical profile, and superelevation of existing facilities which tie to proposed roadways.
2. Surveying specifically for the relocation of utility conflicts.
3. Investigation of a previous stakeout when such stakeout is found to be correct.
4. Surveying which the Engineer has deemed could not have been anticipated or is not customary or inherent to the construction industry.
5. The stakeout of the roadway survey alignments for intermediate cross-sections when deemed necessary by the Engineer.

The quantity of Supplemental Surveying Office Calculations to be paid for will be the actual number of hours the Contractor's survey personnel is actively engaged in performing office calculations specifically associated with the following:

1. Investigative surveying, in excess of 100 feet (30 meters), of horizontal alignment, vertical profile, and superelevation of existing facilities which tie to proposed roadways.
2. Surveying specifically for the relocation of utility conflicts.
3. Investigation of a previous stakeout when such stakeout is found to be correct.
4. Surveying which the Engineer has deemed could not have been anticipated or is not customary or inherent to the construction industry.
5. The stakeout of the roadway survey alignments for intermediate cross-sections when deemed necessary by the Engineer.

**801-4 COMPENSATION**

Exploratory excavation required to locate a utility will be compensated in accordance with Article 104-7.

**Section 801**

Payment for the advance warning signs will be made at the square foot price for "Work Zone Signs (Portable)" as detailed in Subarticle 1110-6.

Payment for "flaggers" will be made at either the hour or day price for flaggers as detailed in Subarticle 1150-6.

Payment will be made at the Contract lump sum price for "Construction Surveying" for the work detailed within this Section.

Partial payments will be made for the item of "Construction Surveying" on each particular payment estimate based upon 10% of the Contract lump sum bid price being paid on the first monthly estimate and the remaining 90 % of the lump sum amount being distributed each estimate based upon the percentage of the project completion.

Payment will be made for the quantity of Supplemental Field Surveying, as measured in Subarticle 801-3, at the stated price of \$100.00 per hour.

Payment will be made for the quantity of Supplemental Surveying Office Calculations, as measured in Subarticle 801-3, at the stated price of \$50.00 per hour.

Any payments for Supplemental Field Surveying or Supplemental Surveying Office Calculations required by this provision will be paid on the appropriate partial payment estimate.

Payment will be made under:

Construction Surveying.....	Lump Sum
Supplemental Field Surveying .....	Hour
Supplemental Surveying Office Calculations .....	Hour

**SECTION 802  
DISPOSAL OF WASTE AND DEBRIS**

**802-1 DESCRIPTION**

The work consists of the disposal of waste and debris in accordance with the requirements of these specifications including, but not limited to, furnishing any waste areas; providing and implementing a Development, Use, and Reclamation Plan; any right of access to waste areas; disposing of waste and debris; dressing and shaping of waste areas; furnishing and spreading earth material over debris, rock, broken pavement, and masonry; clearing and grubbing of waste areas; and hauling waste and debris to waste areas or permitted landfills; assessment for wetlands and endangered species; obtaining required permits and/or certifications; and any tipping fees required for disposal in permitted landfills.

Waste will be considered to be all excavated materials which are not utilized in the construction of the project, including overburden from borrow sources and soil type base course sources.

Debris is all undesirable material encountered on the project.

**802-2 GENERAL REQUIREMENTS**

Provide an area and dispose of waste and debris outside of the right of way, unless otherwise allowed by written request. Limit the materials placed in non-permitted disposal areas to clean soil, rock, concrete, brick, other inert materials, and bituminous asphalt when placed at least 4 feet (1.2 m) above the water table. Mixtures of soil and vegetation, which are primarily soil, may also be placed in non-permitted disposal areas. Place all other debris in sites which have been permitted by the Solid Waste Management Division of the North Carolina Department of Environment, Health and Natural Resources unless otherwise permitted.

Maintain the earth surfaces at all waste areas in a manner that will effectively control erosion and siltation until final acceptance of the project.

Shape the waste or disposal area to drain such that no water will collect or stand. Provide a functioning drainage system.

Shape rock and earth waste to contour and blend with the adjacent topography. Cover all rock, concrete, broken pavement and masonry with a minimum 6 inch (150 mm) thick layer of earth material from the project or borrow. Earth material should be tested to insure it will support long-term growth of the proposed ground cover and should be amended as necessary to support permanent growth. As an exception, side slopes constructed of all rock material will not require earth covering. Construct all slopes, other than rock, 2:1 or flatter and rock slopes on a stable angle of repose.

Where the Engineer has granted permission to dispose of waste within the rightof way, the Engineer will have the authority to establish whatever additional requirements may be necessary to insure the satisfactory appearance and drainage of the completed project.

Where electing to dispose of waste or debris in active public waste or disposal sites, provide evidence satisfactory to the Engineer that the proposed area or site has been permitted by the Solid Waste Management Division of the North Carolina Department of Environment, Health and Natural Resources.

Where electing to dispose of waste in a waste or disposal area, other than active public waste or disposal areas which have been permitted by the Solid Waste Management Division of the North Carolina Department of Environment, Health and Natural Resources or on North Carolina Department of Transportation Right-of-Way, submit jointly with the Property Owner a notarized Development, Use, and Reclamation Plan for each waste or disposal area proposed for use. As part of the Reclamation Plan, perform the following prior to wasting:

**1. Material Description:**

Detail the type of waste material proposed in the area. Only material originating from North Carolina Department of Transportation projects and complying with the requirements of the Solid Waste Disposal Act will be permitted within the proposed waste or disposal area.

**2. Topography**

Detail the existing topography and locations of the proposed access and egress haul roads. Detail the proposed final topography of the waste or disposal area showing any proposed drainage systems. If a pond is to be constructed or remain, the minimum depth must be at least 4 feet (1.2 meters) as determined from the water table at the time the reclamation plan is executed. The slope of the soil below the water must be between 5:1 and 2:1. The slope of the sides above the water line must be 2:1 or flatter.

**3. Slopes**

Rock and earth waste shall be shaped to contours which are compatible to and blend with the adjacent topography. Cover all rock with a minimum 6 inch (150 mm) layer of earth material either from project waste or from borrow. As an exception, side slopes constructed of all rock material will not required earthcovering. Construct all slopes at a 2:1 or flatter except that rock slopes which should be on a stable angle of repose.

**4. Construction Debris**

Cover construction debris and all broken pavement and masonry with a minimum 6 inch (150 mm) thick layer of earth waste material from the project or borrow. Shape the completed waste area as required above for the disposal of earth or rock waste.

## **5. Erosion Control**

Detail the temporary and permanent erosion control measures, along with design calculations, that are intended during use of the site and as part of the reclamation. Unless considered impractical due to special circumstances, provide in the plan for the use of staged permanent seeding and mulching and appropriate fertilizer topdressing on a continual basis during site use and the immediate total reclamation of the site when the site is no longer needed. Define the seed mixture proposed for establishing temporary and/or permanent vegetation. Establish permanent stand of vegetation prior to acceptance of project.

## **6. Evaluation for Potential Wetlands and Endangered Species**

Hire an experienced environmental consultant to perform an assessment of the waste site for potential conflicts with wetlands, Areas of Environmental Concern (CAMA), federally listed threatened or endangered species, and federal species of concern.

Delineate the boundaries of any wetlands or jurisdictional surface waters (streams) encountered. Follow the standard practice for documenting the wetland delineation including completion of the Army Corps of Engineer's approved "wetland data form". Document information including data regarding soil, vegetation and hydrology. Maintain a minimum 25 foot (7.6 meter) buffer adjacent to all sides of the wetland boundary and a minimum 50 foot (15.2 m) buffer adjacent to any stream. Depict the limits of the delineated wetland and surrounding buffer on the Reclamation Plan. Do not dispose of waste and debris in any area under the Corps of Engineers' or any other environmental agencies' regulatory jurisdiction unless and until the NCDOT permit has been modified to permit such disposal activity in the jurisdictional area.

Perform a site assessment for federally listed threatened or endangered species to include habitats which may support these species. Provide to the Engineer a detailed report on the assessment findings. If federally listed threatened or endangered species or habitat which may support such species exist on the proposed waste site, notify the engineer prior to continued pursuit of such site.

## **7. Buffer Zones:**

Allocate sufficient area between the nearest property line and the tie-in of the slope to natural ground to allow for the operation of excavation, hauling, and seeding equipment and for the installation of any and all erosion control devices required. Leave additional undisturbed area between the source and any water course or body to prevent siltation of the water course or body and the movement of the shore line either into the water course or body or into the waste areas. Determine if any additional buffer zones are required by the adjoining property owners or other government agencies and comply with those requirements. [Suggested minimum distances are 10' (3 m) from property lines and 50' (15 m) from water bodies or water courses.] Do not place waste material within the 100-year floodplain.

## **8. Approval**

Obtain written approval from the Engineer prior to wasting within the proposed waste or disposal area.

Submit a revised or additional reclamation plan if the non-permitted waste or disposal area is expanded by more than one acre (0.4047 hectare) or is significantly changed from the previously approved submittal.

**802-3 COMPENSATION**

Payment for the work of seeding and mulching, fertilizer topdressing, and establishing erosion control measures for waste or disposal areas will be made at the contract unit prices for the items established in the contract.

When permitted to waste within the right of way and when the waste area requires additional covering material before seeding, provide covering material at no cost to the Department

When waste areas are located outside the right of way, no payment will be made for any borrow used to cover rock, broken pavement, masonry, or other inert materials.

Except as otherwise provided above, no direct payment will be made for the work covered by this section. Payment at the contract prices for the various items in the contract will be full compensation for all work covered by this section

**SECTION 806  
RIGHT OF WAY MARKERS**

**806-1 DESCRIPTION**

Furnish and install precast concrete or granite monuments to mark the boundaries of the right of way in accordance with the requirements of the plans and the provisions of these specifications.

**806-2 MATERIALS**

Refer to Division 10

Right of Way Markers..... Article 1054-1

The Contractor may, at his option, use either granite or concrete right of way markers.

**806-3 CONSTRUCTION METHODS**

Set the right of way markers as the first part of the work, except where construction may interfere with the markers.

Install the markers vertically in the ground to the depth shown on the plans and at the locations shown on the plans. Thoroughly tamp backfill material.

**806-4 METHOD OF MEASUREMENT**

The quantity of right of way markers to be paid for will be the actual number of right of way markers which have been furnished, installed, and accepted.

**806-5 BASIS OF PAYMENT**

The quantity of right of way markers, measured as provided in Article 806-4, will be paid for at the contract unit price each for "Right of Way Markers".

Payment will be made under:

Right of Way Markers.....Each

**SECTION 808  
OBLITERATION OF EXISTING ROAD**

**808-1 DESCRIPTION.**

The work covered by this section consists of the obliteration of an existing road outside of the construction limits. The work includes but is not limited to all breaking up, removing, and disposing of pavement; all plowing of the roadbed; all grading and excavation necessary to reshape the roadway; and all seeding and mulching.

**808-2 CONSTRUCTION METHODS.**

After traffic has been removed from the existing road, remove or plow up any existing pavement, as directed. Fill or grade and shape the entire roadway to a degree which will be pleasing in appearance and comparable to the adjacent topography and suitable for the application of vegetative cover.

**808-3 COMPENSATION.**

All pavement removed and disposed of will be paid for at the contract unit price for "Removal of Existing Asphalt Pavement" or "Removal of Existing Concrete Pavement" in accordance with the provisions of Article 250-4.

All materials excavated in obliterating the abandoned roadway will be paid for at the contract price for "Unclassified Excavation" in accordance with the provisions of Article 225-8.

Any additional material which is required to complete the reshaping of the roadway will be paid for at the contract unit price for "Unclassified Excavation" in accordance with the provisions of Article 225-8, or at the contract unit price for "Borrow Excavation" in accordance with the provisions of Article 230-6, depending on the source of the material.

All seeding and mulching performed on obliterated areas will be paid for at the contract unit prices for the items established in the contract.

**SECTION 815  
SUBSURFACE DRAINAGE**

**815-1 DESCRIPTION.**

Construct underdrains, blind drains, or other types of subsurface drain except shoulder drains, and furnish and install painted pavement markers and vertical markers to locate concrete pads for the drains in accordance with the requirements of the plans and the provisions of these specifications. This work includes but is not limited to furnishing, hauling, and placing all pipe, fittings, subdrain fine aggregate, concrete, and other materials; making all joint connections; cutting into and making connections to existing drainage structures; removing existing paved ditches; grouting around the pipe where it enters existing drainage structures; pavement and vertical markers; and all excavation and backfilling.

**815-2 MATERIALS.**

Refer to Division 10:

Subdrain fine aggregate.....	Article 1044-1
Concrete pipe and fittings .....	Article 1044-3
Corrugated steel pipe and fittings .....	Article 1044-4
Polyvinyl chloride plastic (PVC) pipe .....	Article 1044-5
____ " (mm) Outlet Pipe .....	Article 1044-7
Corrugated plastic pipe and fittings .....	Article 1044-6
Portland cement concrete .....	Section 1000
Pavement Markers Paint .....	Section 1087
Steel Marker .....	Article 1072-4
Steel Marker Paint.....	Article 1080-14

Subsurface drainage pipe and fittings may be either concrete, corrugated steel or corrugated plastic.

**815-3 CONSTRUCTION METHODS.**

Excavate the trench to the width shown on the plans, and to the depth, line and grade established by the Engineer.

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Lay perforated pipe with the perforations down except for when subsurface water is to be passed through dry materials, turn up the perforations or use non-perforated pipe. When concrete pipe is used and subsurface water is to be passed through dry materials, make mortar joints in accordance with the requirements of Subarticle 300-5(A).

Firmly join together corrugated steel pipe sections by coupling bands or other approved mechanical methods.

After the pipe has been laid, carefully place the backfill material so that the pipe will not be disturbed by the backfilling operation. Firmly tamp all earth backfill material.

Solvent cement the SCH-40 pipe and fittings together. Connect the HDPE pipe with watertight neoprene connectors which are suitable for gravity flow conditions. Provide connectors for all pipe fittings which are suitable for gravity flow conditions. Obtain approval for all pipe fittings from the Engineer prior to delivery. Protect the open end of all outlet pipes with a galvanized rodent screen as shown in plans.

Where pipe is not placed in a trench install the amount of subdrain fine aggregate material placed over and around the pipe as shown on the plans.

Connect the subdrains to existing drainage structures or to concrete pads at the outlet end of the subdrain. Construct the concrete pad in accordance with Section 825 and give an ordinary surface finish. Use Class B concrete.

Furnish and install steel markers in accordance with the plans and use at all concrete pads. Install pavement markers as detailed in the plans at all concrete pads.

### **815-4 METHOD OF MEASUREMENT.**

#### **(A) Excavation:**

The quantity of excavation to be paid for will be the number of cubic yards (cubic meters) of material, measured in its original position, which has been excavated within the authorized pipe trench limits. The authorized trench width will be the width shown on the plans or as directed. The authorized trench depth will be the depth established by the Engineer.

#### **(B) Subdrain Fine Aggregate:**

The quantity of subdrain fine aggregate to be paid for will be the number of cubic yards (cubic meters) of subdrain fine aggregate, measured in place within authorized limits, which has been used as backfill. The authorized trench limits will be the same as those limits used in the measurement of excavation. Where the subdrain fine aggregate has not been placed in a trench, measurement will be based on the dimensions established by the Engineer.

#### **(C) Pipe:**

The quantity of pipe to be paid for will be the actual number of linear feet (linear meters) of pipe which has been incorporated into the completed and accepted work. Measurement will be made along the pipe installation, excluding fittings, to the nearest 0.1 of a foot (meter).

#### **(D) Wyes, Tees, and Elbows:**

The quantity of wyes, tees, and elbows to be paid for will be the actual number of these fittings which have been incorporated into the completed and accepted work.

#### **(E) Concrete Pads:**

The quantity of concrete pads to be paid for will be the actual number of pads which have been completed and accepted.

**815-5 BASIS OF PAYMENT.**

**(A) Excavation:**

The quantity of excavation, measured as provided in Subarticle 815-4(A), will be paid for at the contract unit per cubic yard (cubic meter) for "Subdrain Excavation."

**(B) Subdrain Fine Aggregate:**

The quantity of subdrain fine aggregate, measured as provided in Subarticle 815-4(B), will be paid for at the contract unit price per cubic yard (cubic meter) for "Subdrain Fine Aggregate."

**(C) Pipe:**

The quantity of pipe, measured as provided in Subarticle 815-4(C), will be paid for at the contract unit price per linear foot (linear meter) for " \_\_\_\_\_ Inch (mm) Perforated Subdrain Pipe and \_\_\_\_\_ Inch (mm) Outlet Pipe."

**(D) Wyes, Tees, and Elbows:**

The quantities of wyes, tees, and elbows, measured as provided in Subarticle 815-4(D), will be paid for at the contract unit prices each for " \_\_\_\_\_ Inch (mm) Subdrain Pipe Wyes, Tees, and Elbows."

**(E) Concrete Pads:**

The quantity of pads, measured as provided in Subarticle 815-4(E), will be paid for at the contract unit price each for "Concrete Pad for Subdrain Pipe Outlet".

**(F) Pay Items:**

Payment will be made under:

Subdrain Excavation .....	Cubic Yard (Cubic Meter)
Subdrain Fine Aggregate.....	Cubic Yard (Cubic Meter)
__" (mm) Perforated Subdrain Pipe .....	Linear Foot (Linear Meter)
__" (mm) Subdrain Pipe Wyes, Tees, and Elbows .....	Each
Concrete Pad for Subdrain Pipe Outlet .....	Each
__" (mm) Outlet Pipe .....	Linear Foot (Linear Meter)

**SECTION 816  
SHOULDER DRAINS**

**816-1 DESCRIPTION.**

Construct shoulder drains and furnish and install painted pavement markers and vertical markers to located concrete pads for the drains in accordance with the requirements of the plans and the provisions of these specifications. Work includes but is not limited to furnishing, hauling, and placing all pipe, fittings, shoulder drain aggregate, filter fabric, concrete, and other materials; making all joint connections; cutting into and making connections to existing drainage structures; grouting around the pipe where it enters existing drainage structures; pavement and vertical markers and all excavation and backfilling.

**816-2 MATERIALS.**

Refer to Division 10:

Shoulder drain aggregate, No. 57 stone .....	Section 1005
Concrete pipe and fittings .....	Article 1044-3
Corrugated steel pipe and fittings .....	Article 1044-4
Polyvinyl chloride plastic (PVC) pipe .....	Article 1044-5
Corrugated plastic pipe and fittings .....	Article 1044-6
__ Inch (mm) Outlet Pipe.....	Article 1044-7

Shoulder drain filter fabric (Type 1 fabric).....Section 1056  
 Portland cement concrete .....Section 1000  
 Pavement Marker Paint .....Section 1087  
 Steel Marker ..... Article 1072-4  
 Steel Marker Paint..... Article 1080-14

Material for shoulder drain pipe and fittings may be either concrete, corrugated steel, or corrugated plastic.

**816-3 CONSTRUCTION METHODS.**

Excavate the trench to the width, depth, lines, and grades shown on the plans unless otherwise directed.

Install filter fabric such that all splice joints are provided with a minimum overlap of 2 feet (0.6 m). Make the overlap of the closure at the top of the trench at least 6 inches (150 mm) and secured with mechanical ties. Where outlet pipe passes through the fabric, wrap a separate piece of fabric around the outlet pipe, flare against the side of the filled drain, and secure with anchor pins.

Anchor field splices of filter fabric with anchor pins to ensure that required overlap is maintained.

At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

Perform aggregate placement operations and the pipe installation to prevent damage to the filter fabric. Replace damaged sections of filter fabric at no cost to the Department.

Firmly join together corrugated steel pipe sections with coupling bands or with a smooth sleeve type coupler, or with other approved mechanical methods.

Solvent cement the SCH-40 pipe and fittings together. Connect the HDPE pipe with watertight neoprene connectors which are suitable for gravity flow conditions. Obtain approval for all pipe fittings from the Engineer prior to delivery. Protect the open end of all outlet pipes with a galvanized rodent screen as shown in plans. When the pipe perforations are not distributed uniformly over the circumference of the pipe, lay perforated pipe with the perforated segments of the pipe down. When plain pipe is called for by the plans, turn the perforations up or use non-perforated pipe.

Where pipe is not placed in a trench install the amount of subdrain fine aggregate material over and around the pipe as shown on the plans.

Install outlet fittings and outlet pipes with aggregate shoulder drains. Establish positive drainage within 72 hours of beginning trenching for installation of a given section of aggregate shoulder drain. Failure to comply with this requirement may result in the Engineer restricting installation of additional sections of aggregate shoulder drain until such time as the Contractor completes appropriate outlet installations.

Compact the aggregate to a degree acceptable to the Engineer by the use of a vibratory compactor before making the filter fabric closure at the top of the trench.

Carefully place the backfill material after the pipe has been laid, so that the pipe will not be disturbed by the backfilling operation. Firmly tamp all earth backfill material.

Connect the shoulder drains to existing drainage structures or to concrete pads at the outlet end of the subdrain. Construct the concrete pad in accordance with Section 825 and give an ordinary surface finish. Use Class B concrete.

Furnish and install steel markers in accordance with the plans and use at all concrete pads. Install pavement markers as detailed in the plans at all concrete pads.

**816-4 METHOD OF MEASUREMENT.**

**(A) Shoulder Drain:**

The quantity of shoulder drain to be paid for will be the number of linear feet (linear meters) of shoulder drain which has been completed and accepted, measured to the nearest foot (meter) along the centerline of the completed shoulder drain aggregate. No measurement will be made along the outlet pipe.

**(B) Pipe:**

The quantity of pipe to be paid for will be the actual number of linear feet (linear meters) of all pipe which has been incorporated into the completed and accepted work. Measurement will be made along the pipe installation, including fittings, to the nearest 0.1 of a foot (meter) with no deduction made for fittings.

**(C) Concrete Pads:**

The quantity of concrete pads to be paid for will be the actual number of pads which have been completed and accepted.

**816-5 BASIS OF PAYMENT.**

**(A) Shoulder Drain:**

The quantity of shoulder drain, measured as provided in Subarticle 816-4(A), will be paid for at the contract unit price per linear foot (linear meter) for "Shoulder Drain".

**(B) Pipe:**

The quantity of pipe, measured as provided in Subarticle 816-4(B), will be paid for at the contract unit price per linear foot (linear meter) for " \_\_\_\_\_ Inch (mm) Shoulder Drain Pipe" and \_\_\_\_ Inch (mm) outlet pipe."

**(C) Concrete Pads:**

The quantity of pads, measured as provided in Subarticle 816-4(C), will be paid for at the contract unit price each for "Concrete Pad for Shoulder Drain Pipe Outlet."

**(D) Pay Items:**

Payment will be made under:

Shoulder Drain .....	Linear Foot (Linear Meter)
__" (mm) Shoulder Drain Pipe.....	Linear Foot (Linear Meter)
__" (mm) Outlet Pipe .....	Linear Foot (Linear Meter)
Concrete Pad for Shoulder Drain Pipe Outlet.....	Each

**SECTION 818  
BLOTTING SAND**

**818-1 DESCRIPTION.**

Furnish, uniformly spread, and maintain the blotting sand, as directed to applications of prime coat, asphalt surface treatment, or asphalt curing seal.

**818-2 MATERIALS.**

Refer to Division 10:

Blotting Sand.....Article 1012-3.

**818-3 CONSTRUCTION METHODS.**

Apply blotting sand upon completion of the asphalt application, when directed. Provide relatively dry blotting sand. Spread uniformly, as directed, on the same day as the application of prime coat, asphalt surface treatment, or asphalt curing seal. Apply at the

rate of 10 pounds per square yard (5.4 kg per square meter) of surface area unless otherwise directed.

**818-4 METHOD OF MEASUREMENT.**

The quantity of blotting sand to be paid for will be the number of tons (metric tons) of blotting sand which has actually been placed. The quantity will be measured by weighing in trucks on certified platform scales or other certified weighing devices. No deduction will be made of any moisture in the sand at the time of weighing. No measurement of blotting sand will be made when the blotting sand is part of a Drag Seal or a Sand Seal.

**818-5 BASIS OF PAYMENT.**

The quantity of blotting sand, measured as provided in Article 818-4, will be paid for at the contract unit price per ton (metric ton) for "Blotting Sand."

Payment will be made under:

Blotting Sand..... Ton (Metric Ton)

**SECTION 820  
FUNNELS AND FUNNEL DRAINS**

**820-1 DESCRIPTION.**

Furnish and install all funnels, pipe, elbows and all other materials; all excavation and backfilling; and construction and maintenance of temporary berms for diversion in accordance with the requirements of the plans and the provisions.

**820-2 MATERIALS.**

Refer to Division 10:

- Funnels ..... Subarticle 1054-4(A)
- Funnel drain pipe.....Subarticle 1054-4(B)
- Funnel drain pipe elbows .....Subarticle 1054-4(B)
- Portland cement concrete .....Section 1000

Use Class B or better Concrete

Use connector rings with gaskets in accordance with manufacturer's recommendations that are designed to form a properly sealed joint and provide circumferential and longitudinal strength sufficient to preserve the alignment and prevent separation of the sections

**820-3 CONSTRUCTION METHODS.**

Furnish concrete, install and anchor funnel, and place connector ring with gaskets in accordance with the details in the plans and in accordance with manufacturer's recommendations so that the water will flow freely into it without overflow or leakage. Securely join the funnel drain pipe to the funnel and backfill with sufficient care so that no part of the funnel or funnel drain pipe is displaced or moved out of alignment. Place backfill material in 6 inch (150 mm) layers and compact to a density comparable to the adjacent undisturbed material.

Construct a temporary construction berm to divert runoff into the funnel until paved ditch, paved berm or curb is constructed.

**820-4 METHOD OF MEASUREMENT.**

The quantity of funnels to be paid for will be the actual number of funnels which have been installed and accepted.

The quantity of funnel drain pipe to be paid for will be the actual number of linear feet (linear meters) of pipe which has been incorporated into the completed and accepted

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work. Measurement will be made by counting the number of joints used and multiplying the length of the joint. Where partial joints are used, measurement will be made along the longest length of the partial joint to the nearest 0.1 of a foot (meter).

The quantity of funnel drain pipe elbows to be paid for will be the actual number of elbows which have been installed and accepted.

**820-5 BASIS OF PAYMENT.**

The quantity of funnels, measured as provided in Article 820-4, will be paid for at the contract unit price each for "Metal Funnels."

The quantity of funnel drain pipe, measured as provided in Article 820-4, will be paid for at the contract unit per linear foot (linear meter) for "\_\_\_\_\_Inch (mm) Funnel Drain Pipe."

The quantity of funnel drain pipe elbows, measured as provided in Article 820-4, will be paid for at the contract unit price each for "\_\_\_\_\_Inch (mm) Funnel Drain Pipe Elbows."

No separate payment will be made for the concrete, and the connector ring with gaskets as such work will be included in the contract unit price each for metal funnels.

Payment will be made under:

Metal Funnels.....	Each
___" (mm) Funnel Drain Pipe.....	Linear Foot (Linear Meter)
___" (mm) Funnel Drain Pipe Elbows.....	Each

**SECTION 825  
INCIDENTAL CONCRETE CONSTRUCTION -  
GENERAL**

**825-1 DESCRIPTION.**

This section consists of the general requirements for the construction of all incidental concrete construction. The provisions of Sections 838, 840, 842, 844, 846, 848, 850, 852, 853, 854, 855, 857, and 858 will prevail over any conflicting provisions of this section.

Provide concrete meeting the applicable provisions of Section 1024.

Follow Section 1077 where the concrete is to be precast and then transported to the required location.

**825-2 FORMS.**

**(A) General:**

Maintain forms true to the required lines, grades and dimensions. Construct forms with material of such strength and with sufficient rigidity to prevent any appreciable deflection between supports. Provide mortar-tight forms with a fillet at sharp corners when indicated on the plans.

Design clamps, pins, and metal spacers, anchorages, and other connecting devices to hold the forms rigidly together. Construct or install any metal spacers or anchorages which are required within the forms so that the metal work can be removed to a depth of at least 1 inch (25 mm) from the exposed surface of the concrete without injury to the surface. The recess thus formed in the concrete must have a diameter not greater than 1 1/2 times the depth.

Maintain the shape, strength, rigidity, and surface smoothness of forms that are to be re-used at all times. Thoroughly clean off all dirt, mortar, and foreign material from forms before reusing. Thoroughly coat all inside form surfaces with commercial quality form oil or other equivalent coating before placing concrete.

**(B) Wood Forms:**

Provide forms with a smooth and uniform texture. Make joints between forms tight and even so that no appreciable form marks remain after the forms are removed.

Do not use plywood sheets showing torn grain, worn edges, patches, or other defects which impair the texture of concrete surfaces which will be exposed to view.

**(C) Metal Forms:**

Use metal forms of such thickness and rigidity that the forms will remain true to shape. Counter-sink bolt and rivet heads. Use only metal forms which present a smooth surface and line up properly. Keep metal forms free from all foreign matter which will discolor the concrete.

**825-3 REINFORCEMENT.**

Furnish and place reinforcement as shown on the plans and in accordance with the provisions of Section 425.

**825-4 PLACING CONCRETE.**

Do not place concrete until the foundation, the adequacy of the forms, the placing of reinforcement and other embedded items have been inspected and approved.

Place concrete in daylight unless an approved lighting system is provided.

Remove all debris from the interior of forms in preparation for placing concrete. Moisten earth or base course surfaces on which concrete is to be placed immediately before placing concrete. Do not place concrete on excessively wet or frozen surfaces.

Place concrete in its final position in the forms within the time stipulated in Subarticle 1000-4(E).

Place concrete so as to avoid segregation of the materials and the displacement of the reinforcement. Thoroughly work the concrete during placement. Bring mortar against the forms to produce a smooth finish, substantially free from water and air pockets or honeycombs.

Do not place concrete when the air temperature, measured at the location of the concrete operation in the shade away from artificial heat, is below 35°F (2°C) unless permission is otherwise granted. When such permission is granted, uniformly heat the aggregates and water to a temperature of not higher than 150°F (66°C). Place the heated concrete at a temperature of not less than 55°F (13°C) and not more than 80°F (27°C).

**825-5 SLUMP TESTS.**

Test the slump of the concrete in accordance with Article 420-7.

**825-6 FINISHING****(A) General:**

Provide the type of finish required by the section of the specifications directly applicable to the work being constructed.

**(B) Ordinary Surface Finish:**

Remove all form ties or metal spacers to a depth of at least 1 inch (25 mm) below the surface of the concrete and clean and fill the resulting holes or depressions with grout. Metal devices with exposed cross-sectional area not exceeding approximately 0.05 square inches (32 square mm) on surfaces permanently in contact with earth fill may be broken off flush with the surface of the concrete.

Remove all fins caused by form joints and other projections. Remove stains and discoloration. Clean all pockets and fill with grout as directed. Thoroughly soak the surface of all concrete with water prior to the application of a grout repair.

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Use grout consisting of one part cement and two parts sand. Use cement from the same source as originally incorporated in work. Cure the grout for at least 3 days. After the grout has thoroughly hardened, rub the patch with a carborundum stone as required to match the texture and color of the adjacent concrete.

On surfaces which are to be backfilled or surfaces which are enclosed, the removal of form marks, fins, and pockets; the rubbing of grouted areas to uniform color; and the removal of stains and discoloration will not be required.

### (C) Sidewalk Finish:

Strike off fresh concrete and compact until a layer of mortar is brought to the surface. Finish the surface to grade and cross section with a float, trowel smooth, and finish with a broom.

### (D) Rubbed Finish:

After the ordinary surface finish has been completed, thoroughly wet and rub the entire surface. Use a coarse carborundum stone or other equally good abrasive to bring the surface to a smooth texture and remove all form marks. Finish the paste formed by rubbing by carefully stroking with a clean brush, or spread the paste uniformly over the surface and allow it to take a "reset". Finish by floating with a canvas, carpet-faced, or cork float; or rub down with dry burlap.

### (E) Float Finish:

Finish the surface with a rough carpet float or other suitable device leaving the surface even, but distinctly sandy or pebbled in texture.

## 825-7 REMOVING FORMS.

Do not remove forms from freshly placed concrete until it has hardened sufficiently to resist spalling, cracking, or any other damage.

## 825-8 PROTECTION FROM COLD WEATHER.

When it is anticipated that the atmospheric temperature will fall below 35°F (2°C), protect concrete in accordance with Article 420-9(C). Protect concrete containing fly ash or ground granulated blast furnace slag for a minimum of 7 curing days, and all other concrete for a minimum of 3 curing days. Article 825-9 defines a curing day.

## 825-9 CURING.

Cure concrete in accordance with Subarticle 700-9(B) immediately after finishing operations are completed and surface water has disappeared. Where forms are removed before the expiration of the required curing period, apply the curing compound immediately after the forms are removed.

Cure each mass for a period of 7 curing days.

A curing day is any consecutive 24 hour period, after finishing operations of the mass is completed, when the air temperature adjacent to the mass does not fall below 40°F (4°C).

## 825-10 JOINTS.

### (A) General:

Construct joints at right angles to the surface of the concrete. Locate joints at right angles to the longitudinal centerline of curb, curb and gutter, gutter, island, median, median barrier, and all paved areas, except where different joint locations are called for on the plans.

Where concrete is to be placed adjacent to any existing slab or pavement which has a broken or irregular edge, provide a reasonably vertical edge by sawing.

### (B) Grooved Contraction Joints:

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Form grooved contraction joints by a tool specifically constructed for this purpose, or by sawing with an approved concrete saw.

Groove contraction joints to the depth shown on the plans and to a width between 1/4 inch (6 mm) and 1/2 inch (12 mm), unless otherwise shown on the plans. If formed by a tool, make a radius of 1/8 inch (3 mm) at the corners of the adjacent concrete.

### (C) Expansion Joints:

Fill construction joints with an expansion joint filler. Cut the filler into the shape necessary to fill the joint. Make the filler 1/2 inch (12 mm) thick unless indicated otherwise on the plans. After the concrete has hardened cut the filler away to a depth of 1/2 inch (12 mm) to provide space for the joint sealer.

Install an expansion joint adjacent to any existing slab, pavement, or structure against which new concrete is placed and at other locations detailed in the plans.

### (D) Construction Joints:

Construct construction joints as shown on the plans, or where otherwise approved.

### (E) Sawing Joints:

Saw joints after the concrete has hardened sufficiently to be sawed without spalling and raveling but not more than 24 hours after the concrete has been placed.

### (F) Sealing Joints:

Seal all contraction and expansion joints, except otherwise specified, before the backfill is placed.

Thoroughly clean the joint to remove all foreign matter. Dry joints before sealing.

Entirely fill joints to within 1/8 inch (3 mm) to 1/4 inch (6 mm) of the surface of the concrete with joint sealer. Immediately remove any sealer spilled on the surface of the concrete.

Place joint sealer with equipment meeting the specifications of the manufacturer of the sealer material.

## 825-11 COMPENSATION.

There will be no direct payment for the work covered by this section.

Payment at the contract prices for the various items covered by those sections of the specifications directly applicable to the work being constructed will be full compensation for all work covered by this section.

## SECTION 828 TEMPORARY STEEL COVER FOR MASONRY DRAINAGE STRUCTURES:

### 828-1 DESCRIPTION.

This work consists of furnishing all materials, labor, equipment, tools, and incidentals necessary to satisfactorily install temporary steel plate covers on masonry drainage structures in accordance with the details shown in the plans and as directed.

### 828-2 MATERIALS.

Provide materials that are Grade A36 steel and the size and thickness shown on the detail in the plans.

### 828-3 METHOD OF MEASUREMENT.

The quantity of steel plate covers to be paid for will be the actual number of these items which have been incorporated into the completed and accepted work.

**828-4 BASIS OF PAYMENT.**

The quantity of steel plate covers, measured as provided above, will be paid for at the contract unit price each for "Temporary Steel Plate Covers for Masonry Drainage Structures

Payment will be made under:

Temporary Steel Plate Covers for Masonry Drainage Structures.....Each

**SECTION 830  
BRICK MASONRY CONSTRUCTION -  
GENERAL**

**830-1 DESCRIPTION.**

This section consists of the general requirements for all nonreinforced brick masonry construction. The provisions of Sections 838, 840, 842, 844, and 858 will prevail over any conflicting provisions of this section.

**830-2 CONCRETE CONSTRUCTION.**

Construct all concrete footings and all other concrete elements of the structure in accordance with Section 825. Use Class B concrete unless otherwise indicated on the plans.

**830-3 MORTAR.**

Use freshly mixed mortar meeting the requirements of Article 1040-8. All mortar which has developed initial set or lost plasticity will be rejected.

**830-4 LAYING BRICK.**

Dampen brick when necessary to reduce the rate of absorption. Build brick masonry plumb and true to the required dimensions. Place a header course approximately mid height of the structure in structures less than 9 courses high. Place a header course every third course on structures 9 courses high or higher. Use other types of bonding where indicated on the plans.

Completely fill brick joints and cavities with mortar. The thickness of mortar joints is a maximum 5/8 inch (16 mm) and a minimum of 3/8 inch (10 mm) except where otherwise indicated on the plans. Finish joints that will remain exposed after backfill with a concave jointer. Flush cut all other joints.

Use spalls or bats only when shaping around irregular openings or when unavoidable to finish out a course. Place a full brick at the corner and place the bat in the interior of the course when necessary to finish out the course.

Clean spilled mortar from exposed exterior surfaces not backfilled.

**830-5 PROTECTION FROM COLD WEATHER.**

Do not place masonry when the temperature is below 35°F (2°C) unless adequate protection is provided by a pre-approved method.

When it is anticipated that the atmospheric temperature will fall below 35°F (2°C), protect masonry, in accordance with Subarticle 420-9(C), for a minimum of 3 curing days.

A curing day is considered any consecutive 24 hour period, beginning when the last masonry unit is placed in the completed structure, during which the air temperature adjacent to the structure does not fall below 40°F (4°C).

**830-6 COMPENSATION.**

Payment at the contract prices for the various items covered by those sections of the specifications directly applicable to the work being constructed will be full compensation for all work covered by this section.

**SECTION 832  
REINFORCED BRICK MASONRY  
CONSTRUCTION - GENERAL**

**832-1 DESCRIPTION.**

This section consists of the general requirements for all reinforced brick masonry construction. The provisions of Section 838 will prevail over any conflicting provisions of this section.

**832-2 CONCRETE CONSTRUCTION.**

Construct concrete footings and all other concrete elements of the structure in accordance with Section 825. Furnish and place reinforcement as shown on the plans and in accordance with the provisions of Section 425. Use Class A concrete for footings unless otherwise indicated on the plans. Use Class M concrete in reinforcement cavities. Rod Class M concrete to provide a dense, homogeneous concrete. Do not vibrate.

**832-3 MORTAR.**

Machine mix mortar meeting the requirements of Article 1040-8 for not less than 1 1/2 minutes. Remove and dispose of any mortar which has developed initial set or lost plasticity.

**832-4 LAYING BRICK.**

Dampen brick when necessary to reduce the rate of absorption. Construct the type of bond called for on the plans. Build reinforced brick masonry plumb and true to the required dimensions.

Lay brick with completely filled mortar joints. Make mortar joints not more than 1/2 inch (13 mm) nor less than 1/4 inch (6 mm) thick except where indicated on the plans. Finish joints, which will remain exposed after backfill, with a concave jointer. Flush cut all other joints.

Use spalls or bats only when shaping around irregular openings. Place a full brick at the corner and place the bat in the interior of the course when necessary to finish out a course.

Clean spilled mortar from exposed exterior surfaces not backfilled.

**832-5 PROTECTION FROM COLD WEATHER.**

Refer to Article 830-5.

**832-6 COMPENSATION.**

There will be no direct payment for the work covered by this section.

Payment at the contract unit prices for the various items covered by those sections of the specifications directly applicable to the work being constructed will be full compensation for all work covered by this section.

**SECTION 834  
REINFORCED BLOCK MASONRY  
CONSTRUCTION - GENERAL**

**834-1 DESCRIPTION.**

This section consists of the general requirements for all reinforced concrete block masonry construction. The provisions of Section 842 will prevail over any conflicting provisions of this section.

**834-2 CONCRETE CONSTRUCTION.**

Construct concrete footings and all other concrete elements of the structure in accordance with Section 825. Use Class B concrete unless otherwise indicated on the plans.

**834-3 MORTAR.**

Use freshly mixed mortar meeting the requirements of Article 1040-8. Remove and dispose of any mortar which has developed initial set or has lost plasticity.

**834-4 LAYING CONCRETE BLOCK.**

Build block masonry plumb and true to the required dimensions. Stagger vertical joints. Set the block with the cells vertical. Spread mortar on the bearing members and fill the vertical joints with mortar. Dampen block when necessary to reduce the rate of absorption.

Make joints straight, level, plumb, and neat at intersection. Make joints 1/4 to 1/2 inch (6 to 13 mm) thick except where otherwise indicated on the plans. Finish joints, which will remain exposed after backfill, with a concave jointer. Flush cut all other joints. Clean exposed exterior surfaces of spilled mortar which are not backfilled.

Place truss type horizontal reinforcing on every other course and in the bed joint of the top course of block. Lap reinforcing at least 6 inches (150 mm).

**834-5 PROTECTION FROM COLD WEATHER.**

Refer to Article 830-5.

**834-6 COMPENSATION.**

There will be no direct payment for the work covered by this section.

Payment at the contract prices for the various items covered by those sections of the specifications directly applicable to the work being constructed will be full compensation for all work covered by this section.

**SECTION 838  
ENDWALLS**

**838-1 DESCRIPTION.**

Perform the work covered by this section including but not limited to excavation, hauling, disposal of materials, furnishing and placing backfill materials, subsurface drainage, concrete, brick masonry, mortar, grout, and furnishing and placing reinforcing steel in order to construct portland cement concrete or brick masonry endwalls, either plain or reinforced, in accordance with the requirements shown on the plans and the provisions of these specifications.

**838-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....Section 1000

**Section 838**

Curing agents .....Section 1026  
 Brick..... Article 1040-1  
 Mortar..... Article 1040-8  
 Steel bar reinforcement ..... Article 1070-2  
 Subdrain fine aggregate..... Article 1044-1  
 Stone, No 78M .....Section 1005  
 Precast Concrete Units .....Section 1077  
 Select Material .....Section 1016

Use either portland concrete or brick masonry for the endwall unless otherwise specified on the Drainage Summary Sheet of the Plans.

If Pre-cast sections are proposed, submit in writing for approval.

**838-3 CONSTRUCTION METHODS.**

**(A) Foundation:**

Do not place concrete or masonry until the foundation is approved.

Excavate foundation to a firm surface, make level or stepped, and clean surfaces of loose material. Make excavation true to lines and dimensions shown on plans.

Where the foundation material is found to be of poor supporting value or of rock, the Engineer may make minor adjustments in the location of the structure to provide a more suitable foundation. Where this is not practical, undercut the foundation and condition by backfilling with an approved select material.

**(B) Concrete and Masonry:**

Construct concrete in accordance with Section 825 and give an ordinary surface finish. Construct brick masonry in accordance with Sections 830 and 832. Furnish and place reinforcing steel in accordance with Section 425.

Provide the class of concrete indicated on the plans.

Obtain approval if field conditions necessitate a variance from the plan dimensions of the structure and footings.

Construct endwalls on the end of a full joint of pipe and in accordance with the details in the plans.

Any endwall which incorporates an opening for circular pipe 54 inches (1370 mm) or greater must be reinforced.

**(C) Backfill:**

Complete endwall construction, and remove all forms. Backfill with approved material after the concrete or brick masonry has cured for at least 7 curing days unless otherwise permitted. A curing day is defined in Article 825-9 for concrete or Article 830-5 for brick masonry. Within 4 calendar days after the completion of the seven day curing period, shape, compact, and complete backfill in accordance with the plans and specifications.

**838-4 METHOD OF MEASUREMENT.**

The quantity of endwalls to be paid for will be the number of cubic yards (cubic meters) of cast in place concrete, brick, or block masonry that has been completed and accepted. This quantity will be computed from the dimensions shown on the plans or from revised dimensions authorized.

The quantity of reinforced endwalls to be paid for will be the number of cubic yards (cubic meters) of reinforced cast in place concrete, reinforced brick, or reinforced block masonry which has been completed and accepted. This quantity will be computed from the dimensions shown on the plans or from revised dimensions authorized.

**838-5 BASIS OF PAYMENT:**

The quantity of endwalls, measured as provided above, will be paid for at the contract unit price per cubic yard (cubic meter) for “Endwalls”.

The quantity of reinforced endwalls, measured as provided above, will be paid for at the contract unit price per cubic yard (cubic meter) for “Reinforced Endwalls”.

The above prices and payments will be full compensation for all of the work covered by this provision.

Payment will be made under:

Endwalls .....	Cubic Yard (Cubic Meter)
Reinforced Endwalls .....	Cubic Yard (Cubic Meter)

**SECTION 840  
MINOR DRAINAGE STRUCTURES**

**840-1 DESCRIPTION.**

Perform the work covered by this section including but not limited to excavation; providing protection of employees in excavation; hauling; disposal of materials; removing existing pipe and drainage structures at the site of the work; furnishing, transporting, and placing foundation conditioning material, backfill material, subsurface drainage, concrete, brick masonry, block masonry, precast units, mortar, grout, reinforcing steel, hardware, castings, and miscellaneous metal; fabrication; welding; and galvanizing in order to construct cast-in-place concrete, brick masonry, block masonry, or precast concrete inlets, catch basins, junction boxes, spring boxes, manholes, concrete aprons, and other minor drainage structures excluding endwalls, together with all necessary metal grates, covers, frames, steps, and other hardware, in accordance with the requirements shown on the plans and the provisions of these specifications.

Use either cast-in place concrete, brick masonry, block masonry, or precast concrete construction as shown on approved plans.

**840-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint fillers .....	Article 1028-1
Joint sealers .....	Article 1028-2
Brick .....	Article 1040-1
Concrete block .....	Article 1040-2
Mortar .....	Article 1040-8
Precast drainage structure units .....	Section 1077
Reinforcing steel .....	Section 1070
Structural steel .....	Section 1072
Steps .....	Article 1074-8
Fabricated steel grates .....	Article 1074-9
Gray iron castings .....	Article 1074-7
Select Materials .....	Section 1016

Use grout in precast structures consisting of 1 part portland cement to 2 parts of mortar sand meeting the requirements of Articles 1040-4, 1040-6, and 1040-7.

Use foundation conditioning material meeting the requirements of Article 1016-3 for Class II, III, IV, V or VI select material as shown in the plans and specifications or as directed.

**840-3 CONSTRUCTION METHODS.****(A) Excavation**

Perform excavation with equipment of adequate weight, size and capability. Where necessary, provide a competent person and protection of personnel in excavation by sloping, shoring or bracing in accordance with local, state or federal standards and Article 107-1.

**(B) Foundation:**

Do not place masonry drainage structure until the foundation has been approved.

Where the foundation material is found to be of poor supporting value or of rock, minor adjustments in the location of the structure may be approved to provide a more suitable foundation. Where this is not practical, undercut the foundation and condition by backfilling with an approved select material.

Set precast foundation slabs to within plus or minus 1/2 inch (13 mm) of grade on a 2 to 3 inch (50 to 75 mm) thick bed of compacted foundation conditioning material.

**(C) Cast-In-Place Concrete, Brick, and Block Masonry:**

Construct concrete in accordance with Section 825 and give an ordinary surface finish. Construct brick masonry in accordance with Section 830. Construct block masonry in accordance with Section 834 except that truss type horizontal reinforcing will not be required. Furnish and place reinforcing steel in accordance with Section 425.

Use Class B concrete unless otherwise indicated on the plans.

Obtain approval if field conditions necessitate a variance from the plan dimensions of the structure and/ or footings.

**(D) Installation of Precast Units:**

Assemble and grout together the precast drainage structure units in accordance with the manufacturer's instructions. Subarticle 840-3(C) applies where it is necessary to use cast-in-place concrete, brick masonry, or block masonry construction as part of the structure.

Obtain approval if field conditions necessitate a variance from the plan dimensions of the structure and/ or footings.

**(E) Fittings and Connections:**

As the work is built up, accurately space, align, and thoroughly bond fittings which enter the structure.

Make pipe connections so that the pipe does not project beyond the inside wall of the drainage structure, and grout as necessary to make smooth and uniform surfaces on the inside of the structure.

Set metal frames for grates and covers in full mortar beds or secure by approved methods.

**(F) Backfill:**

Complete drainage structure and remove all forms and falsework. Backfill with approved material, compacted to the density required by Subarticle 235-4(C), after the drainage structure has cured for at least 7 curing days, unless otherwise permitted. A curing day is defined in Article 825-9 for concrete or Article 830-5 for brick or block masonry.

**(G) Pipe Collars and Pipe Plugs:**

Construct pipe collars and pipe plugs in accordance with the details shown in the plans or as directed.

Use any class of portland cement concrete contained within Section 1000 for pipe collars.

Construct pipe plugs with either brick masonry or any class of portland cement concrete contained within Section 1000.

**(H) Concrete Aprons:**

Construct concrete aprons in accordance with the details in the plans. Use Class "B" or higher compressive strength concrete.

**840-4 METHOD OF MEASUREMENT.**

**(A) Masonry Drainage Structures:**

**(1) Per Each Basis:**

Any drainage structure which incorporates an opening for circular pipe not exceeding 48 inches (1200 mm) in diameter will be measured and paid for on a "per each" basis as provided below.

The quantity of masonry drainage structures to be paid for will be actual number of drainage structures which have been completed and accepted.

In addition, that portion of a drainage structure exceeding a height of 5.0 feet (1.5 m) will be measured and paid for on a linear foot (linear meter) basis. The quantity of masonry drainage structures above a height of 5.0 feet (1.5 m) to be paid for will be the number of linear feet (linear meters) which the height of the drainage structure exceeds 5.0 feet (1.5 m). The height will be measured vertically to the nearest tenth of a foot (meter) from the top of the bottom slab to the top of the wall.

**(2) Volume Basis:**

Any masonry drainage structure which incorporates an opening for circular pipe exceeding 48 inches (1200 mm) in diameter, or for pipe arch of any size, will be measured and paid for on a volume basis as provided below.

The quantity of masonry to be paid for will be the number of cubic yards (cubic meter) of cast-in-place concrete, brick, block, or precast masonry which has been incorporated into the completed and accepted structure. This quantity will be computed from the dimensions shown on the plans or from revised dimensions authorized by the Engineer. Where the wall thickness is greater than the wall thickness shown on the plans due to the use of oversize brick or for any other reason, the wall thickness shown on the plans will be used to compute quantities except where an increase in wall thickness has been authorized by the Engineer.

**(B) Pipe Collars and Pipe Plugs:**

The quantity of pipe collars and pipe plugs to be paid for will be the number of cubic yards (cubic meters) of concrete or brick which has been incorporated into the completed and accepted pipe collar or pipe plug. The number of cubic yards (cubic meters) of pipe collars and pipe plugs will be computed from the dimensions shown on the plans or from revised dimensions authorized by the Engineer.

**(C) Frame Assemblies with Grates or Covers:**

The quantity of assemblies to be paid for will be the actual number of assemblies which have been incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers which are part of the assembly as the grates, hoods, and covers will be considered to be part of the complete assembly.

The quantity of fabricated steel grates to be paid for will be the actual number of fabricated steel grates which have been incorporated into the completed work.

**(D) Concrete Aprons:**

The quantity of concrete aprons, constructed in curbing or islands, to be paid for will be the actual number completed and accepted.

**840-5 BASIS OF PAYMENT.****(A) Masonry Drainage Structures:****(1) Per Each Basis:**

Any masonry drainage structure which incorporates an opening for circular pipe not exceeding 48 inches (1200 mm) in diameter will be paid for on a "per each" basis as provided below.

The quantity of masonry drainage structures, measured as provided in Subarticle 840-4(A)(1), will be paid for at the contract unit price each for "Masonry Drainage Structures."

In addition, the quantity of masonry drainage structures, measured as provided in Subarticle 840-4(A)(1), will be paid for at the contract unit price per linear foot (linear meter) for "Masonry Drainage Structures" for that portion of the drainage structure from a height of 5.0 feet (1.5 m) to 10.0 feet (3 m). For that portion of the drainage structure above a height of 10.0 feet (3 m), payment will be made at 1.3 times the contract unit price per linear foot (linear meter) for "Masonry Drainage Structures".

**(2) Volume Basis:**

Any masonry drainage structure which incorporates an opening for circular pipe exceeding 48 inches (1200 mm) in diameter, or for pipe arch of any size will be paid for on a volume basis as provided below.

The quantity of masonry, measured as provided in Subarticle 840-4(A)(2), will be paid for at the contract unit price per cubic yard (cubic meter) for "Masonry Drainage Structures".

**(B) Pipe Collars and Pipe Plugs:**

The quantity of concrete or brick, measured as provided in Subarticle 840-4(B), will be paid for at the contract unit prices per cubic yard (cubic meter) for "Pipe Collars" and "Pipe Plugs".

**(C) Foundation Conditioning:**

Foundation conditioning will be paid for as provided in Subarticles 300-9(A) and 300-9(E).

**(D) Frame Assemblies with Grates and Covers:**

The quantity of assemblies, measured as provided in Subarticle 840-4(C), will be paid for at the contract unit price each for "Frame with Grate and Hood, Std. \_\_\_\_\_," "Frame with Grate, Std. \_\_\_\_\_" "Frame with Two Grates, Std. \_\_\_\_\_," "Frame with Cover, Std. \_\_\_\_\_".

The quantity of fabricated steel grates, measured as provided in Subarticle 840-4(C), will be paid for at the contract unit price each for "Steel Frame with Two Grates, Std. \_\_\_\_\_".

**(E) Concrete Aprons:**

The quantity of concrete aprons, measured as provided for in Subarticle 840-4(D) will be paid for at the contract unit price each for "Concrete Apron for Catch Basins" and "Concrete Apron for Drop Inlets."

**(F) Compensation:**

The above prices and payments will be full compensation for all work covered by this section.

**(G) Pay Items:**

Payment will be made under:

Masonry Drainage Structures.....	Each
Masonry Drainage Structures.....	Linear Foot (Linear Meter)
Masonry Drainage Structures.....	Cubic Yard (Cubic Meter)
Pipe Collars .....	Cubic Yard (Cubic Meter)
Pipe Plugs.....	Cubic Yard (Cubic Meter)
Frame with Grate and Hood, Std. _____	Each
Frame with Grate, Std. _____	Each
Frame with Two Grates, Std. _____	Each
Frame with Cover, Std. _____	Each
Steel Frame with Two Grates, Std. _____	Each
Concrete Apron for Catch Basins .....	Each
Concrete Apron for Drop Inlets .....	Each

**SECTION 842  
GRAVITY RETAINING WALLS**

**842-1 DESCRIPTION.**

Construct gravity retaining walls of concrete, brick masonry, or concrete block masonry, in accordance with the requirements shown on the plans and the provisions of these specifications. The work includes but is not limited to excavation and backfilling, subsurface drainage, furnishing and placing concrete, brick masonry, concrete block masonry, mortar, reinforcing steel, and constructing joints.

**842-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint fillers.....	Article 1028-1
Joint sealers .....	Article 1028-4
Brick.....	Article 1040-1
Concrete block .....	Article 1040-2
Mortar.....	Article 1040-8
Truss type horizontal reinforcing .....	Article 1070-7
Subdrain fine aggregate.....	Article 1044-1
Stone, No. 78M .....	Section 1005

**842-3 CONSTRUCTION REQUIREMENTS.**

Construct concrete in accordance with Section 825 and give an ordinary surface finish. Use Class A concrete. Do not remove forms for at least 12 hours after placing the concrete.

Construct brick masonry in accordance with Section 830. Construct reinforced concrete block masonry in accordance with Section 834.

Do not backfill gravity retaining walls until at least 7 curing days, as defined in Article 825-9 for concrete or Article 830-5 for brick or block masonry, have elapsed unless otherwise permitted.

Compact backfill in accordance with the plans and specifications .

**842-4 METHOD OF MEASUREMENT.**

The quantity of concrete to be paid for will be the number of cubic yards (cubic meters) of concrete, computed from the dimensions shown on the plans or established by the Engineer, which has been incorporated into the completed and accepted retaining walls.

The quantity of brick masonry to be paid for will be the number of cubic yards (cubic meters) of brick masonry, computed from the dimensions shown on the plans or established by the Engineer, which has been incorporated into the completed and accepted retaining walls. Wherever a brick masonry retaining wall has a concrete footing, the quantity of concrete in the footing will be measured and included in the quantity of brick masonry and is to be paid for as brick masonry.

The quantity of concrete block masonry to be paid for will be the number of cubic yards (cubic meters) of concrete block masonry, computed from the dimensions shown on the plans or established by the Engineer, which has been incorporated into the completed and accepted retaining walls.

**842-5 BASIS OF PAYMENT.**

The quantity of concrete, measured as provided in Article 842-4, will be paid for at the contract unit price per cubic yard (cubic meter) for "Concrete Retaining Walls."

The quantity of brick masonry, measured as provided in Article 842-4, will be paid for at the contract unit price per cubic yard (cubic meter) for "Brick Masonry Retaining Walls."

The quantity of concrete block masonry, measured as provided in Article 842-4, will be paid for at the contract unit price per cubic yard (cubic meter) for "Concrete Block Masonry Retaining Walls."

Payment will be made under:

Concrete Retaining Walls .....	Cubic Yard (Cubic Meter)
Brick Masonry Retaining Walls.....	Cubic Yard (Cubic Meter)
Concrete Block Masonry Retaining Walls.....	Cubic Yard (Cubic Meter)

**SECTION 844  
STEPS**

**844-1 DESCRIPTION.**

Construct reinforced concrete or brick masonry steps in accordance with the plans and provisions of these specifications. Work includes but is not limited to excavation and backfilling, furnishing and placing concrete, reinforcing steel, brick masonry, and mortar.

**844-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Steel bar reinforcement .....	Article 1070-2
Brick.....	Article 1040-1
Mortar.....	Article 1040-8

**844-3 CONSTRUCTION REQUIREMENTS.**

Construct concrete in accordance with Section 825, except as otherwise provided herein. Furnish and place reinforcement, as shown on the plans, in accordance with the provisions of Section 425. Use Class B concrete. Give formed surfaces of the concrete a rubbed finish. Give unformed surfaces a float finish.

Construct brick masonry in accordance with Section 830.

Compact backfill to a degree comparable to the adjacent undisturbed material.

**844-4 METHOD OF MEASUREMENT.**

The quantity of concrete to be paid for will be the number of cubic yards (cubic meters) of concrete, computed from the dimensions shown on the plans or established by the Engineer, which has been incorporated into the completed and accepted steps.

The quantity of brick masonry to be paid for will be the number of cubic yards (cubic meters) of brick masonry, computed from the dimensions shown on the plans or established by the Engineer, which has been incorporated into the completed and accepted steps.

**844-5 BASIS OF PAYMENT.**

The quantity of concrete, measured as provided in Article 844-4, will be paid for at the contract unit price per cubic yard (cubic meter) for "Concrete Steps."

The quantity of brick masonry, measured as provided in Article 844-4, will be paid for at the contract unit price per cubic yard (cubic meter) for "Brick Masonry Steps."

Payment will be made under:

Concrete Steps.....	Cubic Yard (Cubic Meter)
Brick Masonry Steps .....	Cubic Yard (Cubic Meter)

**SECTION 846  
CONCRETE CURB, CURB AND GUTTER, CONCRETE  
GUTTER, SHOULDER BERM GUTTER, CONCRETE EXPRESSWAY  
GUTTER, CONCRETE VALLEY GUTTER  
AND CONCRETE FLUMES**

**846-1 DESCRIPTION.**

Construct portland cement concrete curb, concrete curb and gutter, concrete gutter, shoulder berm gutter, concrete expressway gutter, 4" (100 mm) concrete valley gutter and concrete flumes as shown on the plans and in accordance with the provisions of these specifications. Work includes providing all materials, placing all concrete, excavating and backfilling, forming, finishing, constructing and sealing joints, and all incidentals necessary to complete the work.

**846-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete.....	Section 1000
Curing agents.....	Section 1026
Joint fillers.....	Article 1028-1
Joint sealers.....	Article 1028-2, 1028-4

**846-3 CONSTRUCTION METHODS.**

**(A) General:**

Construct concrete in accordance with Section 825, except as provided herein.

Use Class B concrete.

Give surface a light broom finish with brush marks parallel to the curb line or gutter line.

Prepare foundation and compact base or subgrade to the degree required by the applicable section of the specifications before placing forms.

Construct concrete flumes as shown on plans.

Construct six inch (150 mm) aggregate base under flume, curb and apron section. A four inch (100 mm) Asphalt Concrete base Course, type HB or four inches (100 mm) of Class B or higher strength concrete may be substituted for the aggregate base course.

Construct concrete base independently of the flume, curb and apron.

**(B) Forms:**

Use forms which have no more than one eighth inch (3 mm) in 10 feet (3 m) deflection from true line horizontally and vertically to adequately support the concrete and construction equipment.

Obtain approval before placing concrete.

**(C) Joints:**

Locate joints as shown on the plans except as provided herein.

Space joints no closer than 5 feet (1.5 m).

Locate joints to line up with the joints in concrete pavement when placed adjacent to concrete pavement.

Form grooved contraction joints as required by Subarticle 825-10(B).

Construct grooved butt joint between the work and adjacent pavement except where expansion joints are required by the plans. Form butt joints as required by Subarticle 825-10(B) for grooved contraction joints and seal.

Seal all joints except for joints in curb sections not having an integral gutter.

Fill joints in gutter with joint sealer to the top surface of the gutter.

Seal joints before backfilling or performing adjacent operations.

**(D) Surface Tolerances:**

Finish surface within one quarter inch (6 mm) when checked longitudinally with a 10 foot (3 m) straightedge.

**(E) Backfilling:**

Do not place backfill or pavement adjacent to the curb, curb and gutter, gutter, shoulder berm gutter, expressway gutter, concrete valley gutter or flumes until at least three curing days, as defined in Article 825-9, have elapsed.

Complete backfill within four calendar days after the completion of the three day curing period unless otherwise approved.

Compact backfill to an approved density.

**(F) Opening to Traffic:**

Vehicles may be permitted on the completed work after the following curing days, as defined in Article 825-9, have elapsed:

- Regular strength concrete -- seven curing days.

- High early strength concrete -- three curing days.

**846-4 METHOD OF MEASUREMENT.**

Concrete curb, curb and gutter, concrete gutter, shoulder berm gutter, concrete expressway gutter, and concrete valley gutter will be measured by the linear foot (linear meter), as accepted in place, along the surface of the top of the curb or at the flow line where there is no curb.

Concrete flumes will be measured by the actual number of each which have been completed and accepted.

**846-5 BASIS OF PAYMENT.**

Payment will be made for quantities as measured in Article 846-4, for the pay items listed below.

Payment will be made under:

__" (mm) X __" (mm) Concrete Curb .....	Linear Foot (Linear Meter)
__' (m) __" (mm) Concrete Curb and Gutter .....	Linear Foot (Linear Meter)
__' (m) Concrete Gutter.....	Linear Foot (Linear Meter)
Shoulder Berm Gutter .....	Linear Foot (Linear Meter)
Concrete Expressway Gutter.....	Linear Foot (Linear Meter)
Concrete Valley Gutter .....	Linear Foot (Linear Meter)
Concrete Flume .....	Each

**SECTION 848  
CONCRETE SIDEWALKS, DRIVEWAYS  
AND WHEELCHAIR RAMPS**

**848-1 DESCRIPTION.**

Construct portland cement concrete sidewalks, driveways, and wheelchair ramps in accordance with the requirements shown on the plans and the provisions of these specifications. The work includes but is not limited to excavating and backfilling; sawing the existing sidewalk or driveway; furnishing and placing concrete; and constructing and sealing joints.

**848-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint fillers.....	Article 1028-1
Joint sealers .....	Article 1028-2, Article 1028-4

**848-3 CONSTRUCTION REQUIREMENTS.**

Where it is necessary to remove a portion of existing sidewalks or driveways, saw a neat edge along the pavement to be retained approximately 2 inches (50 mm) deep with a concrete saw before breaking the adjacent pavement away.

Construct concrete in accordance with Section 825 and give a sidewalk finish, except as otherwise provided herein. Use Class B concrete.

Broom the concrete surface in a transverse direction to traffic. Make joint spacing no less than 5 feet (1.5 m). Where existing sidewalks are being widened, line up new transverse joints with existing joints in the adjacent sidewalk. Seal expansion joints where sidewalk and wheelchair ramps are placed adjacent to concrete curb and/ or gutter. Do not seal grooved joints.

Do not place backfill adjacent to the sidewalk, driveway or wheelchair ramp until at least 3 curing days, as defined in Article 825-9, have elapsed. Complete backfill within 4 calendar days after the completion of the 3 day curing period unless otherwise approved. Compact backfill to a degree comparable to the adjacent undisturbed material.

Do not place vehicles on the completed work until 7 curing days, as defined in Article 825-9, have elapsed. When high early strength concrete is used, vehicles will be permitted on the completed work after 3 curing days have elapsed.

**848-4 METHOD OF MEASUREMENT.**

The quantities of sidewalk, driveways, and wheelchair ramps to be paid for will be the actual number of square yards (square meters) of sidewalks, driveways, and wheelchair ramps, measured along the surface of the completed and accepted work.

**848-5 BASIS OF PAYMENT.**

The quantity of sidewalk, measured as provided in Article 848-4, will be paid for at the contract unit price per square yard (square meter) for " \_\_\_\_\_ Inch (mm) Concrete Sidewalk."

The quantity of driveways, measured as provided in Article 848-4, will be paid for at the contract unit price per square yard (square meter) for " \_\_\_\_\_ Inch (mm) Concrete Driveways."

The quantity of wheelchair ramps, measured as provided in Article 848-4, will be paid for at the contract unit price per square yard (square meter) for "Concrete Wheelchair Ramps."

Payment will be made under:

___" (mm) Concrete Sidewalk .....	Square Yard (Square Meter)
___" (mm) Concrete Driveways .....	Square Yard (Square Meter)
Concrete Wheelchair Ramps.....	Square Yard (Square Meter)

**SECTION 850  
CONCRETE PAVED DITCH**

**850-1 DESCRIPTION.**

Construct portland cement concrete paved ditches in accordance with the requirements shown on the plans for the various types of ditches and the provisions of these specifications. Work includes but is not limited to all excavating and backfilling, furnishing and placing concrete, constructing curtain walls, and constructing and sealing joints.

**850-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint fillers.....	Article 1028-1
Joint sealers .....	Article 1028-2, Article 1028-4

**850-3 CONSTRUCTION REQUIREMENT.**

Construct concrete in accordance with Section 825 and give a sidewalk finish, except as otherwise provided herein. Use Class B concrete.

Broom the concrete surface transverse to the longitudinal centerline of the paved ditch. Make joint spacing no less than 5 feet (1.5 m).

Do not place backfill adjacent to the paved ditch until at least 3 curing days, as defined in Article 825-9, have elapsed. Complete backfill within 4 calendar days after the completion of the 3 day curing period unless otherwise approved. Compact backfill to a degree comparable to the adjacent undisturbed material.

**850-4 METHOD OF MEASUREMENT.**

The quantity of paved ditch to be paid for will be the actual number of square yards (square meters) of paved ditches which is completed and accepted. In determining this area, longitudinal measurements will be made along the surface of the pavement at the centerline of the ditch and transverse measurements will be made along the surface of the

pavement at right angles to the centerline. No measurement will be made of curtain walls at the beginning or ends of the paved ditches.

**850-5 BASIS OF PAYMENT.**

The quantity of paved ditch, measured as provided in Article 850-4, will be paid for at the contract unit price per square yard (square meter) for " \_\_\_\_\_Inch (mm) Concrete Paved Ditch."

Payment will be made under:

\_\_\_" (mm) Concrete Paved Ditch ..... Square Yard (Square Meter)

**SECTION 852  
TRAFFIC ISLANDS AND MEDIANS**

**852-1 DESCRIPTION.**

Construct traffic islands and medians of the type required by the plans. Perform the work in accordance with the requirements of the plans, this section of the specifications, and of any other section of the specifications pertaining to the construction of any part of the traffic islands or medians. This work includes but is not limited to excavation and backfilling, furnishing and applying herbicide, establishing a grass cover, constructing base, furnishing and placing concrete, forming holes for sign posts, and constructing and sealing joints.

**852-2 MATERIALS.**

Refer to Division 10:

- Portland cement concrete .....Section 1000
- Curing Agents .....Section 1026
- Joint fillers..... Article 1028-1
- Joint sealers .....Article 1028-2, Article 1028-4
- Herbicide ..... Article 1060-13

**852-3 CONSTRUCTION REQUIREMENTS.**

Construct curb, and curb and gutter, in accordance with the provisions of Section 846.

Uniformly grade and compact the earth or base course under any island or median to the same requirements as the surrounding material.

Treat aggregate and soil type base courses, and subgrade beneath other types of bases or directly beneath any concrete, with a herbicide which is appropriate for use as a soil sterilant. Use the method and rate of application of herbicide as specified in the special provisions. Take all applicable safety precautions that are recommended by the manufacturer.

Construct concrete in accordance with Section 825 and give a sidewalk finish, except as otherwise provided herein. Use Class B concrete. Broom concrete surfaces in medians transverse to the direction of traffic unless otherwise directed. Locate joints in island and median covers so as to line up with the joints in the curb and curb and gutter wherever possible. Locate joints in monolithic concrete islands and medians constructed adjacent to concrete pavement so as to line up with the joints in the concrete pavement wherever possible. Seal all joints.

Form openings in the island or island cover to accommodate sign posts.

**852-4 METHOD OF MEASUREMENT.**

The quantity of concrete island covers to be paid for will be the actual number of square yards (square meters) of concrete island cover which has been placed and accepted. Measurement will be made along the top surface of the completed island cover.

**Section 852**

The quantity of concrete islands or median to be paid for will be the actual number of square yards (square meters) of concrete island or median which has been placed and accepted. Measurement will be made parallel to the bottom surface of the island or median.

**852-5 BASIS OF PAYMENT.**

The quantity of concrete island covers, measured as provided in Article 852-4, will be paid for at the contract unit price per square yard (square meter) for "\_\_\_\_\_ Inch (mm) Concrete Island Covers."

The quantity of monolithic concrete islands, measured as provided in Article 852-4, will be paid for at the contract unit price per square yard (square meter) for "\_\_\_\_\_ Inch (mm) Monolithic Concrete Islands."

The quantity of monolithic concrete median, measured as provided in Article 852-4, will be paid for at the concrete unit price per square yard (square meter) for "\_\_\_\_\_ Inch (mm) Monolithic Concrete Median."

The quantity of corrugated concrete islands, measured as provided in Article 852-4 will be paid for at the contract unit price per square yard (square meter) for "\_\_\_Inch (mm) Corrugated Concrete Island".

Payment for constructing earth fill will be made as provided in Article 225-8 for "Unclassified Excavation" or Article 230-6 for "Borrow Excavation," depending on the source of the material.

Payment for establishing a grass cover in unpaved island areas will be made as provided in Article 1660-9.

Payment for constructing concrete curb, and concrete curb and gutter, will be made as provided in Article 846-5.

Payment will be made under:

___" (mm) Concrete Island Covers.....	Square Yard (Square Meter)
___" (mm) Monolithic Concrete Islands ( ).....	Square Yard (Square Meter)
___" (mm) Monolithic Concrete Median ( ).....	Square Yard (Square Meter)
___" (mm) Corrugated Concrete Island.....	Square Yard (Square Meter)

**SECTION 853  
CONCRETE GLARE SCREEN**

**853-1 DESCRIPTION.**

Construct portland cement concrete glare screen in accordance with the requirements shown on the plans and the provisions of these specifications. Work includes but is not limited to furnishing and placing concrete and reinforcing steel, and constructing and sealing joints.

The concrete glare screen may be cast in place or extruded.

**853-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint filler .....	Article 1028-1
Joint sealer .....	Article 1028-4
Steel bar reinforcement .....	Article 1070-2

**853-3 CONSTRUCTION REQUIREMENTS.**

Construct concrete in accordance with Section 825 and give an ordinary surface finish, except as otherwise provided herein. Use Class AA concrete.

Construct joints in accordance with the details shown on the plans. Seal expansion joints.

**853-4 METHOD OF MEASUREMENT.**

The quantity of concrete glare screen to be paid for will be the actual number of linear feet (linear meter) placed and accepted on the project.

Measurement will be made along the top surface at the centerline of the completed and accepted glare screen with no deduction made for joints.

**853-5 BASIS OF PAYMENT.**

The quantity of concrete glare screen, measured as provided in Article 853-4, will be paid for at the contract unit price per linear foot (linear meter) for "\_\_\_\_\_ Concrete Glare Screen."

Payment will be made under:

\_\_\_\_\_ Concrete Glare Screen..... Linear Foot (Linear Meter)

**SECTION 854  
CONCRETE BARRIER**

**854-1 DESCRIPTION.**

Construct portland cement concrete barrier in accordance with the requirements shown on the plans and the provisions. The work includes but is not limited to excavating; furnishing and placing concrete, reinforcing steel, grout, and hardware; transporting and placing precast units; galvanizing; constructing and sealing joints; and furnishing and installing barrier delineators.

The concrete barrier may be cast in place, slip formed, or precast, unless otherwise specified in the plans or special provisions.

**854-2 MATERIALS.**

Refer of Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint filler .....	Article 1028-1
Joint sealer .....	Article 1028-4
Grout.....	Article 1054-6
Steel bar reinforcement .....	Article 1070-2
Connector pins and eye assemblies.....	Section 1072
Guardrail and Barrier Delineators .....	Article 1088-2

Use clear curing compound.

Galvanize connector pins and eye assemblies in accordance with Section 1076.

**854-3 CONSTRUCTION REQUIREMENTS.**

**(A) Cast in Place or Slip Formed:**

Construct concrete in accordance with Section 825 and give an ordinary surface finish, except as otherwise provided herein. Use Class AA concrete.

Construct joints in accordance with the details shown on the plans. Seal expansion joints.

**(B) Precast:**

Construct concrete in accordance with Section 825 and give an ordinary surface finish, except as otherwise provided herein. Use Class AA concrete.

Do not handle or remove the forms from barrier until the strength of the concrete reaches at least 2000 psi (13.8 MPa) as evidenced by nondestructive tests made in place by a rebound hammer in accordance with ASTM C805.

Construct the base beneath the precast units so as to be equivalent to the adjacent pavement structure.

Lift and place precast units using a two-point pick up, or other approved method, which will not overstress or damage the concrete. Do not use connectors for lifting purposes. Do not use lifting devices or methods that will mar the surface of the concrete. Do not use any precast unit which has been cracked, damaged, chipped, scarred, or otherwise disfigured.

**(C) Barrier Delineators:**

Use any of the several alternate delineator types for barrier shown in the plans, but only one delineator type for barrier at any one time throughout the project.

The delineators consist of a reflector and base or casing. Attach the delineator to the barrier as shown in the plans. Only one attachment position will be permitted throughout the project length.

Position delineators perpendicular to the centerline of the road. Use yellow delineators in the median and on the left side of one-way ramps, loops, or other one-way facilities. Use crystal delineators on the right side of divided highways, ramps, loops and all other one-way or two-way facilities. In all cases, the color of the delineator must supplement the color of the adjacent edgelines.

**854-4 METHOD OF MEASUREMENT.**

The quantity of concrete barrier to be paid for will be the number of linear feet (linear meters) of barrier which has been completed and accepted. Measurement will be made along the top surface at the centerline of the barrier completed and in place with no deduction made for joints.

The quantity of concrete barrier transition sections to be paid for will be the actual number of transition sections which have been completed and accepted.

There will be no measurement made of barrier delineators as they are considered incidental to the other pay items in this specification.

**854-5 BASIS OF PAYMENT.**

The quantity of concrete barrier, measured as provided in Article 854-4, will be paid for at the contract unit price per linear foot (linear meter) for "Concrete Barrier" and "Variable Height Concrete Barrier, Type \_\_\_\_\_".

The quantity of concrete barrier transition sections, measured as provided in Article 854-4, will be paid for at the contract unit price each for "Concrete Barrier Transition Section".

No direct payment will be made for the work of constructing any footing beneath the concrete barrier or concrete barrier transition sections as payment at the various contract unit prices for concrete barrier or concrete barrier transition sections will be full compensation for all such work.

There will be no direct payment made for barrier delineators as they are considered incidental to the other pay items in this specification.

The above prices and payments will be full compensation for all work covered by this section.

Payment will be made under:

Concrete Barrier, Type _____	Linear Foot (Linear Meter)
Variable Height Concrete Barrier, Type _____	Linear Foot (Linear Meter)
Concrete Barrier Transition Section.....	Each

**SECTION 855  
PRECAST CONCRETE NOISE BARRIER**

**855-1 DESCRIPTION**

The work covered by this provision includes but is not limited to excavation; furnishing and placing concrete, reinforcing steel, galvanized hardware, joint seals, and any other materials; and hauling and placing the precast units into position at the locations shown in the plans in accordance with the requirements of the plans and these special provisions.

**855-2 MATERIALS**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Preformed neoprene joint seal.....	Article 1028-3
Wire mesh reinforcement.....	Article 1070-3

Use size No. 78M coarse aggregate for concrete.

Galvanize all hardware after fabrication in accordance with ASTM A153.

**855-3 CONSTRUCTION METHODS**

Construct concrete in accordance with Section 825 of the Standard Specifications except as otherwise provided herein. Use Class AA concrete.

Use metal forms and non-staining form oil. Give formed surfaces an ordinary surface finish.

Produce finished precast units that are neat and uniform in appearance. Produce a concrete surface that is dense and free of holes, voids, honeycombs, or other irregularities. Precast units having a mottled, uneven, or discolored appearance will be rejected.

Lift and place precast units using a two-point pick up, or other acceptable method, which will not overstress or damage the concrete. Do not use lifting devices or methods that will mar the surface of the concrete. Do not use any precast unit which has been cracked, damaged, chipped, scarred, or otherwise disfigured.

Construct the precast concrete noise barrier in accordance with the details shown in the plans and to the approved line and grade.

**855-4 METHOD OF MEASUREMENT**

The quantity of precast concrete noise barrier to be paid for will be the number of linear feet (linear meters) of each height of noise barrier which has been completed and accepted. Measurement will be made horizontally along the top edge of the noise barrier.

**855-5 BASIS OF PAYMENT**

The quantity of precast concrete noise barrier, measured as provided for above, will be paid for at the contract unit price per linear foot (linear meter) for the various heights of "Precast Concrete Noise Barrier".

Payment will be made under:

Precast Concrete Noise Barrier, ___' (m) ___" (mm) High .....	Linear Foot (Linear Meter)
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**SECTION 857**  
**PRECAST REINFORCED CONCRETE BARRIER -**  
**SINGLE FACED**

**857-1 DESCRIPTION.**

Construct precast reinforced portland cement concrete barrier in accordance with the requirements shown on the plans and the provisions of these specifications. Work includes but not limited to furnishing and placing concrete and reinforcing steel, transporting, and placing precast units, grout, joint filler, hardware, galvanizing, constructing joints, and furnishing and installing barrier delineators.

**857-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint filler .....	Article 1028-1
Grout.....	Article 1054-6
Steel bar reinforcement .....	Article 1070-2
Eye assemblies .....	Section 1072
Guardrail and Barrier Delineators .....	Article 1088-2

Use clear curing compound.

Galvanize eye assemblies in accordance with Section 1076.

**857-3 CONSTRUCTION METHODS.**

Construct concrete in accordance with Section 825 and give an ordinary surface finish, except as otherwise provided herein. Use Class AA concrete.

Lift and place precast units using a two-point pick up or other approved method, which will not overstress or damage the concrete. Do not use lifting devices or methods that will mar the surface of the concrete. Do not set any precast unit which is cracked, damaged, chipped, scarred, or otherwise disfigured.

Do not start installation of the precast concrete barrier until all components are prepared for a complete continuous installation, including the guardrail and guardrail anchors approaching the barrier. Once work has begun on a barrier installation, the work of installing the barrier, guardrail and guardrail anchors must be prosecuted to its completion unless weather or other conditions beyond the control of the Contractor interfere with the work.

Use any of the several alternate delineator types for barrier shown in the plans, but only one delineator type for barrier at any one time throughout the project.

The delineators consist of a reflector and base or casing. Attach the delineator to the barrier as shown in the plans. Only one attachment position will be permitted throughout the project length.

Position delineators perpendicular to the centerline of the road. Use yellow delineators in the median and on the left side of one-way ramps, loops, or other one-way facilities. Use crystal delineators on the right side of divided highways, ramps, loops and all other one-way or two-way facilities. In all cases, the color of the delineator must supplement the color of the adjacent edgelines.

**857-4 METHOD OF MEASUREMENT.**

There will be no measurement made of barrier delineators as they are considered incidental to the other pay items in this specification.

**Section 857**

The quantity of precast concrete barrier to be paid for will be the number of linear feet (linear meters) of barrier which has been completed, placed on the road, and accepted. Measurement will be made along the top surface at the centerline of the barrier with no deduction made for joints.

The quantity of concrete barrier transition sections to be paid for will be the actual number if transition sections which have been completed and accepted.

**857-5 BASIS OF PAYMENT**

There will be no direct payment made for barrier delineators as they are considered incidental to the other pay items in this specification.

The quantity of precast reinforced concrete barrier, measured as provided in Article 857-4, will be paid for at the contract unit price per linear foot (linear meter) for "Precast Reinforced Concrete Barrier, Single Faced".

Payment will be made under:

Precast Reinforced Concrete Barrier, Single Faced..... Linear Foot (Linear Meter)

**SECTION 858  
ADJUSTMENT OF CATCH BASINS,  
MANHOLES, DROP INLETS, METER  
BOXES, AND VALVE BOXES**

**858-1 DESCRIPTION.**

Raise or lower existing catch basins, manholes, drop inlets, meter boxes, and valve boxes encountered within the limits of the project to match the adjacent finished work. This work includes but is not limited to excavation and backfilling, removal of a portion of the existing structure, brick masonry, mortar, grout, concrete, reinforcing steel, fittings, furnishing and hauling asphalt plant mix and any other materials, and placing, maintaining, removing, and disposing of traffic ramps.

**858-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Asphalt Plant Mix .....	Section 610
Joint fillers.....	Article 1028-1
Joint sealers .....	Article 1028-2
Brick.....	Article 1040-1
Concrete block .....	Article 1040-2
Mortar.....	Article 1040-8
Steel bar reinforcement .....	Article 1070-2
Steps .....	Article 1074-8
Fabricated steel grates .....	Article 1074-9
Gray iron castings .....	Article 1074-7
Precast Risers .....	Section 1077

**858-3 CONSTRUCTION REQUIREMENTS.**

Perform the adjustment with brick or block masonry, or portland cement concrete on existing walls, in accordance with Subarticle 840-3(C).

Adjust manholes, meter boxes, and valve boxes as provided above or, where approved, by utilizing cast iron or steel fittings. When fittings are used, leave the existing walls in place and securely attach the fittings to the existing walls or install in a manner which will eliminate movement of the fitting.

**Section 858**

Backfill excavated areas in an existing pavement with portland cement concrete meeting the requirements for Class B or of any higher class of concrete. High early strength concrete may be used. Wait at least 72 hours after the placement of the concrete before placing any surfacing or resurfacing material over the concrete. This time period will not be required where the strength of the concrete is at least 2500 psi (17.2 MPa) as evidenced by nondestructive tests made in place by a rebound hammer in accordance with ASTM C805. Thoroughly compact backfill of other excavated areas.

In areas open to traffic, construct a temporary ramp of asphalt plant mix around structures which have been adjusted. Construct the ramp to extend a minimum of 3 feet (1.0 m) from the structure within one calendar day after completing the adjustment. Construct the ramp using any type of asphalt surface course plant mix meeting the requirements of any job mix formula issued by the Division of Highways for a Department project. Compact to an approved density.

Place bituminous plant mix flush with the top of the raised structure within 7 days after raising the structure.

Make the adjustments before the final layer of surfacing material is placed in areas to be surfaced or resurfaced. Salvage and reuse existing frames, grates, manhole covers, rings, and meter and valve boxes in the adjustment.

**858-4 METHOD OF MEASUREMENT.**

The quantity of adjusted catch basins, drop inlets, manholes, meter boxes, and valve boxes to be paid for will be the actual number of these items which have been satisfactorily adjusted. Where any one catch basin, drop inlet, manhole, meter box, or valve box is adjusted more than once because of milling operations, such adjustments will be counted as one adjustment.

Where a catch basin, manhole, drop inlet, meter box, or valve box is raised more than 2 feet (0.6 m), the number of linear feet (linear meters) exceeding 2 feet (0.6 m) that such structure has been raised will be measured for payment. Measurement will be made by subtracting the elevation at the highest point of the original structure from the elevation at the highest point of the adjusted structure, and then subtracting 2 feet (0.6 m) from the results of the first subtraction.

**858-5 BASIS OF PAYMENT.**

The quantity of adjusted catch basins, drop inlets, manholes, meter boxes, or valve boxes, measured as provided in Article 858-4, will be paid for at the contract unit price each for "Adjustment of Catch Basins," "Adjustment of Drop Inlets," "Adjustment of Manholes, or "Adjustment of Meter Boxes or Valve Boxes."

Where a catch basin, manhole, drop inlet, meter box, or valve box is raised more than 2 feet (0.6 m), that portion raised in excess of 2 feet (0.6 m), measured as provided in Article 858-4, will be paid for at the contract unit price per linear foot (linear meter) for "Masonry Drainage Structures", as provided in Article 840-5.

Payment will be made under:

Adjustment of Catch Basins.....	Each
Adjustment of Drop Inlets.....	Each
Adjustment of Manholes .....	Each
Adjustment of Meter Boxes or Valve Boxes .....	Each

**SECTION 859  
CONVERTING EXISTING CATCH BASINS  
AND DROP INLETS**

**859-1 DESCRIPTION.**

Convert existing catch basins and drop inlets to either drop inlets or junction boxes, including all necessary construction and reconstruction in accordance with the requirements shown on the plans and the provisions. Work includes but is not limited to excavating hauling; removal of a portion of the existing structures; disposal of materials; furnishing, transporting, and placing backfill material, subsurface drainage, concrete, brick masonry, mortar, grout, reinforcing steel, hardware, casting, and miscellaneous metal; fabrication; welding; and galvanizing.

**859-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint fillers.....	Article 1028-1
Joint sealers .....	Article 1028-2, Article 1028-4
Brick.....	Article 1040-1
Concrete block .....	Article 1040-2
Mortar.....	Article 1040-8
Reinforcing steel .....	Section 1070
Structural steel.....	Section 1072
Steps .....	Article 1074-8
Fabricated steel grates .....	Article 1074-9
Gray iron castings .....	Article 1074-7
Stone, No. 78M .....	Section 1005

**859-3 CONSTRUCTION METHODS.**

Perform work in accordance with the applicable provisions of Article 840-3 and the details shown in the plans. Raise or lower the existing catch basins and drop inlets as required by the plans and provisions.

**859-4 METHOD OF MEASUREMENT.**

The quantity of converting existing catch basins and drop inlets to be paid for will be the actual number of these drainage structures which have been acceptably converted to the type of drainage structure required by the plans.

Where a catch basin or drop inlet is raised more than 2 feet (0.6 m), the number of linear feet (linear meters) exceeding 2 feet (0.6 m) that the catch basin or drop inlet has been raised will be measured for payment. Measurement will be made by subtracting the elevation at the highest point of the original catch basin or drop inlet from the elevation at the highest point of the converted junction box or drop inlet, and then subtracting 2 feet (0.6 m) from the results of the first subtraction.

**859-5 BASIS OF PAYMENT.**

The quantity of converting existing catch basins and drop inlets, measured as provided in Article 859-4, will be paid for at the contract unit price each for "Convert Existing Catch Basin to Junction Box," "Convert Existing Catch Basin to Drop Inlet," and "Convert Existing Drop Inlet to Junction Box".

Where a catch basin or drop inlet is raised more than 2 feet (0.6 m), that portion raised in excess of 2 feet (0.6 m), measured as provided in Article 859-4, will be paid for at

the contract unit price per linear foot (linear meter) for "Masonry Drainage Structures," as provided in Article 840-5.

If grates and frames are necessary in converting either catch basins or drop inlets, separate payment will be made for the grates and frames.

Payment will be made under:

Convert Existing Catch Basin to Junction Box.....	Each
Convert Existing Catch Basin to Drop Inlet .....	Each
Convert Existing Drop Inlet to Junction Box.....	Each

**SECTION 860  
TEMPORARY CONCRETE COVER FOR CATCH BASINS**

**860-1 DESCRIPTION.**

Provide all materials, labor, equipment, tools, and incidentals necessary to satisfactorily complete the work of constructing a concrete cover and place same on the catch basins in accordance with the applicable provisions of Section 840 of the Standard Specifications.

**860-2 CONSTRUCTION METHODS.**

Construct the cover as detailed in the plans and place as directed.

Where catch basins are constructed in future curb and gutter locations, leave them approximately one foot (0.3 m) low.

**860-3 METHOD OF MEASUREMENT.**

The quantity of concrete covers to be paid for will be the actual number of these items which have been incorporated into the completed and accepted work.

**860-4 BASIS OF PAYMENT.**

The quantity of concrete covers, measured as provided above, will be paid for at the contract unit price each for "Temporary Concrete Cover for Catch Basins".

Payment will be made under:

Temporary Concrete Cover for Catch Basins .....	Each
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**SECTION 862  
GUARDRAIL**

**862-1 DESCRIPTION.**

Construct either permanent or temporary steel beam guardrail, in accordance with the requirements of the plans and these specifications and at the locations designated on the plans or as directed. Work includes but is not limited to furnishing and erecting posts, offset blocks, rail, terminal sections, miscellaneous hardware, concrete, and all other materials; setting posts in concrete; field curving and shop curving of the rail; removing temporary guardrail; excavation; furnishing and installing additional guardrail posts and additional blocks; backfilling; fabrication; welding; galvanizing; furnishing and installing guardrail delineators and end delineation.

**862-2 MATERIALS.**

Refer to Division 10:

Rail elements .....	Article 1046-2
Posts and offset blocks .....	Article 1046-3
Hardware .....	Article 1046-4
Anchors .....	Article 1046-5
Welded wire fabric .....	Article 1070-3
Organic zinc repair paint .....	Article 1080-9

Guardrail and Barrier Delineators ..... Article 1088-2  
Guardrail End Delineation ..... Article 1088-3

Supply material in accordance with the Departments Brand Certification Program for Guardrail.

Use Class B concrete meeting the requirements of Section 1000, unless otherwise indicated on the plans.

Temporary guardrail must be of the type called for on the plans and must be fabricated from plates which are not less than 12 gauge in thickness. Used materials are acceptable for temporary guardrail construction provided their condition is approved.

**862-3 CONSTRUCTION METHODS.**

Erect the rail elements to produce a smooth continuous rail paralleling the line and grade of the highway surface or as shown on the plans. Lap the rail elements in the direction of traffic. Re-lap the rail elements if required by traffic phasing. Field drill holes for special details. Field punching holes is allowed. Attach terminal sections, when required, to the ends of each installation and lap on the face of the rail.

Install shop curve guardrail when the curvature is 150 feet (45 m) or less.

Posts may be power driven, or set by hand. Protect the top of steel posts by a suitable driving cap if power driven. If set by hand, dig post holes to the depth and at the locations shown on the plans. Thoroughly ram the bottom of the post holes so that the posts will have a stable foundation. Set the posts plumb and accurately space and line. Backfill the post holes in 6 inch (150 mm) layers with suitable material and thoroughly compact by tamping or puddling.

Where rock interferes with the proper installation of the post, set posts in concrete. Set the concrete and posts into the ground a minimum of 2 feet (0.6 m) deep and a minimum of 15 inches (380 mm) in diameter, with the top of the concrete flush with the surrounding area or slightly lower. Where solid rock is encountered the diameter may be reduced to 12 inches (300 mm).

Where timber posts are to be driven in fill slopes 1 1/2:1 or steeper and the fill height is 15 feet (4.6 m) or more, auger a 6 inch (150 mm) diameter pilot hole to the full depth of the post before driving.

Where steel posts are required to be installed at box culverts, weld the post to the anchor plate, cut off, and align in accordance with the details shown in the plans or as directed.

Use the same type of guardrail posts and offset blocks throughout the project unless otherwise directed or detailed in the plans.

After galvanized guardrail has been erected, clean all scarred, scratched, or abraded areas of all loose spelter coat and rust. Paint with organic zinc repair paint 3 mils thick.

When guardrail is being constructed near traffic, conduct operations so as to constitute the least hazard to the public. Schedule and conduct operations to construct and complete each individual continuous guardrail installation in the least possible time.

Do not begin work on any section of new guardrail until preparations are made to fully complete the installation of the section as a continuous operation. Once work is initiated on a section, pursue the work to its completion unless inclement weather or other conditions beyond the control of the Contractor interfere with the work. Begin attachment of the rail elements at the approach end of the guardrail and continue in the same direction as the movement of traffic.

When directed, install guardrail posts and blocks at locations that are in addition to those required by the plans.

## Section 862

Install tubular triple corrugated steel beam guardrail on concrete bridges or driven posts or at locations shown in the plans in accordance with the details shown in the plans and as directed. Where the tubular triple corrugated steel beam guardrail is to be mounted on concrete, use steel posts, weld the post to the anchor plate, cut off, and align in accordance with the details shown in the plans or as directed.

### **862-4 GUARDRAIL DELINEATORS.**

Use any of the several alternate delineator types for guardrail shown in the plans, but only one delineator type for guardrail at any one time throughout the project.

The delineators consist of a reflector and base or casing. Attach the delineator to the guardrail as shown in the plans. Only one attachment position will be permitted throughout the project length.

Position delineators perpendicular to the centerline of the road. Use yellow delineators in the median and on the left side of one-way ramps, loops, or other one-way facilities. Use crystal delineators on the right side of divided highways, ramps, loops and all other one-way or two-way facilities. In all cases, the color of the delineator must supplement the color of the adjacent edgelines.

### **862-5 TEMPORARY GUARDRAIL.**

Erect temporary guardrail in accordance with the requirements of the plans and these specifications.

Use either steel posts or timber posts.

Temporary guardrail may be reused if it is still in satisfactory condition.

After temporary guardrail is no longer needed, it becomes the property of the Contractor. Remove the temporary guardrail from the project.

### **862-6 METHOD OF MEASUREMENT.**

#### **(A) Guardrail:**

The quantity of permanent or temporary steel beam guardrail or 20" (500 mm) tubular triple corrugated steel beam guardrail to be paid for will be the actual number of linear feet (linear meters) of guardrail which has been satisfactorily completed and accepted exclusive of that length of guardrail which is within the pay limits of guardrail anchors. Measurement will be made from center to center of the outermost post in the length of guardrail being measured.

#### **(B) Terminal Sections:**

The quantity of permanent or temporary steel beam guardrail terminal sections to be paid for will be the actual number of terminal sections which have been completed and accepted, exclusive of terminal sections which are within the pay limits of guardrail anchors.

#### **(C) Anchor Units:**

The quantity of guardrail anchor units to be paid for will be the actual number of units which have been completed and accepted. No separate measurement will be made of any rail, terminal sections, posts, offset blocks, concrete, hardware, or any other components of the completed unit which are within the pay limits shown on the plans for the unit as all such components will be considered to be part of the unit.

#### **(D) Transition Section:**

The quantity of guardrail transition sections to be paid for will be the actual number of transition sections which have been completed and accepted.

**(E) Additional Guardrail Posts:**

The quantity of additional guardrail posts to be paid for will be the actual number of additional posts required but not shown in the plans.

**(F) Guardrail Delineators:**

There will be no measurement made of guardrail delineators as they are considered incidental to the other pay items in this specification.

**(G) Guardrail End Delineation:**

There will be no measurement made of guardrail end delineation as it is considered incidental to the other pay items in this specification.

**862-6 BASIS OF PAYMENT.****(A) Guardrail:**

The quantities of permanent steel beam guardrail, measured as provided in Subarticle 862-5(A), will be paid for at the contract unit prices per linear foot (linear meter) for "Steel Beam Guardrail," "Steel Beam Guardrail, Shop Curved," "Steel Beam Guardrail, Double Faced," and "Triple Corrugated Steel Beam Guardrail."

The quantity of temporary steel beam guardrail, measured as provided in Subarticle 862-5(A), will be paid for at the contract unit price per linear foot (linear meter) for "Temporary Steel Beam Guardrail."

The quantity of 20" (500 mm) tubular triple corrugated steel beam guardrail, measured as provided in Subarticle 862-5(A), will be paid for at the contract unit price per linear foot (linear meter) for "20" (500 mm) Tubular Triple Corrugated Steel Beam Guardrail"

**(B) Terminal Sections:**

The quantity of terminal sections used in constructing permanent guardrail, measured as provided in Subarticle 862-5(B), will be paid for at the contract unit price each for "Steel Beam, Guardrail Terminal Sections," and "Triple Corrugated Steel Guardrail Terminal Sections."

The quantity of terminal sections used in constructing temporary guardrail, measured as provided in Subarticle 862-5(B), will be paid for at the contract unit price each for "Temporary Steel Beam Guardrail Terminal Sections."

**(C) Anchor Units:**

The quantity of guardrail anchor units, measured as provided in Subarticle 862-5(C), will be paid for at the contract unit price each for "Guardrail Anchor Units, Type \_\_\_\_\_."

**(D) Transition Sections:**

The quantity of transition sections, measured as provided in Subarticle 862-5(D), will be paid for at the contract unit price each for "W-TR Steel Beam Guardrail Transition Sections."

**(E) Additional Guardrail Posts:**

The quantity of additional guardrail posts, measured as provided in Subarticle 862-5(E), will be paid for at the contract unit price each for "Additional Guardrail Posts."

**(F) Guardrail Delineators:**

There will be no payment made for guardrail delineators as they are considered incidental to the other pay items in this specification.

**(G) Guardrail End Delineation:**

There will be no payment made for guardrail end delineation as it is considered incidental to the other pay items in this specification.

**(H) Pay Items:**

Payment will be made under:

Steel Beam Guardrail .....	Linear Foot (Linear Meter)
Steel Beam Guardrail, Shop Curved .....	Linear Foot (Linear Meter)
Steel Beam Guardrail, Double Faced.....	Linear Foot (Linear Meter)
Triple Corrugated Steel Beam Guardrail .....	Linear Foot (Linear Meter)
20" (500 mm) Tubular Triple Corrugated Steel Beam Guardrail.....	Linear Foot (Linear Meter)
Steel Beam Guardrail Terminal Section .....	Each
Triple Corrugated Steel Beam Guardrail Terminal Sections .....	Each
Temporary Steel Beam, Guardrail .....	Linear Foot (Linear Meter)
Temporary Steel Beam Guardrail, Shop Curved .....	Linear Foot (Linear Meter)
Temporary Steel Beam Guardrail, Double Faced.....	Linear Foot (Linear Meter)
Temporary Guardrail Anchor Units, Type____.....	Each
Temporary Steel Beam Guardrail Terminal Sections .....	Each
Guardrail Anchor Units, Type .....	Each
W-TR Steel Beam Guardrail Transitions Sections .....	Each
Additional Guardrail Posts.....	Each

**SECTION 863  
REMOVE EXISTING GUARDRAIL**

**863-1 GENERAL.**

Dismantle, remove and dispose of existing guardrail and anchors of any type at locations shown on the plans or established by the Engineer and in accordance with this specification.

**863-2 CONSTRUCTION METHODS.**

Remove guardrail and posts beginning at the trailing end and continuing towards the approach end. Remove the posts immediately after the rail is removed. Complete post removal so that no posts without rail attached are present at the end of any day's operations. Exercise care not to damage adjoining structures or other appurtenances. Repair all damage at no cost to the Department. All guardrail and components removed are the property of the Contractor.

**863-3 METHOD OF MEASUREMENT.**

The quantity of guardrail measured will be the actual number of linear feet (linear meters) of guardrail which has been satisfactorily removed. Measurement will be made to the nearest 1.0 foot (meter) from center to center of the outermost post or end shoe center bolt in the length of the guardrail being removed. Measurement will be made prior to removing the guardrail.

**863-4 BASIS OF PAYMENT**

The quantity measured as provided in Article 863-3, will be paid for at the contract unit price per linear foot (linear meter) for "Remove Existing Guardrail".

Payment will be made under:

Remove Existing Guardrail.....	Linear Foot (Linear Meter)
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**SECTION 864  
REMOVE AND RESET EXISTING GUARDRAIL**

**864-1 GENERAL:**

Remove and reset existing guardrail and anchors of any type at locations shown in the plans and as directed in accordance with this specification. This work will include but is not limited to removing and resetting the guardrail, and for furnishing all equipment, labor, and incidentals necessary to complete the work detailed in this specification.

**864-2 CONSTRUCTION METHODS:**

Exercise care not to damage adjoining structures or other appurtenances. Repair all damage at no cost to the Department. Reset existing guardrail in accordance with Article 862-3. Reset guardrail in a condition that is equal to or better than the condition which exists before the guardrail is removed. Replace any of the guardrail components which have been unnecessarily damaged.

**864-3 METHOD OF MEASUREMENT:**

The quantity of remove and reset existing guardrail to be paid for will be the actual number of linear feet (linear meters) of guardrail and anchors that has been removed, reset, and accepted. Measurement will be made after the guardrail has been reset.

**864-4 BASIS OF PAYMENT:**

The quantity of remove and reset existing guardrail, measured as measured in Article 862-3, will be paid for at the contract unit price per linear foot (linear meter) for "Remove and Reset Existing Guardrail".

Payment will be made under:

Remove and Reset Existing Guardrail ..... Linear Foot (Linear Meter)

**SECTION 865  
CABLE GUIDERAIL**

**865-1 DESCRIPTION.**

Construct cable guiderail in accordance with the details in the plans and these specifications and at the locations designated in the plans or as directed. Work includes but is not limited to furnishing and erecting posts, cable, anchor units, miscellaneous hardware, concrete, delineators, and all incidentals necessary to complete the work.

**865-2 MATERIALS.**

Refer to Division 10:

Rail elements .....	Article 1046-2
Posts .....	Article 1046-3
Hardware .....	Article 1046-4
Organic zinc repair paint .....	Article 1080-9

Manufacture cable in accordance with AASHTO M-30, Type I, Class A. The cable must be pre-inspected at the producer's facility prior to shipment.

Use Class A concrete meeting the requirement of Section 1000 of the Standard Specifications or precast concrete anchors conforming to the requirements of Section 1077 of the Standard Specifications.

**865-3 CONSTRUCTION METHODS.**

Erect the rail elements to produce a smooth continuous rail paralleling the line and grade of the highway surface or as shown on the plans.

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Posts may be power driven, or set by hand. Protect the top of steel posts by a suitable driving cap if power driven. If set by hand, dig post holes to the depth and at the locations shown on the plans. Thoroughly ram the bottom of the post holes so that the posts will have a stable foundation. Set the posts plumb and accurately space and line. Backfill the post holes in 6 inch (150 mm) layers with suitable material and thoroughly compact by tamping or puddling.

Where rock interferes with the proper installation of the post, set posts in concrete. Set the concrete and posts into the ground a minimum of 2 feet (0.6 m) deep and a minimum of 15 inches (380 mm) in diameter, with the top of the concrete flush with the surrounding area or slightly lower. Where solid rock is encountered the diameter may be reduced to 12 inches (300 mm).

Where timber posts are to be driven in fill slopes 1 1/2:1 or steeper and the fill height is 15 feet (4.6 m) or more, auger a 6 inch (150 mm) diameter pilot hole to the full depth of the post before driving.

Where steel posts are required to be installed at box culverts, weld the post to the anchor plate, cut off, and align in accordance with the details shown in the plans or as directed.

After galvanized guiderail has been erected, clean all scarred, scratched, or abraded areas of all loose spelter coat and rust. Paint with organic zinc repair paint 3 mils thick.

When guiderail is being constructed near traffic, conduct operations so as to constitute the least hazard to the public. Schedule and conduct operations to construct and complete each individual continuous guiderail installation in the least possible time.

Do not begin work on any section of new guiderail until preparations are made to fully complete the installation of the section as a continuous operation. Once work is initiated on a section, pursue the work to its completion unless inclement weather or other conditions beyond the control of the Contractor interfere with the work. Begin attachment of the cable elements at the approach end of the guiderail and continue in the same direction as the movement of traffic.

### **865-4 METHOD OF MEASUREMENT.**

The quantity of cable guiderail to be paid for will be the actual number of linear feet (linear meters) of guiderail which has been satisfactorily completed and accepted exclusive of that length of guiderail which is within the pay limits of guiderail anchors. Measurement will be made from center to center of the outermost post in the length of guiderail being measured.

The quantity of double faced cable guiderail to be paid for will be the actual number of linear feet (linear meters) of double faced guiderail which has been satisfactorily completed and accepted exclusive of that length of guiderail which is within the pay limits of guiderail anchors. Measurement will be made from center to center of the outermost post in the length of guiderail being measured.

The quantity of anchor units to be paid for will be the actual number of units which have been completed and accepted.

No separate measurement will be made of any rail, terminal sections, posts, concrete, hardware, or any other components of the completed unit which are within the pay limits shown on the plans for the unit as all such components will be considered to be part of the unit.

### **865-5 BASIS OF PAYMENT.**

The quantity of Cable Guiderail, measured as provided for above will be paid for at the contract unit price per linear foot (linear meter) for "Cable Guiderail".

The quantity of Double Faced Cable Guiderail, measured as provided for above will be paid for at the contract unit price per linear foot (linear meter) for "Double Faced Cable Guiderail".

The quantity of Cable Guiderail Anchor Units, measured as provided for above will be paid for at the contract unit price each for "Cable Guiderail Anchor Unit".

Payment will be made under:

Cable Guiderail .....	Linear Foot (Linear Meter)
Double Faced Cable Guiderail.....	Linear Foot (Linear Meter)
Cable Guiderail Anchor Unit .....	Each

**SECTION 866  
FENCE**

**866-1 DESCRIPTION.**

Furnish and erect woven wire, chain link, and barbed wire fence with gates in conformity with the details shown on the plans and at locations as shown on the plans. Work includes but is not limited to clearing and grading; and furnishing and installing fence fabric, barbed wire, staples, tie wires, stretcher bars, top rails, tension wire, posts and post braces, concrete, gates, fittings, and any other materials, furnishing and installing sleeves in retaining walls and filling sleeves upon setting posts.

**866-2 MATERIALS.**

Refer to Division 10:

Timber posts and braces.....	Article 1050-2
Metal posts and rails.....	Article 1050-3
Barbed wire .....	Article 1050-4
Woven wire .....	Article 1050-5
Chain link fabric.....	Article 1050-6
Fittings and accessories.....	Article 1050-7

Article 1050-1 applies to the fence materials.

Use Class B concrete for anchors. In lieu of Class B concrete, use pre-mixed commercially bagged dry concrete mix provided the concrete meets the minimum strength requirements for Class B concrete when mixed with the quantity of water shown on the instructions printed on the bag.

**866-3 CONSTRUCTION METHODS.**

**(A) Clearing and Grubbing:**

Only clear the ground that is absolutely necessary to erect a clear fence line. Clearing includes satisfactory removal and disposal of all trees, brush, stumps, or other objectionable material. Erect the fence to conform to the general contour of the ground. Place the bottom of the fabric or wire no more than 6 inches (150 mm) above the natural ground, except where the Engineer directs that ditches and depressions are to be spanned by using extra length posts in conjunction with additional barbed wire installed between the bottom of the fence wire or fabric and the ground surface. Grade along the fence line to meet the above requirement such that no obstructions to proper drainage are created.

**(B) Setting Posts and Braces**

Set and maintain all posts in a vertical position. Line posts may be hand set or set with a post driver. Thoroughly tamp all backfilled material if hand set. If power driven, wood posts may be sharpened to a dull point. Remove and replace posts which are damaged by power driving.

Set posts in concrete anchors to maintain the position and alignment of the post when required on the plans or where dictated by soil conditions. Forms are not required for the concrete. Trowel the top of the concrete to a smooth finish and slope to drain away from the post. The concrete anchors require at least a 3 day curing period before any load is placed on the post.

In lieu of setting roll formed steel line posts in concrete, such posts may be driven provided they are not part of a line brace assembly. Drive the posts a minimum of 3 feet (1.0 m) into the ground. Provide adequate protection to the post tops to prevent damage from the driving operations. Repair damage to the zinc coating of otherwise acceptable driven posts by brushing with a steel wire brush to remove flaked and cracked zinc coating and by painting with enough coats to equal 3 mils thick of organic zinc repair paint meeting the requirements of Article 1080-9. Set posts in concrete anchors where soil conditions are such that the posts cannot be driven without deformation, or where soils are encountered that do not provide adequate in-ground stability.

Where rock or concrete pavement or slabs are encountered within the required depth where fence posts are to be erected, drill a hole in the rock or concrete of a diameter slightly larger than the largest dimension of the post in the rock or concrete and grout in the post. The depth of post embedment shown on the plans will not be required and the post may be shortened as necessary, provided the post is embedded within the rock or concrete pavement or slab to a minimum depth of 12 inches (300 mm).

Do not fabricate the posts by welding short sections of posts together to provide a longer posts.

Place line braces at the end of each roll or piece of woven wire.

Do not use pieces of woven wire fabric less than 100 feet (30 m) in length, unless otherwise directed. When the use of short pieces of woven wire is permitted, furnish and install the additional required brace posts and braces at no cost to the Department. Approved splicing sleeves may be used in lieu of providing such brace posts and braces.

Set approved sleeves in retaining wall in accordance with the details in the structure plans. After the posts have been set, fill sleeves with molten lead, sulphur, or other approved material.

### **(C) Installing Fabric and Wire:**

#### **(1) Chain Link Fence:**

Attach chain link fabric to tubular end, gate, corner, or brace posts with stretcher bars and stretcher bar bands as shown on the plan. Fasten the fabric to line posts and to top and brace rails with wire fasteners spaced and wound as shown on the plans. Fasten the fabric to the tension wire by hog rings spaced at 24 inch (600 mm) intervals, or weave the tension wire through the fabric. Make hog ring ties at fabric joints with the hog ring passing completely around the fabric joint.

Place chain link fabric by securing or fastening on end and applying sufficient tension to remove all slack before making permanent attachments elsewhere. Apply the tension for stretching by mechanical fence stretchers designed for this purpose.

Connect rolls and pieces of chain link fabric to each other by field weaving provided that such weaving is identical in appearance and strength as the machine weaving done at the factory.

Attach barbed wire used in conjunction with chain link fabric, to the post by means of eye-bolt or by a tie wire passing through holes drilled in the metal post so as to prevent any vertical movement of the barbed wire. Wrap the ends and beginnings of strands around the post twice and securely fasten by winding the end around the wire near the post. Splice barbed wire only at posts.

Install additional barbed wire when shown on the plans or where directed.

**(2) Woven Wire Fence:**

Stretch woven wire fabric taut and securely attach to each post with a staple in each line of wire. Use as many additional staples as required to firmly secure the wire at the location and elevation required by the plans. When woven wire is attached to metal posts, use at least 5 clips at each post to fasten the individual strands of wire to the post except where wrapping of the strand around the post is required. Stretch with an approved stretcher that will produce equal tension in each line of wire.

At each end or gate post, at the center post in each line brace and at corner posts except as otherwise shown on the plans, cut out all vertical strands of wire and wrap each horizontal strand of wire around the post and securely fasten by winding the end around the strand of wire near the post.

Do not splice fabric between the posts of a brace post assembly. Do not splice between other posts, unless the splicing sleeves are approved.

Pull woven wire taut and securely attach to each post by methods described for woven wire when used in conjunction with woven wire fabric. Do not splice woven wire between posts.

Install additional woven wire as shown on the plans or where directed.

**(3) Barbed Wire Fence:**

Install barbed wire fence in accordance with the plans and as directed.

Pull barbed wire taut and securely attach to each post by methods described for woven wire. Do not splice barbed wire between posts.

**866-4 METHOD OF MEASUREMENT.****(A) Fence:**

The quantity of fence to be paid for will be the actual number of linear feet (linear meter) of fence, measured in place from center of each post or gate post to center of end post or gate post exclusive of gate sections, which has been completed and accepted.

**(B) Barbed Wire Fence with Posts:**

The quantity of barbed wire fence to be paid for will be the actual number of linear feet (linear meter) of fence, measured in place from center of each post or gate post to center of end post or gate post exclusive of gate sections, which has been completed and accepted. All posts used for the barbed wire fence are included in the price of the barbed wire fence and will not be paid for separately.

**(C) Posts:**

The quantity of fence posts to be paid for will be the actual number of each of the several sizes and kinds of posts actually installed on the project, including timber posts erected as barriers at driveways and entrances. Where the Contractor has elected to use pieces of woven wire shorter than 100 feet (30 m) in length, as permitted by Subarticle 866-3(B), on the condition that he furnish and install at no additional cost to the Department line braces at the ends of short pieces, the quantity of timber fence posts shall also include the number of line posts which have been made unnecessary by such line braces shall exclude the posts used in the line braces.

The quantity of metal terminal posts to be paid for will be the total number of all end, corner, and brace posts actually installed on the project.

For timber posts, the actual length in linear feet (linear meters) of variable length and extra length posts shall be measured as placed and converted to an equivalent number of standard length posts of the same size for which a pay item has been established. For extra length metal posts, the actual length of post in place in excess of the standard pay length for each post shall be measured in linear feet (linear meters), and one half of such

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length shall be converted to an equivalent number of standard length posts of the same size for which a pay item has been established. In converting to equivalent numbers of standard length posts, any fractional portion of a post remaining from the division of a total number of linear feet (linear meters) by a standard post length shall be considered as equal to one post.

**(D) Additional Barbed Wire:**

The quantity of additional barbed wire to be paid for will be the number of linear feet (linear meters) of this wire installed in the work, complete and in place. Measurement of additional barbed wire shall be made along each strand after the installation has been completed. No measurement will be made of any wraps, nor will measurement be made of the upper or lower continuous strand of barbed wire that is erected as part of woven wire fence.

**(E) Gates:**

The quantity of gates to be paid for will be the number of gates actually erected on the project. Double gates will be measured as one gate.

**(F) Setting Sleeves in Retaining Wall**

There will be no measurement made for setting approved sleeves in retaining walls or filling the sleeves after fence installation as such work is considered incidental to the other pay items in this specification.

**866-5 BASIS OF PAYMENT.**

**(A) Fence:**

The quantity of fence, measured as provided for in Subarticle 866-4(A), will be paid for at the contract unit prices per linear foot (linear meter) for "Woven Wire Fence, \_\_\_\_\_ Inch (mm) Fabric" and "Chain Link Fence, \_\_\_\_\_ Inch (mm) Fabric."

**(B) Barbed Wire Fence with Posts:**

The quantity of fence, measured as provided for in Subarticle 866-4(A), will be paid for at the contract unit prices per linear foot (linear meter) for "\_\_\_\_ Strand Barbed Wire Fence with Posts."

**(C) Posts:**

The quantities of posts, measured as provided in Subarticle 866-4(B), will be paid for at the contract unit prices each of "\_\_\_\_\_ Inch (mm) Timber Fence Posts, \_\_\_\_\_ Long", "Metal Line Posts for \_\_\_\_\_ Inch (mm) Chain Link Fence, "Metal Terminal Posts for \_\_\_\_\_ Inch (mm) Chain Link Fence," "Metal Gate Posts for \_\_\_\_\_ Inch (mm) Chain Link Fence, Double Gate," and "Metal Gate Posts for \_\_\_\_\_ Inch (mm) Chain Link Fence, Single Gate."

**(D) Additional Barbed Wire:**

The quantity of additional barbed wire, measured as provided in Subarticle 866-4(C), will be paid for at the contract unit price per linear foot (linear meter) for "Additional Barbed Wire."

**(E) Gates:**

The quantity of gates, measured as provided in Subarticle 866-4(D), will be paid for at the contract unit prices each for "Double Gates, \_\_\_\_\_ High, \_\_\_\_\_ Wide, \_\_\_\_\_ Opening", and "Single Gates, \_\_\_\_\_ High, \_\_\_\_\_ Wide, \_\_\_\_\_ Opening."

**(F) Setting Sleeves in Retaining Wall**

There will be no payment made for setting approved sleeves in retaining walls or filling the sleeves after fence installation as such work is considered incidental to the other pay items in this specification.

**(G) Pay Items:**

Payment will be made under:

Woven Wire Fence, ___" (mm) Fabric.....	Linear Foot (Linear Meter)
Chain Link Fence, ___" (mm) Fabric .....	Linear Foot (Linear Meter)
___ Strand Barbed Wire Fence .....	Linear Foot (Linear Meter)
___" (mm) Timber Fence Posts, ___Long .....	Each
Metal Line Posts for ___" (mm) Chain Link Fence.....	Each
Metal Terminal Posts for ___" (mm) Chain Link Fence .....	Each
Metal Gate Posts for ___" (mm) Chain Link Fence, Double Gate .....	Each
Metal Gate Posts for ___" (mm) Chain Link Fence, Single Gate.....	Each
Additional Barbed Wire .....	Linear Foot (Linear Meter)
Double Gates, _____High, _____Wide, _____ Opening .....	Each
Single Gates, _____High, _____Wide, _____ Opening.....	Each

**SECTION 867  
FENCE RESET**

**867-1 DESCRIPTION.**

Remove and reset existing fences of various types to the locations indicated in the plans or where directed. The work includes but is not limited to removing, hauling, and re-erecting the existing fence; and furnishing and installing any fence components unnecessarily damaged by the Contractor's forces.

**867-2 CONSTRUCTION METHODS.**

Reset the fence in a condition that is equal to or better than before the fence is removed. Replace any of the fence components unnecessarily damaged by the contractor's forces.

The Contractor will be responsible for damage caused by livestock escaping or entering the existing fenced area through the negligence of his forces.

If the owner of the fence desires to repair, rebuild, or renew any parts of the fence, and agrees to furnish the materials without cost to the Contractor, then repair, rebuild, renew, and reset such fence using the material furnished by the owner at no additional cost to the owner or the Department.

**867-3 METHOD OF MEASUREMENT.**

The quantity of fence reset to be paid for will be the actual number of linear feet (linear meters) of fence that has been acceptably reset. Measurement will be made along the fence after it has been reset from center of end post to center of end post.

**867-4 BASIS OF PAYMENT.**

The quantity of fence reset, measured as provided for in Article 867-3, will be paid for at the contract price per linear foot (linear meter) " \_\_\_\_\_ Fence Reset".

Payment will be made under:

_____ Fence Reset .....	Linear Foot (Linear Meter)
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**SECTION 869  
RELAPPING GUARDRAIL**

**869-1 DESCRIPTION.**

Relap either existing or recently installed guardrail in accordance with the requirements of the plans, this specification, at locations designated on the plans, and where directed. Work includes but is not limited to providing all necessary labor, tools, equipment, and materials necessary to acceptably relap the guardrail.

**869-2 CONSTRUCTION METHODS.**

Where required by the traffic phasing, at locations shown on the plans, or where directed, relap guardrail to conform to the required traffic pattern. Complete all required relapping of guardrail and have it inspected prior to shifting traffic into a new traffic pattern. All guardrail must be lapped in the direction of traffic prior to placing traffic next to the guardrail.

**869-3 METHOD OF MEASUREMENT.**

The quantity of relapping guardrail to be paid for will be the actual number of linear feet (linear meters) of guardrail that has been satisfactorily relapped and accepted. Measurement will be made from center to center of the outermost post in the length of guardrail being measured.

**869-4 BASIS OF PAYMENT.**

The quantity of relapping guardrail, measured as provided above, will be paid for at the contract unit price per linear foot (linear meter) for "Relapping Guardrail".

Payment will be made under:

Relapping Guardrail ..... Linear Foot (Linear Meter)

**SECTION 876  
RIP RAP**

**878-1 DESCRIPTION.**

Construct concrete rip rap or plain rip rap in accordance with the requirements of the plans and specifications and at the locations designated on the plans or as directed. Work includes but is not limited to all excavation, embankment preparation, and backfilling; and furnishing and placing concrete, reinforcement, stone or broken concrete rip rap, filter fabric, and other materials.

**876-2 MATERIALS.**

Refer to Division 10:

Portland cement concrete .....	Section 1000
Curing agents .....	Section 1026
Joint fillers.....	Article 1028-1
Wire mesh reinforcement.....	Article 1070-3
Plain rip rap .....	Section 1042
Filter Fabric .....	Article 1042-2

Concrete rip rap consist of poured concrete slabs reinforced in accordance with the details shown on the plans.

Plain rip rap consist of quarry run stone, or field stone, or broken concrete, and is classified by size into either Class 1 or Class 2. Plain rip rap when classified as either Class A or Class B must consist of quarry run stone or field stone. Use the class and

thickness called for on the plans. Place filter fabric under plain rip rap where indicated in the plans.

**876-3 CONCRETE RIP RAP.**

Construct concrete in accordance with Section 825, except as otherwise provided herein. Use Class B concrete. Furnish and place reinforcement as shown on the plans and in accordance with the provisions of Section 425.

Properly shape and firmly compact the slope immediately before placing concrete so that it conforms to the required lines and grades.

After placing the concrete, strike off to plan grade and finish to a uniform surface. Provide a finished surface that is reasonably smooth and uniform and that does not vary more than 1/2 inch (13 mm) in a distance of 10 feet (3 m).

Do not seal joints.

Compact backfill to a degree comparable to the adjacent undisturbed material.

**876-4 PLAIN RIP RAP.**

Unless otherwise directed, place the stone where indicated in the plans. Grade the stone so that the smaller stones are uniformly distributed throughout the mass.

Place the stone by mechanical methods, augmented by hand placing where necessary. Complete the rip rap to form a properly graded, dense, neat layer of stone.

Install the rip rap to at least the thickness indicated on the plans. Construct toe walls and other construction details as indicated in the plans.

Any additional excavation required for the placement of rip rap will be considered incidental to the cost of the rip rap.

At locations where rip rap is required for channel changes and drainage ditches, place the rip rap prior to diverting the water into the channel changes and drainage ditches.

At locations where rip rap is required at the outlets of pipe culverts, place the rip rap immediately after completion of the pipe culvert installation.

Unless otherwise directed, grade the surfaces which receive filter fabric to the lines and grades shown on the plans. Provide a surface free of obstructions, debris, and pockets of soft or low density material.

The fabric will be rejected at the time of installation if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

Lay the fabric smooth and free from tension, stress, folds, wrinkles, or creases. Make horizontal overlaps a minimum of 12 inches (300 mm) with the upper fabric overlapping the lower fabric. Make vertical overlaps a minimum of 18 inches (450 mm) with the upstream fabric overlapping the downstream fabric. In the event that the fabric is displaced or damaged during rip rap placement, remove the rip rap and reposition or replace the fabric prior to replacement of the rip rap, all at no additional cost to the Department.

Place the fabric and rip rap in a continuous manner. Protect the fabric from damage while placing rip rap or other materials.

Do not allow more than 72 hours to elapse from the time the filter fabric is unwrapped to the time the fabric is covered with rip-rap or sand.

**876-5 METHOD OF MEASUREMENT.**

**(A) Square Yard (Square Meter):**

The quantity of rip rap measured will be the actual number of square yards (square meters) of rip rap, measured along the surface of the completed and accepted rip rap.

Measurement of toe walls for concrete rip rap will be made by converting the volume of concrete in the toe wall to an area of rip rap of uniform thickness having the same volume.

**(B) Ton (Metric Ton):**

The quantity of rip rap measured will be the actual number of tons (metric tons) of each class of rip rap which has been incorporated into the completed and accepted work. The rip rap will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

**(C) Filter Fabric:**

The quantity of filter fabric measured will be the area in square yards (square meters), measured along the surface of the ground, over which fabric has been acceptably placed.

**876-6 BASIS OF PAYMENT.**

**(A) Concrete Rip Rap:**

The quantity of concrete rip rap, measured as provided in Subarticle 876-5(A), will be paid for at the contract unit price per square yard (square meter) for "Concrete Rip Rap".

**(B) Plain Rip Rap:**

The quantity of plain rip rap, measured as provided in Subarticles 876-5(A) or 876-5(B), will be paid for at the contract unit price per square yard (square meter) or per ton (metric ton) for "Plain Rip Rap, Class\_\_\_\_\_". The unit of measurement to be used will be that called for in the contract.

**(C) Filter Fabric:**

The quantity of filter fabric, measured as provided in Subarticle 876-5(C), will be paid for at the contract unit price per square yard (square meter) for "Filter Fabric for Drainage."

**(D) Compensation:**

The above prices and payments will be full compensation for all work covered by this section.

**(D) Basis of Payment:**

Payment will be made under:

Concrete Rip Rap .....	Square Yard (Square Meter)
Plain Rip Rap, Class_____ .....	Square Yard (Square Meter)
Plain Rip Rap, Class_____ .....	Ton (Metric Ton)
Filter Fabric for Drainage.....	Square Yard (Square Meter)

## NOTES

