

**DIVISION 8
INCIDENTALS**

**SECTION 800
MOBILIZATION**

800-1 DESCRIPTION

This work consists of preparatory work and operations to mobilize personnel, materials and equipment to the project site.

800-2 MEASUREMENT AND PAYMENT

Mobilization will be paid for as contract lump sum price.

Partial payments for 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 on each of these partial pay estimates, 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 2½ 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.

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 Mobilization will be made with the first partial pay estimate paid on the contract, provided the amount bid does not exceed 5 percent of the total amount bid for the contract. Where the amount bid for 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. That portion exceeding 5 percent will be paid on the last partial pay estimate.

Such price and payment includes but is 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 that shall be performed for costs incurred prior to beginning work on the various items on the project site.

Payment will be made under:

Pay Item	Pay Unit
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*. Provide a stakeout of areas where an environmental permit is required prior to performing any construction in or adjacent to these areas. Stake out limits of the permitted work areas according to the approved permit drawings. Provide clear delineation by use of highly visible flagging. Insure construction limits do not exceed approved permitted work areas. Immediately notify the Engineer of any variations of the stakeout limits when compared to the approved permit drawings.

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

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801-2 CONSTRUCTION METHODS

(A) General

Furnish personnel who are under the direct supervision of a North Carolina Licensed Professional Engineer and/or Licensed 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 and conform to the requirements of Article 107-22. 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*. Department projects utilize a localized coordinate system developed by the Location and Surveys Unit specifically for each individual project. Obtain the control information that 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 that 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 that tie to proposed roadways. Investigate 30 m 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 Field 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 contract. 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 Licensed Professional Engineer 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 measurement and payment will be made in accordance with Article 801-3.
- (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 requirements 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 Licensed Professional Engineer and/or Licensed Professional Land Surveyor in responsible charge.

(C) Horizontal and Vertical Control

The Department will furnish and set horizontal baseline control on approximate 300 m intervals and vertical control on approximate 765 m 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 meter per 5,000 meters of perimeter 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 shall not exceed an error of closure of 1 meter per 20,000 meters of perimeter. Verify the vertical control by performing a closed loop survey utilizing differential leveling. For the error of closure, do not exceed $15.24 \text{ mm } \sqrt{.62137(x)km}$. 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.

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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 contract.

(D) Right of Way and Easements

The Department will establish the location of all proposed right of way markers and permanent drainage easements.

Reference the location of all proposed right of way markers and permanent drainage easements. Restore right of way monument positions after completion of construction. Set a right of way monument cap on a 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 a 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. Report 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 15 m 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 that 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 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.

(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. The Engineer will review any major modifications.

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 contract. 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. The Engineer will review any major modifications.

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.

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(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 that 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, that may interfere with the proposed sign installation. Provide an 11" x 17" 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 MEASUREMENT AND PAYMENT

Construction Surveying will be paid for at the contract lump sum price for the work detailed in this section.

Partial payments will be made on each particular payment estimate based upon the percentage complete of Construction Surveying as determined by the Engineer. The Contractor shall submit a certified statement each month indicating the percentage of Construction Surveying work completed. The Engineer will determine if the amount indicated is reasonably correct and the Engineer will pay accordingly on the next partial pay estimate.

Supplemental Field Surveying will be measured and paid for as the actual number of hours the Contractor's survey crew is actively engaged in performing the following:

- (A) Investigative surveying, in excess of 30 m of horizontal alignment, vertical profile, and superelevation of existing facilities that tie to proposed roadways.
- (B) Surveying specifically for the relocation of utility conflicts.
- (C) Investigation of a previous stakeout when such stakeout is found to be correct.
- (D) Surveying that the Engineer has deemed could not have been anticipated or is not customary or inherent to the construction industry.
- (E) The stakeout of the roadway survey alignments for intermediate cross sections when deemed necessary by the Engineer.

Supplemental Surveying Office Calculations will be measured and paid for as the actual number of hours the Contractor’s survey personnel is actively engaged in performing office calculations specifically associated with the following:

- (A) Investigative surveying, in excess of 30 m of horizontal alignment, vertical profile, and superelevation of existing facilities that tie to proposed roadways.
- (B) Surveying specifically for the relocation of utility conflicts.
- (C) Investigation of a previous stakeout when such stakeout is found to be correct.
- (D) Surveying that the Engineer has deemed could not have been anticipated or is not customary or inherent to the construction industry.
- (E) The stakeout of the roadway survey alignments for intermediate cross sections when deemed necessary by the Engineer.

Supplemental Surveying Office Calculations will be paid at the stated price of \$50.00 per hour. *Supplemental Field Surveying* will be paid at the stated price of \$100.00 per hour. The payment includes furnishing personnel, all surveying equipment, stakes, layout drawings, calculations, stakeout records, and any materials and equipment necessary to perform the surveying and engineering work.

The payment includes furnishing personnel, all surveying equipment, stakes, layout drawings, calculations, stakeout records, and any materials and equipment necessary to perform the surveying and engineering work.

Exploratory Excavation required to locate a utility will be paid for in accordance with Article 104-7.

Work Zone Signs (Portable) will be paid for in accordance with Article 1110-4.

Flaggers will be paid for by either the hour or day in accordance with Article 1150-4.

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

Payment will be made under:

Pay Item	Pay Unit
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 that are not utilized in the construction of the project, including overburden from borrow sources and soil type base course sources.

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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 1.2 m above the water table. Mixtures of soil and vegetation, that are primarily soil, may also be placed in non-permitted disposal areas. Place all other debris in sites that have been permitted by the Solid Waste Management Division of the North Carolina Department of Environment 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 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. Construct rock slopes on a stable angle of repose.

Where the Engineer has granted permission to dispose of waste within the right of 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 Solid Waste Management Division of the North Carolina Department of Environment and Natural Resources has permitted the proposed area or site.

Where electing to dispose of waste in a waste or disposal area, other than active public waste or disposal areas that have been permitted by the Solid Waste Management Division of the North Carolina Department of Environment and Natural Resources or on the Department's right-of-way or an existing borrow pit, 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:

(A) Material Description

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

(B) 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 shall be at least 1.2 m as determined from the water table at the time the reclamation plan is executed. The slope of the soil below the water shall be between 5:1 and 2:1. The slope of the sides above the water line shall be 2:1 or flatter.

(C) Slopes

Rock and earth waste shall be shaped to contours that are compatible to and blend with the adjacent topography. Cover all rock with a minimum 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 require earth covering. Construct all slopes at a 2:1 or flatter except rock slopes that shall be on a stable angle of repose.

(D) Construction Debris

Cover construction debris and all broken pavement and masonry with a minimum 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.

(E) 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.

(F) Evaluation for Potential Wetlands and Endangered Species

Hire an experienced environmental consultant on the Department's approved list 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 7.6 m buffer adjacent to all sides of the wetland boundary and a minimum 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 that may support these species. Provide to the Engineer a detailed report on the assessment findings. If federally listed threatened or endangered species or habitat that may support such species exist on the proposed waste site, notify the Engineer prior to continued pursuit of such site.

(G) 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 watercourse or body to prevent siltation of the watercourse or body and the movement of the shore line either into the watercourse or body or into the waste areas. Determine if the adjoining property owners or other government agencies require any additional buffer zones and comply with those requirements. [Suggested minimum distances are 3 m from property lines and 15.2 m from water bodies or watercourses.] Do not place waste material within the 100-year floodplain unless superseded by an environmental permit.

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(H) 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 0.4 hectare or is significantly changed from the previously approved submittal.

802-3 MEASUREMENT AND PAYMENT

Seeding and Mulching, Fertilizer Topdressing, and establishing erosion control measures for waste or disposal areas will be measured and paid for 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 markers to mark the boundaries of the right of way in accordance with the requirements of the contract.

806-2 MATERIALS

Refer to Division 10.

Item	Section
Right of Way Markers	1054-1

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

806-3 CONSTRUCTION METHODS

Install the markers vertically in the ground to the depth and locations specified in the contract. Thoroughly tamp backfill material.

806-4 MEASUREMENT AND PAYMENT

Right of Way Markers will be measured and paid for in units of each for the actual number of right of way markers that have been furnished, installed, and accepted.

Payment will be made under:

Pay Item	Pay Unit
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.

808-2 CONSTRUCTION METHODS

Remove any existing pavement as directed. Fill or grade and shape the entire roadway to a degree that will blend with the adjacent topography and suitable for the application of vegetative cover.

808-3 MEASUREMENT AND PAYMENT

Removal of Existing Asphalt Pavement will be measured and paid for in accordance with the requirements of Article 250-3. 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.

Removal of Existing Concrete Pavement will be measured and paid for in accordance with the requirements of Article 250-3. Such price 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.

All materials excavated in obliterating the abandoned roadway will be paid for at the contract price for *Unclassified Excavation* in accordance with the requirements of Article 225-7.

Any additional material that 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 requirements of Article 225-7, or at the contract unit price for *Borrow Excavation* in accordance with the requirements of Article 230-5, 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 contract.

815-2 MATERIALS

Refer to Division 10.

Item	Section
Subdrain Fine Aggregate	1044-1
Concrete Pipe and Fittings	1044-3
Corrugated Steel Pipe and Fittings	1044-4
Polyvinyl Chloride Plastic (PVC) Pipe	1044-5
Outlet Pipe	1044-7
Corrugated Plastic Pipe and Fittings	1044-6
Portland Cement Concrete	1000
Pavement Markers Paint	1087
Steel Marker	1072-4
Steel Marker Paint	1080-14

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

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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.

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 Article 300-6.

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.

Outlet pipe shall meet the requirements of Article 1044-7. Solvent cement the SCH-40 pipe and fittings together. Connect the HDPE pipe with watertight neoprene connectors that are suitable for gravity flow conditions. Provide connectors for all pipe fittings that 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, place the amount of subdrain fine aggregate material 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 MEASUREMENT AND PAYMENT

Subdrain Excavation will be measured and paid for as the actual cubic meters measured in its original position that 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.

Subdrain Fine Aggregate will be measured and paid for as the actual number of cubic meters, measured in place within authorized limits, that 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.

___ *mm Perforated Subdrain Pipe* will be measured and paid for in linear meters of pipe that has been incorporated into the completed and accepted work. Measurement will be made along the pipe installation, excluding fittings, to the nearest 0.1 meter.

___ *mm Outlet pipe* will be measured and paid for in linear meters of pipe that has been incorporated into the completed and accepted work. Measurement will be made along the pipe installation, excluding fittings, to the nearest 0.1 meter.

Subdrain Wyes, Tees, and Elbows will be measured and paid for per each for the actual number of these fittings that have been incorporated into the completed and accepted work.

Concrete Pads for Subdrain Pipe Outlet will be measured and paid for per each for the actual number of pads that have been completed and accepted.

Such price and payment 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.

Payment will be made under:

Pay Item	Pay Unit
Subdrain Excavation	Cubic Meter
Subdrain Fine Aggregate	Cubic Meter
__ mm Perforated Subdrain Pipe	Linear Meter
__ mm Outlet Pipe	Linear Meter
__ mm Subdrain Pipe Wyes, Tees, and Elbows	Each
Concrete Pad for Subdrain Pipe Outlet	Each

SECTION 816 SHOULDER DRAINS

816-1 DESCRIPTION

Construct 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 contract.

816-2 MATERIALS

Refer to Division 10.

Item	Section
Shoulder Drain Aggregate, No. 57 Stone	1005
Concrete Pipe and Fittings	1044-3
Corrugated Steel Pipe and Fittings	1044-4
Polyvinyl Chloride Plastic (PVC) Pipe	1044-5
Corrugated Plastic Pipe and Fittings	1044-6
__ mm Outlet Pipe	1044-7
Shoulder Drain Filter Fabric, Type 1	1056
Portland Cement Concrete, Class B	1000
Pavement Marker Paint	1087
Steel Marker	1072-4
Steel Marker Paint	1080-14

Material for shoulder drain pipe and fittings may be 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.

Do not leave fabric uncovered for more than 7 days. Install filter fabric such that all splice joints are provided with a minimum overlap of 0.6 m. Overlap the closure at the top of the trench at least 150 mm and secure 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.

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.

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Outlet pipe shall meet the requirements of Article 1044-7. Solvent cement the SCH-40 pipe and fittings together. Connect the HDPE pipe with watertight neoprene connectors that 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 MEASUREMENT AND PAYMENT

Shoulder Drain will be measured and paid as the actual number of linear meters that has been completed and accepted, measured to the nearest meter along the centerline of the completed shoulder drain aggregate. No measurement will be made along the outlet pipe.

___ mm *Shoulder Drain Pipe* will be measured and paid for in linear meters of all pipe that has been incorporated into the completed and accepted work. Measurement will be made along the pipe installation, including fittings, to the nearest 0.1 meter with no deduction made for fittings.

___ mm *Outlet Pipe for Shoulder Drain* will be measured and paid for in linear meters of all pipe that has been incorporated into the completed and accepted work. Measurement will be made along the pipe installation, including fittings, to the nearest 0.1 meter with no deduction made for fittings.

Concrete Pad for Shoulder Drain Pipe Outlet will be measured and paid for in units of each for the actual number of pads that have been completed and accepted.

Such price and payment 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.

Payment will be made under:

Pay Item	Pay Unit
Shoulder Drain	Linear Meter
___ mm Shoulder Drain Pipe	Linear Meter
___ mm Outlet Pipe for Shoulder Drain	Linear Meter
Concrete Pad for Shoulder Drain Pipe Outlet	Each

**SECTION 818
BLOTTING SAND**

818-1 DESCRIPTION

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

818-2 MATERIALS

Refer to Division 10.

Item	Section
Blotting Sand	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 5.4 kg/m² of surface area unless otherwise directed.

818-4 MEASUREMENT AND PAYMENT

Blotting Sand will be measured and paid for in metric tons that have 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.

Payment will be made under:

Pay Item	Pay Unit
Blotting Sand	Metric Ton

**SECTION 820
FUNNELS AND FUNNEL DRAINS**

820-1 DESCRIPTION

Furnish and install all funnels, pipe, elbows and all other materials in accordance with the requirements of the contract.

820-2 MATERIALS

Refer to Division 10.

Item	Section
Funnels	1054-4(A)
Funnel Drain Pipe	1054-4(B)
Funnel Drain Pipe Elbows	1054-4(B)
Portland Cement Concrete, Class B	1000

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

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backfill material in 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 MEASUREMENT AND PAYMENT

Metal Funnels will be measured and paid for in units of each for the actual number of funnels that have been installed and accepted. 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.

___ *mm Funnel Drain Pipe* will be measured and paid for as the actual number of linear meters of pipe that has been incorporated into the completed and accepted 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 meter.

___ *mm Funnel Drain Pipe Elbows* will be measured and paid for in units of each for the actual number of elbows that have been installed and accepted.

Such price and payment includes but is not limited to metal funnels, funnel drain pipe and elbows, all excavation and backfilling, and construction and maintenance of temporary berms for diversion in accordance with the requirements of the contract.

Payment will be made under:

Pay Item	Pay Unit
Metal Funnels	Each
___mm Funnel Drain Pipe	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, 846, 848, 850, 852, 853, 854, 855, 857, and 858 will prevail over any conflicting requirements of this section.

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 that are required within the forms so that the metal work can be removed to a depth of at least 25 mm from the exposed surface of the concrete without injury to the surface. The recess thus formed in the concrete shall 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 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 that impair the texture of concrete surfaces that 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 that present a smooth surface and line up properly. Keep metal forms free from all foreign matter that will discolor the concrete.

825-3 REINFORCEMENT

Furnish and place reinforcement as shown on the plans and in accordance with the requirements 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 2°C unless permission is otherwise granted. When such permission is granted, uniformly heat the aggregates and water to a temperature no higher than 66°C. Place the heated concrete at a temperature of not less than 13°C and not more than 27°C.

825-5 SLUMP TESTS

Test the slump of the concrete in accordance with Article 420-6.

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

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

(B) Ordinary Surface Finish

Remove all form ties or metal spacers to a depth of at least 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 32 mm² 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 that are to be backfilled or surfaces that 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 2°C, protect concrete in accordance with Subarticle 420-7(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.

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 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 that has a broken or irregular edge, provide a reasonably vertical edge by sawing.

(B) Grooved Contraction Joints

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 6 mm and 12 mm, unless otherwise shown on the plans. If formed by a tool, make a radius of 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 12 mm thick unless indicated otherwise on the plans. After the concrete has hardened cut the filler away to a depth of 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 3 mm to 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 MEASUREMENT AND PAYMENT

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 STRUCTURE**

828-1 DESCRIPTION

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 MEASUREMENT AND PAYMENT

Temporary Steel Plate Covers for Masonry Drainage Structures will be measured and paid for in units of each for the actual number of these items that have been incorporated into the completed and accepted work.

Payment will be made under:

Pay Item	Pay Unit
Temporary Steel Plate Covers for Masonry Drainage Structures	Each

**SECTION 830
BRICK MASONRY CONSTRUCTION
GENERAL**

830-1 DESCRIPTION

This work consists of the general requirements for all nonreinforced brick masonry construction. The provisions of Sections 453, 838, 840 and 858 will prevail over any conflicting provisions of this section.

830-2 CONSTRUCTION METHODS

Construct all concrete footings and all other concrete elements of the structure in accordance with Section 825.

830-3 MORTAR

Use freshly mixed mortar meeting the requirements of Article 1040-8. All mortar that 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 16 mm and a minimum of 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 2°C unless adequate protection is provided by a pre-approved method.

When it is anticipated that the atmospheric temperature will fall below 2°C protect masonry, in accordance with Subarticle 420-8(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 4°C.

830-6 MEASUREMENT AND PAYMENT

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 832
REINFORCED BRICK MASONRY CONSTRUCTION
GENERAL**

832-1 DESCRIPTION

This work shall consist of the general requirements for all reinforced brick masonry construction. The requirements 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 requirements 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 that 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 13 mm or less than 6 mm thick except where 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. 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 MEASUREMENT AND PAYMENT

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
BLOCK MASONRY CONSTRUCTION
GENERAL**

834-1 DESCRIPTION

This work consists of constructing concrete block masonry. The requirements of Sections 840, 858 and 859 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 that 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.

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

834-5 PROTECTION FROM COLD WEATHER

Refer to Article 830-5.

834-6 MEASUREMENT AND PAYMENT

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 in the contract.

838-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Brick	1040-1
Mortar	1040-8
Reinforcing Steel	1070-2
Subdrain Fine Aggregate	1044-1
Stone, No 78M	1005
Precast Concrete Units	1077
Select Material	1016

Use portland concrete, brick masonry or precast concrete for the endwall unless otherwise specified on the plans.

If precast 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 that incorporates an opening for circular pipe 1370 mm or greater shall 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 830-5. Within 4 calendar days after the completion of the seven day curing period, shape, compact, and complete backfill in accordance with the contract.

838-4 MEASUREMENT AND PAYMENT

Endwalls will be measured and paid for in cubic meters of cast in place concrete, brick, or precast concrete that has been completed and accepted. This quantity will be computed from the dimensions shown on the plans or from revised authorized dimensions.

Reinforced Endwalls will be paid for in cubic meters of reinforced cast in place concrete, reinforced brick or precast concrete that has been completed and accepted. This quantity will be computed from the dimensions shown on the plans or from revised authorized dimensions.

Payment will be made under:

Pay Item	Pay Unit
Endwalls	Cubic Meter
Reinforced Endwalls	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, with all necessary metal grates, covers, frames, steps, and other hardware, in accordance with the requirements of the contract.

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

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840-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-2
Brick	1040-1
Concrete Block	1040-2
Mortar	1040-8
Precast Drainage Structure Units	1077
Reinforcing Steel	1070
Structural Steel	1072
Steps	1074-8
Fabricated Steel Grates	1074-9
Gray Iron Castings	1074-7
Select Materials	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 contract 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 achieved adequate strength.

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 13 mm of grade on a 50 mm to 75 mm thick bed of compacted foundation conditioning material.

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

Install drainage structures to plan line and grade or approved to meet drainage conditions. Do not modify the drainage structure by cobbling or use of concrete slabs unless otherwise directed.

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. Furnish and place reinforcing steel in accordance with Section 425.

Do not modify box to adjust location.

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

(D) Installation of Precast Units

Install drainage structures to plan line and grade or approved to meet drainage conditions. Do not modify the drainage structure by cobbling or use of concrete slabs unless otherwise directed.

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 or 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 that 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 MEASUREMENT AND PAYMENT

Masonry Drainage Structure that incorporate an opening for circular pipe not exceeding 1200 mm in diameter will be measured and paid for on an each basis, for the actual number completed and accepted.

Masonry Drainage Structure exceeding a height of 1.5 meters to be measured and paid for in linear meters for the portion of the drainage structure exceeding a height of 1.5 meters. The height will be measured vertically to the nearest tenth of a meter from the top of the bottom slab to the top of the wall.

Masonry Drainage Structures that incorporate an opening for circular pipe exceeding 1200 m in diameter, or for pipe arch of any size, will be measured and paid for on a volume basis as provided below.

Masonry to be paid for will be the number of cubic meters of cast-in-place concrete brick or block that has been incorporated into the completed and accepted structure. This

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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.

Pipe Collars will be measured and paid for in cubic meters of concrete or brick that has been incorporated into the completed work. The cubic meters of pipe collars will be computed from the dimensions shown on the plans or from revised dimensions authorized by the Engineer.

Pipe Plugs will be measured and paid for in cubic meters of concrete or brick that has been incorporated into the completed and accepted pipe plug. The cubic meters of pipe plugs will be computed from the dimensions shown on the plans or from revised dimensions authorized by the Engineer.

Frame with Grate and Hood, Std. ___ will be measured and paid for in units of each for actual number of assemblies that have been incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods, and covers will be considered to be part of the complete assembly.

Frame with Grate, Std. ___ will be measured and paid for in units of each for actual number of assemblies that have been incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods, and covers will be considered to be part of the complete assembly.

Frame with Two Grates, Std. ___ will be measured and paid for in units of each for actual number of assemblies that have been incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods, and covers will be considered to be part of the complete assembly.

Frame with Cover, Std. ___ will be measured and paid for in units of each for actual number of assemblies that have been incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods, and covers will be considered to be part of the complete assembly.

Steel Frame with Two Grates, Std. ___ will be measured and paid for in units of each for the actual number of fabricated steel grates that have been incorporated into the completed work.

Concrete Apron for catch basins and drop inlets will be considered incidental to the other work in this section. No separate payment will be made.

Foundation Conditioning will be paid for as provided in Article 300-9.

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

Payment will be made under:

Pay Item	Pay Unit
Masonry Drainage Structures	Each
Masonry Drainage Structures	Linear Meter
Masonry Drainage Structures	Cubic Meter
Pipe Collars	Cubic Meter
Pipe Plugs	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

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

846-1 DESCRIPTION

Construct portland cement concrete curb, concrete curb and gutter, concrete gutter, shoulder berm gutter, concrete expressway gutter and 100 mm concrete valley gutter as shown in the contract.

846-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-2, 1028-4

846-3 CONSTRUCTION METHODS**(A) General**

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

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.

(B) Forms

Use forms that have no more than 3 mm in 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 1.5 meter.

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 6 mm when checked longitudinally with a 3 m straightedge.

Section 846

(E) Backfilling

Do not place backfill or pavement adjacent to the curb, curb and gutter, gutter, shoulder berm gutter, expressway gutter or concrete valley gutter 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 MEASUREMENT AND PAYMENT

__ mm X __ mm Concrete Curb will be measured and paid for by the linear meter, accepted in place, along the surface of the top of the curb.

__ mm Concrete Curb and Gutter will be measured and paid for by linear meter, accepted in place. Measurement will be made along the surface of the top of the curb.

__ mm Concrete Gutter will be measured and paid for by linear meter accepted in place. Measurement will be made along the surface of the top of the curb.

Shoulder Berm Gutter will be measured and paid for by linear meter accepted in place. Measurement will be made along the surface of the top of the curb.

Concrete Expressway Gutter will be measured and paid for by linear meter accepted in place. Measurement will be made along the surface of the top of the curb.

Concrete Valley Gutter will be measured and paid for by linear meter, accepted in place. Measurement will be made along the surface of the top of the curb.

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.

Payment will be made under:

Pay Item	Pay Unit
__ mm X __ mm Concrete Curb	Linear Meter
__ mm Concrete Curb and Gutter	Linear Meter
__ mm Concrete Gutter	Linear Meter
Shoulder Berm Gutter	Linear Meter
Concrete Expressway Gutter	Linear Meter
Concrete Valley Gutter	Linear Meter

**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 in the contract.

848-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-2, 1028-4

Detectable Warnings may be either truncated dome concrete paving blocks or stamped concrete. Detectable warnings shall consist of raised truncated domes. Truncated Domes shall have a base diameter of no less than 23 mm to no more than 36 mm, a top diameter of no less than 50% to no more than 65% of the base diameter, and a height of 5 mm. Truncated domes shall have center-to-center spacing of no less than 40 mm to no more than 61 mm, and a base to base spacing of 16 mm minimum, measured between the most adjacent domes on square grid.

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 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.

Broom the concrete surface in a transverse direction to traffic. Make joint spacing no less than 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 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.

Install detectable warnings 610 mm in length of truncated dome paving blocks along the bottom of the curb ramps in accordance with the plans and details. Obtain 70 percent contrast visibility with adjoining surfaces, either light-on-dark, or dark-on-light sequence covering the entire ramp.

848-4 MEASUREMENT AND PAYMENT

 mm *Concrete Sidewalk* will be measured and paid for in square meters, measured along the surface of the completed and accepted work. Such price includes, but is not limited to excavating and backfilling, sawing the existing sidewalk, furnishing and placing concrete, and constructing and sealing joints.

 mm *Concrete Driveways* will be measured and paid for in square meters, measured along the surface of the completed and accepted work. Such price includes, but is not limited to excavating and backfilling, sawing the existing driveway, furnishing and placing concrete, and constructing and sealing joints.

Concrete Wheelchair Ramps will be measured and paid for in units of each. Such price includes, but is not limited to excavating and backfilling, sawing the existing sidewalk or driveway, furnishing and placing concrete, constructing and sealing joints, and furnishing and installing truncated domes.

Section 848

Payment will be made under:

Pay Item	Pay Unit
__ mm Concrete Sidewalk	Square Meter
__ mm Concrete Driveways	Square Meter
Concrete Wheelchair Ramps	Each

**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 requirements 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.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-2, 1028-4

850-3 CONSTRUCTION METHODS

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

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

Do not place backfill adjacent to the paved ditch until at least 3 curing days have elapsed unless otherwise approved. Compact backfill to a degree comparable to the adjacent undisturbed material.

850-4 MEASUREMENT AND PAYMENT

__ mm Concrete Paved Ditch will be measured and paid for in square meters that is completed and accepted. 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.

Payment will be made under:

Pay Item	Pay Unit
__ mm Concrete Paved Ditch	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 contract.

852-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-2, 1028-4
Herbicide	1060-13

852-3 CONSTRUCTION REQUIREMENTS

Construct curb, and curb and gutter, in accordance with the requirements 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 in accordance with Article 1670-7.

Construct concrete in accordance with Section 825 and give a sidewalk finish, except as otherwise provided herein. 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 MEASUREMENT AND PAYMENT

___ mm *Concrete Island Cover* will be measured and paid for in square meters of concrete island cover that has been placed and accepted. Measurement will be made along the top surface of the completed island cover. This work includes but is not limited to excavation and backfilling, constructing base, furnishing and placing concrete, forming holes for signposts, and constructing and sealing joints.

___ mm *Monolithic Concrete Islands* () will be measured and paid for in square meters of concrete island that has been placed and accepted. Measurement will be made parallel to the bottom surface of the island or median. This work includes but is not limited to excavation and backfilling, constructing base, furnishing and placing concrete, forming holes for signposts, and constructing and sealing joints.

___ mm *Monolithic Concrete Median* () will be measured and paid for in square meters of concrete median that has been placed and accepted. Measurement will be made parallel to the bottom surface of the island or median. This work includes but is not limited to excavation and backfilling, constructing base, furnishing and placing concrete, forming holes for signposts, and constructing and sealing joints.

Payment for constructing earth fill will be made in accordance with Article 225-7 for *Unclassified Excavation* or Article 230-5 for *Borrow Excavation*, depending on the source of the material.

Payment for establishing a grass cover in unpaved island areas will be in accordance with Article 1660-8.

Payment for constructing *Concrete Curb* and *Concrete Curb and Gutter* will be made in accordance with Article 846-4.

Section 852

Payment will be made under:

Pay Item	Pay Unit
__ mm Concrete Island Cover	Square Meter
__ mm Monolithic Concrete Islands ()	Square Meter
__ mm Monolithic Concrete Median ()	Square Meter

SECTION 854 CONCRETE BARRIER

854-1 DESCRIPTION

Construct portland cement concrete barrier in accordance with the requirements shown in the contract. The concrete barrier may be cast in place, slip formed, or precast, unless otherwise specified in the contract.

854-2 MATERIALS

Refer of Division 10.

Item	Section
Portland Cement Concrete, Class AA	1000
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-4
Grout	1054-6
Reinforcing Steel	1070-2
Connector Pins and Eye Assemblies	1072
Guardrail and Barrier Delineators	1088-2

Use clear curing compound.

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

854-3 CONSTRUCTION METHODS

(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.

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 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 that 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 that 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 shall supplement the color of the adjacent edgelines.

854-4 MEASUREMENT AND PAYMENT

Concrete Barrier, Type _____ will be measured and paid for in linear meters of barrier that 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.

Variable Height Concrete Barrier, Type _____ will be measured and paid for in linear meters of barrier that 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.

Concrete Barrier Transition Section will be measured and paid for in units of each for transitions 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.

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.

Price and payment 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.

Payment will be made under:

Pay Item	Pay Unit
Concrete Barrier, Type _____	Linear Meter
Variable Height Concrete Barrier, Type _____	Linear Meter
Concrete Barrier Transition Section	Each

**SECTION 857
PRECAST REINFORCED CONCRETE BARRIER
SINGLE FACED**

857-1 DESCRIPTION

Construct precast reinforced portland cement concrete barrier in accordance with the requirements shown in the contract.

857-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class AA	1000

Section 857

Curing Agents	1026
Joint Filler	1028-1
Grout	1054-6
Reinforcing Steel	1070-2
Eye Assemblies	1072
Guardrail and Barrier Delineators	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.

Lift and place precast units using a two-point pick up or other approved method that 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 that 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, continue the work 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 shall supplement the color of the adjacent edgelines.

857-4 MEASUREMENT AND PAYMENT

There will be no measurement made of barrier delineators as they are considered incidental to the other pay items in this specification. *Precast Reinforced Concrete Barrier, Single Faced* will be measured and paid for in linear meters of barrier that 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. Price includes but is 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.

Concrete Barrier Transition Section will be paid for in accordance with Section 854.

Payment will be made under:

Pay Item	Pay Unit
Precast Reinforced Concrete Barrier, Single Faced	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.

858-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Asphalt Plant Mix	1020
Joint Fillers	1028-1
Joint Sealers	1028
Brick	1040-1
Concrete Block	1040-2
Mortar	1040-8
Reinforcing Steel	1070
Steps	1070
Fabricated Steel Grates	1074-9
Gray Iron Castings	1074-7
Precast Risers	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 that will eliminate movement of the fitting.

Backfill excavated areas in an existing pavement with portland cement 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 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 that have been adjusted. Construct the ramp to extend a minimum of 1 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 Department 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.

Section 858

858-4 MEASUREMENT AND PAYMENT

Adjustment of Catch Basins will be measured and paid for in units of each for catch basins that have been satisfactorily adjusted.

Adjustment of Drop Inlets will be measured and paid for in units of each for drop inlets that have been satisfactorily adjusted.

Adjustment of Manholes will be measured and paid for in units of each for manholes that have been satisfactorily adjusted.

Adjustment of Meter Boxes or Valve Boxes will be measured and paid for in units of each for meter boxes or valve boxes that 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 0.6 m, the number of linear meters exceeding .6 m that such structure has been raised will be measured and paid for per linear meter as provided in Article 840-4 for *Masonry Drainage Structure*. 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 0.6 m from the results of the first subtraction.

Such price 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.

Payment will be made under:

Pay Item	Pay Unit
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 in the contract.

859-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-4
Brick	1040-1
Concrete Block	1040-2
Mortar	1040-8
Reinforcing Steel	1070

Structural Steel	1072
Steps	1074-8
Fabricated Steel Grates	1074-9
Gray Iron Castings	1074-7
Stone, No. 78M	1005

859-3 CONSTRUCTION METHODS

Perform work in accordance with the applicable requirements 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 MEASUREMENT AND PAYMENT

Convert Existing Catch Basin to Junction Box will be measured and paid for in units of each drainage structure that has been acceptably converted.

Convert Existing Catch Basin to Drop Inlet will be measured and paid for in units of each drainage structure that has been acceptably converted.

Convert Existing Drop Inlet to Junction Box will be measured and paid for in units of each drainage structure that has been acceptably converted.

Where a catch basin or drop inlet is raised more than 0.6 m, the number of linear meters exceeding 0.6 m that the catch basin or drop inlet has been raised will be measured and paid for per linear meter for Masonry Drainage Structure as provided for in Article 840-4. 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 0.6 meter from the results of the first subtraction.

If grates and frames are necessary in converting either catch basins or drop inlets, separate payment will be made for the grates and frames in accordance with Section 840.

Such price will include 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, fabricating, welding, and galvanizing.

Payment will be made under:

Pay Item	Pay Unit
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 862 GUARDRAIL

862-1 DESCRIPTION

Construct either permanent or temporary steel beam guardrail, in accordance with the requirements of the contract and at the locations designated on the plans or as directed.

862-2 MATERIALS

Refer to Division 10.

Item	Section
Rail Elements	1046-2
Posts and Offset blocks	1046-3
Hardware	1046-4

Section 862

Anchors	1046-5
Welded Wire Fabric	1070-3
Organic Zinc Repair Paint	1080-9
Guardrail and Barrier Delineators	1088-2
Guardrail End Delineation	1088-3
Select Material, Class VI	1016

Supply material in accordance with the Department's Brand Certification Program for Guardrail.

Temporary guardrail shall be of the type called for on the plans and shall be fabricated from plates that 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 in accordance with the plans.

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 150 mm layers with suitable material and thoroughly compact by tamping or puddling.

Where rock interferes with the proper installation of the post, excavate a shaft in the rock not less than 230 mm wide, parallel to the roadway, by 584 mm long, perpendicular to the roadway, and 610 mm deep. Place the post against the roadside edge of the shaft and fill in behind the post with Select Material Class VI, up to the top elevation of the rock. Fill the remainder of the hole with earth material. Where timber posts are to be driven in fill slopes 1 1/2:1 or steeper and the fill height is 4.6 m or more, auger a 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 .076 mm 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.

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 shall supplement the color of the adjacent edgelines.

862-5 TEMPORARY GUARDRAIL

Erect temporary guardrail in accordance with the requirements of Section 1046 and the contract.

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 MEASUREMENT AND PAYMENT

Steel Beam Guardrail will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that 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.

Steel Beam Guardrail, Shop Curved will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that 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.

Steel Beam Guardrail, Double Faced will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that 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.

Triple Corrugated Steel Beam Guardrail will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that 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.

500 mm Tubular Triple Corrugated Steel Beam Guardrail will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that 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.

Temporary Steel Beam, Guardrail will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that 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.

Temporary Steel Beam Guardrail, Shop Curved will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of

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that length of guardrail that 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.

Temporary Steel Beam Guardrail, Double Faced will be measured and paid for in linear meters of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that 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.

Steel Beam Guardrail Terminal Section and Temporary Steel Beam Guardrail Terminal Sections will be measured and paid for in units of each that have been completed and accepted, exclusive of terminal sections that are within the pay limits of guardrail anchors.

Triple Corrugated Steel Beam Guardrail Terminal Sections will be measured and paid for in units of each that have been completed and accepted, exclusive of terminal sections that are within the pay limits of guardrail anchors.

Guardrail Anchor Units, Type ___ and Temporary Guardrail Anchor Units Type ___ will be measured and paid for as units of each that 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 that 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.

W-TR Steel Beam Guardrail Transition Sections will be measured and paid for in units of each that have been completed and accepted.

Additional Guardrail Posts will be measured and paid for in units of each for additional posts required but not shown in the plans.

There will be no measurement or payment made for *Guardrail Delineators* as they are considered incidental to the other pay items in this Specification.

There will be no measurement or payment made for *Guardrail End Delineation* as it is considered incidental to the other pay items in this Specification.

Such price and payment includes, but is not limited to furnishing and erecting posts, offset blocks, rail, terminal sections, miscellaneous hardware, and all other materials, field curving and shop curving of the rail; removing temporary guardrail; excavation; furnishing and installing additional guardrail posts and additional offset blocks; backfilling; fabrication; welding; galvanizing; furnishing and installing guardrail delineators and end delineation.

Payment will be made under:

Pay Item	Pay Unit
Steel Beam Guardrail	Linear Meter
Steel Beam Guardrail, Shop Curved	Linear Meter
Steel Beam Guardrail, Double Faced	Linear Meter
Triple Corrugated Steel Beam Guardrail	Linear Meter
500 mm Tubular Triple Corrugated Steel Beam Guardrail	Linear Meter
Temporary Steel Beam Guardrail	Linear Meter
Temporary Steel Beam Guardrail, Shop Curved	Linear Meter
Temporary Steel Beam Guardrail, Double Faced	Linear Meter
Temporary Guardrail Anchor Units, Type ___	Each
Temporary Steel Beam Guardrail Terminal Sections	Each
Steel Beam Guardrail Terminal Section	Each

Triple Corrugated 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 MEASUREMENT AND PAYMENT

Remove Existing Guardrail will be measured and paid for in linear meters of guardrail that has been satisfactorily removed. Measurement will be made to the nearest 1.0 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.

Payment will be made under:

Pay Item	Pay Unit
Remove Existing Guardrail	Linear Meter

**SECTION 864
REMOVE AND RESET EXISTING GUARDRAIL AND GUIDERAIL**

864-1 GENERAL

Remove and reset existing guardrail and guiderail and anchors of any type at locations shown in the plans and as directed in accordance with the contract.

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 and guiderail in accordance with Article 862-3 and 865-3. Reset guardrail and guiderail in a condition that is equal to or better than the condition that exists before the guardrail and guiderail is removed. Replace any of the guardrail and guiderail components that have been unnecessarily damaged.

864-3 MEASUREMENT AND PAYMENT

Remove and Reset Existing Guardrail will be measured and paid for in linear meters of guardrail and anchors that has been removed, reset, and accepted. Measurement will be made after the guardrail has been reset.

Remove and Reset Existing Guiderail will be measured and paid for in linear meters of guiderail and anchors that has been removed, reset, and accepted. Measurement will be made after the guiderail has been reset.

Such price will include but is not limited to removing and resetting the guardrail, guiderail, and anchors and for furnishing all equipment, labor, and incidentals necessary to complete the work.

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Payment will be made under:

Pay Item	Pay Unit
Remove and Reset Existing Guardrail	Linear Meter
Remove and Reset Existing Guiderail	Linear Meter

SECTION 865 CABLE GUIDERAIL

865-1 DESCRIPTION

Construct cable guiderail in accordance with the contract and at the locations designated in the plans or as directed.

865-2 MATERIALS

Refer to Division 10.

Item	Section
Rail Elements	1046-2
Posts	1046-3
Hardware	1046-4
Organic Zinc Repair Paint	1080-9
Portland Cement Concrete, Class A	1000
Precast Concrete Anchors	1077
Select Material, Class VI	1016

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

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.

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 align. Backfill the post holes in 150 mm layers with suitable material and thoroughly compact by tamping or puddling.

Where rock interferes with the proper installation of the post, excavate a shaft in the rock not less than 230 mm wide, parallel to the roadway, by 584 mm long, perpendicular to the roadway, and 610 mm deep. Place the post against the roadside edge of the shaft and fill in behind the post with Select Material Class VI, up to the top elevation of the rock. Fill the remainder of the hole with earth material. Where timber posts are to be driven in fill slopes 1 1/2:1 or steeper and the fill height is 4.6 m or more, auger a 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.

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 MEASUREMENT AND PAYMENT

Cable Guiderail will be measured and paid for in linear meters of guiderail that has been satisfactorily completed and accepted exclusive of that length of guiderail that 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. Such price will include but is not limited to furnishing and erecting posts, cable, miscellaneous hardware, concrete, delineators, and all incidentals necessary to complete the work.

Double Faced Cable Guiderail will be measured and paid for in linear meters of guiderail that has been satisfactorily completed and accepted exclusive of that length of guiderail that 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. Such price will include but is not limited to furnishing and erecting posts, cable, miscellaneous hardware, concrete, delineators, and all incidentals necessary to complete the work.

Cable Guiderail Anchor Unit will be measured and paid for in units of each that have been completed and accepted.

No separate measurement will be made of any cable, posts, concrete, hardware, or any other components of the completed anchor units that are within the pay limits shown on the plans.

Payment will be made under:

Pay Item	Pay Unit
Cable Guiderail	Linear Meter
Double Faced Cable Guiderail	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.

866-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Timber Posts and Braces	1050-2
Metal Posts and Rails	1050-3
Barbed Wire	1050-4
Woven Wire	1050-5
Chain Link Fabric	1050-6
Fittings and Accessories	1050-7
Fence Materials	1050-1

Use Class B concrete for anchors. In lieu of Class B concrete, 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 may be used.

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 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 that 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 1 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 .076 mm 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 does 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 305 mm.

Do not fabricate extra length posts by welding short sections of posts together.

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

Do not use pieces of woven wire fabric less than 30.5 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 plans. After the posts have been set, fill sleeves with grout.

(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 610 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 eyebolt 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 MEASUREMENT AND PAYMENT

Woven Wire Fence, ___ mm Fabric will be measured and paid for in linear meters 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, that has been completed and accepted.

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Chain Link Fence, ___ mm Fabric will be measured and paid for in linear meters, 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, that has been completed and accepted.

___ Strand Barbed Wire Fence with Posts will be measured and paid for in linear meters 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, that 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.

___ mm Timber Fence Posts, _____ will be measured and paid for in units of each for the several sizes and kinds of posts installed on the project, including timber posts erected as barriers at driveways and entrances. The actual length of timber posts in 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. 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 meters by a standard post length shall be considered as equal to one post. Where the Contractor has elected to use pieces of woven wire shorter than 30.5 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, timber fence posts shall also include the number of line posts that have been made unnecessary by such line braces but shall exclude the posts used in the line braces.

Metal Line Posts for ___ mm Chain Link Fence will be measured and paid for in units of each for the several sizes and kinds of posts actually installed on the project. 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 meters, and one half of such 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 meters by a standard post length shall be considered as equal to one post.

Metal Terminal Posts for ___ mm Chain Link Fence will be measured and paid for in units of each for all end, corner, and brace posts installed on the project.

Metal Gate Posts for ___ mm Chain Link Fence, Double Gate will be measured and paid for in units of each for gateposts installed on the project.

Metal Gate Posts for ___ mm Chain Link Fence, Single Gate will be measured and paid for in units of each for gate posts installed on the project.

Double Gates, ___ High, ___ Wide, _____ Opening will be measured and paid for in units of each for the number of gates actually erected on the project. Double gates will be measured as one gate.

Single Gates, ___ High, ___ Wide, ___ Opening will be measured and paid for in units of each for the number of gates actually erected on the project.

Additional Barbed Wire will be measured and paid for in linear meters of wire installed in the work, complete and in place. Measurement of additional barbed wire will 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.

Setting sleeves in retaining wall will not be paid for as such work is considered incidental to the other pay items in this specification.

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.

Payment will be made under:

Pay Item	Pay Unit
Woven Wire Fence, ___mm Fabric	Linear Meter
Chain Link Fence, ___mm Fabric	Linear Meter
___ Strand Barbed Wire Fence with Posts	Linear Meter
___mm Timber Fence Posts, ___m 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
Double Gates, ___ High, ___ Wide, ___ Opening	Each
Single Gates, ___ High, ___ Wide, ___ Opening	Each
Additional Barbed Wire	Linear Meter

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.

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 MEASUREMENT AND PAYMENT

___ *Fence Reset* will be measured and paid for in the 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. Such price 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.

Payment will be made under:

Pay Item	Pay Unit
___ Fence Reset	Linear Meter

SECTION 869 RELAPPING GUARDRAIL

869-1 DESCRIPTION

Relap either existing or recently installed guardrail in accordance with the requirements of the contract and where directed.

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

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relapping of guardrail and have it inspected prior to shifting traffic into a new traffic pattern. All guardrail shall be lapped in the direction of traffic prior to placing traffic next to the guardrail.

869-3 MEASUREMENT AND PAYMENT

Relapping Guardrail will be measured and paid for in 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. Such price includes but is not limited to providing all necessary labor, tools, equipment, and materials necessary to acceptably relap the guardrail.

Payment will be made under:

Pay Item	Pay Unit
Relapping Guardrail	Linear Meter

**SECTION 876
RIPRAP**

876-1 DESCRIPTION

Place riprap at the locations designated in the contract and as directed.

876-2 MATERIALS

Refer to Division 10.

Item	Section
Plain Riprap	1042
Filter Fabric for Drainage, Type 2	1056

Plain riprap consists of quarry run stone, or field stone, or broken concrete, and is classified by size into either Class 1 or Class 2. Plain riprap when classified as either Class A or Class B shall consist of quarry run stone or field stone. Use the class and thickness called for on the plans. Place filter fabric under plain riprap where indicated in the plans.

876-3 PLAIN RIPRAP

Place the stone where indicated in the plans, unless otherwise directed. 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 riprap to form a properly graded, dense, neat layer of stone.

Install the riprap to at least the thickness indicated on the plans. At locations where riprap is required for channel changes and drainage ditches, place the riprap prior to diverting the water into the channel changes and drainage ditches.

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

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

Do not leave fabric uncovered for more than 7 days. Lay the fabric smooth and free from tension, stress, folds, wrinkles, or creases. Make horizontal overlaps a minimum of 300 mm with the upper fabric overlapping the lower fabric. Make vertical overlaps a minimum of 450 mm with the upstream fabric overlapping the downstream fabric. Place the riprap in a continuous manner. Protect the fabric from damage while placing riprap or other materials.

In the event that the fabric is displaced or damaged during riprap placement, remove the riprap and reposition or replace the fabric prior to replacement of the riprap, all at no additional cost to the Department.

876-4 MEASUREMENT AND PAYMENT

Riprap, Class__ will be measured and paid for in metric tons that has been incorporated into the completed and accepted work. The riprap will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

Filter Fabric for Drainage will be measured and paid for in square meters measured along the surface of the ground, over fabric that has been acceptably placed. No separate measurement will be made for overlapping fabric, sewing seams or bonding.

Such price will include, but is not limited to all excavation, embankment preparation, and backfilling; and stone or broken concrete riprap, filter fabric, and other materials.

Payment will be made under:

Pay Item	Pay Unit
Riprap, Class_____	Metric Ton
Filter Fabric for Drainage	Square Meter