I - INTRODUCTION

CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

Construction of the Concord River Greenway Pedestrian Walkway, Phase III-A (West), Centennial Apartments to Rogers Street, in the City of LOWELL

SCOPE OF WORK

The work to be done under this contract consists of the construction of a pedestrian walkway along the Concord River in Lowell. The project begins at property line of Centennial Island Apartments, and continues along the west bank of the Concord River to Jolene Dubner Park at Rogers Street. Total distance is 725.71 linear feet (approximately of 0.14 miles). The proposed pedestrian walkway cross section consists of an 8 foot wide hot mix asphalt surface with 1 to 3 foot soft surface shoulders.

The work also includes clearing and grubbing, excavation, filling, wood rail fence, straw wattle, tree trunk barrier, retaining walls, signs, pavement markings, construction safety controls, and other miscellaneous improvements along the pedestrian walkway. Items contained in these special provisions and description of items refers to locations laid out in plan set entitled *"Lowell- Concord River Greenway;* **Phase III-A (West), Centennial Apartments to Rogers Street**. All work done under this contract shall be in conformance with the Massachusetts Highway Department *Standard Specifications for Highways and Bridges*, dated 1988 and the English *Supplemental Specifications*, dated June 6, 2006; the Standard Special Provisions contained in this book, the *1977 Construction Standards* and the *Supplemental Drawings* dated April 2003*; the latest edition of the Manual on Uniform Traffic Control Devices* with revisions; the *1990 Standard Drawings for Signs and Supports*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the *Plans* and these *Special Provisions.*

EMAIL ADDRESS FOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Contractors should email questions and addendum acknowledgements to the following email

Address: PMVaughn@lowellma.gov.

DESIGNER PROJECT MANAGER:

David Beati, Greater Lowell Engineering Associates, LLC,

info@lowellengineers.com

PROTECTION OF UNDERGROUND FACILITIES

The Contractor's attention is directed to the necessity of making his own investigation in order to assure that no damage to existing structures, drainage lines, etc., will occur. The Contractor shall notify the Massachusetts DIG SAFE and procure a dig safe number for each location prior to disturbing existing ground in any way. The telephone number of the DIG SAFE Call Center is 1-888-344-7233 (1-888-DIG-SAFE).

If live service connections are to be interrupted by excavations of any kind, the Contractor shall not break the service until new services are provided. Abandoned services shall be plugged off or otherwise made secure. Operation of all existing water system valves shall be by the City of Lowell or their authorized representatives.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all the work involved in protecting or repairing property as specified in this section, shall be considered as included in the prices paid for the various contract items of work, and no additional compensation will be allowed therefore.

NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsections 5.05, 7.13 and 7.18)

The Contractor shall cooperate with the City of Lowell's Department of Public Works and be responsible for contacting all utilities to obtain construction requirements and coordinate construction operations. The Contractor shall make all necessary alterations under the appropriate items, which shall include the cost of all labor, materials, equipment, and other incidental items necessary to perform the work required.

SUBSECTION 4.06 INCREASED OR DECREASED CONTRACT QUANTITIES

Replace this Subsection with the following: (Revised – 3/23/ 2007)

The quantities contained in the Contract are set forth as a basis for the comparison of bids only and may not necessarily reflect the actual quantity of work to be performed. The City of Lowell reserves the right to increase, decrease or eliminate the quantity of any particular item of work.

Where the actual quantity of a pay item varies more than 25 percent above or below the estimated quantity stated in the Contract, an equitable adjustment in the Contract Price for that pay item shall be negotiated upon demand of either party regardless of the cause of the variation in quantity. No allowances will be made for loss of anticipated overhead costs or profits suffered or claimed by the Contractor resulting directly or indirectly from such increased, decreased or eliminated quantities or from unbalanced allocation among the contract items from any other cause. It is the intention of this provision to preserve the bid basis while limiting the Contractor's risk exposure to 25% of each bid quantity.

In the case of an overrun, the contractor will be compensated at the Contract Unit Price for a quantity up to 125% of the Contract quantity. The adjusted unit price shall only be applied to that quantity above 125% of the contract quantity.

Neither party shall be required to demonstrate any change in the cost to perform the work based solely on the overrun. The original Contract unit bid price shall have no bearing on determining the adjusted unit price for an overrun. The adjusted unit price shall be based on the estimated cost of performing the added work over 125% of the bid quantity. In the event that an adjusted unit price cannot be agreed upon within 60 days after being requested by either party, a unit price will be established that is deemed to be fair and equitable by the Engineer, whether higher or lower than the unit price bid. Payment will be made at that rate until agreement is reached or until the Contractor chooses to exercise his rights under Section 7.16.

To assist the Engineer in the determination of an equitable adjustment for an overrun, the Contractor shall prepare a submission in the following manner and accept as full payment for work or materials an amount for an equitable adjustment in the Contract Price equal to the following:

The actual cost or a reasonable cost estimate for direct labor, material (less value of salvage, if any) and use of equipment, plus 10 percent of this total for overhead;

Plus actual cost or a reasonable cost estimate of Worker's Compensation and Liability Insurance, Health, Welfare and Pension Benefits, Social Security deductions and Employment Security Benefits; plus 10 percent of the total of (1) and (2) for profit and other unallocated costs; plus the estimated proportionate cost of surety bonds. No allowance shall be made for general superintendence and the use of small tools and manual equipment.

For work performed by a Subcontractor, the Contractor shall accept as full payment therefore an amount equal to the actual cost or the reasonable cost estimate to the Contractor of such work as determined by the Engineer, plus 10 percent of such cost. The Subcontractor is bound by the same criteria for the determination of an equitable adjustment as the Contractor.

In the case of an underrun, the unit price for the actual quantity installed, if less than 75% of the bid quantity, shall only be adjusted to account for increased unit costs that result solely from the

decreased quantity. The adjusted unit price shall be the bid price plus the demonstrated unit change in the cost of performing the work due solely to the decreased quantity.

The Contractor shall prepare a submission demonstrating actual increased unit costs for review and evaluation by the Engineer. No allowance will be made for loss of anticipated overhead costs or profits suffered or claimed by the Contractor resulting directly or indirectly from such decreased or eliminated quantities.

The Contractor is required to furnish itemized statements of cost and give the Department access to supporting records.

PERSONAL PROTECTIVE SAFETY EQUIPMENT FOR CONTRACTOR PERSONNEL

The Contractor is responsible to ensure that all personnel, including all subcontractors, working on the project are issued and are wearing all necessary personal protective safety equipment while working within the project limits. This equipment shall include, as a minimum, a hardhat and a safety vest, regardless of the type of work being performed. Other safety equipment shall be added as required to perform the work in which they are engaged and in accordance with all local, state and federal requirements in effect. Safety equipment shall be provided at no additional cost to the City of Lowell.

WORK SCHEDULE

Work on this project is restricted to a normal 8-hour day, 5-day week, with the Prime Contractor and all Subcontractors working on the same shift, except for emergency work necessary to maintain safety standards or unless specifically approved by the Engineer.

JOINTS

(Supplementing Subsection 460.65)

The application of hot poured rubberized asphalt sealer, where required in accordance with Subsection 460.65 of the Supplemental Specifications, shall be considered incidental to the work included under Item 460.

EROSION AND SEDIMENT CONTROL

(Supplementing Section 7.02)

This work shall consist of temporary and permanent control measures as shown on the plans or as ordered by the Engineer during the life of the contract to control erosion and sedimentation. An erosion control system consisting of straw wattle is to be installed along any areas of construction adjacent to wetland resource areas.

Temporary erosion and sediment control provisions shall be coordinated with the permanent control features to the extent practical to assure economical, effective and continuous control throughout the construction and post-construction period.

The erosion and sediment control features installed by the Contractor shall be satisfactorily maintained by the Contractor until acceptance.

In the event of conflict between these specifications and laws, rules, and regulations of local agencies, the more restrictive requirements shall apply.

In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as part of the work as scheduled, and such additional measures are ordered by the Engineer, the work shall be performed by the Contractor at his own expense. Temporary erosion and sediment control work, which is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls, will be

performed as ordered by the Engineer.

Repeated failures by the Contractor to control erosion, pollution, and/or siltation shall be cause for the Engineer to employ outside assistance or to use his own forces to provide the necessary corrective measures. The cost of such assistance, plus project engineering costs, will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.

ARCHITECTURAL ACCESS BOARD TOLERANCES

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards. All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR - Rules and Regulations of the Architectural Access Board (AAB).

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions. Contractors shall establish grade elevations at all wheel chair ramp locations, and shall set

transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans). All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

ASPHALT BINDER

In order to allow an efficient transition from viscosity graded Asphalt Cement (AC) specifications to performance graded Superpave Binder (PG) specifications (non-modified binder), the Massachusetts Highway Department is replacing AC graded products with PG binder as follows:

Projects requiring AC-20 will be constructed using PG 64-28

Projects requiring AC-5 will be constructed using PG 52-34

The Contractor shall follow existing mix design requirements and produce the hot-mix using the required grade of PG binder. The binder supplier shall provide the Resident Engineer with PG test results and a certification of the PG binder grade when PG binder is substituted for AC grade asphalt. This testing and certification shall be based on the existing lot numbering system. The binder supplier shall not mix AC and PG binders in the same tank, unless tested and certified to meet the specified grade. Performance-Graded asphalt shall not have a higher temperature grade than specified without prior approval.

PROVISIONS FOR TRAVEL AND PROSECUTION OF WORK

(Supplementing Subsections 7.09, 7.10 and 8.03)

The Contractor shall prepare and submit to the Engineer a Schedule of Operations as provided in Section 8.02. The work schedule shall include a plan of the construction procedures and the safety measures that will be used during the prosecution of work as set forth in Section 850 of the Mass Highway Standard Specifications for Highways and Bridges. No work shall be started until the Engineer’s approval of the schedule is received.

The Contractor shall also be responsible for notifying the City of Lowell, in writing, at least two weeks in advance of commencement of work.

DELIVERY AND STORAGE OF MATERIALS

(Supplementing Subsection 6.03)

Equipment and materials to be used in the work under this Contract shall be delivered sufficiently in advance of their proposed use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for the work. The Contractor shall so schedule his work to avoid delays due to late delivery of any materials. The Contractor shall have no basis of claims for delays resulting from his failure to order materials in a timely fashion.

DISPOSAL OF SURPLUS EXCAVATED MATERIALS

Surplus materials obtained from any type of excavation, and not needed for further use as determined by the Engineer shall become the property of the Contractor and shall be disposed of by him outside the location subject to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

DISPOSAL OF SURPLUS MATERIALS

All existing and other materials not required or needed for use on the project, and not required to be removed and stacked, shall become the property of the Contractor and shall be removed from the site during the construction period and legally disposed of. No separate payment will be made for this work, but all costs in connection there with shall be included in the prices bid for various contract items.

SAFETY CONTROLS FOR CONSTRUCTION OPERATIONS

(Supplementing Subsections 850.21 and 850.61)

Safety controls for construction operations shall be done in accordance with the relevant provisions of Section 850 of the Standard Specifications, the Manual on Uniform Traffic Control Devices, and the following:

The providing of safety controls for construction operations shall be considered incidental to this contract and the costs for safety controls shall be included in the unit bid price for those contract items requiring such controls.

Positioning, adjusting and re-positioning of all devices such as traffic cones, high level warning devices, etc., not otherwise classified and paid for under other items in this contract, is considered incidental and no separate payment will be made.

ENVIRONMENTAL

If field conditions and/or Contractor-proposed erection, demolition, storage, or other procedures not originally allowed by existing environmental permits require work to occur in or otherwise impact water or wetland resource areas, the Contractor is advised that no associated work can occur until all required environmental permits have been either amended or obtained allowing such work. The Contractor must notify the Project Manager and Resident Engineer in writing at least 60 days prior to desired commencement of the proposed activity. All environmental submittals, including any contact with Local, State, or Federal environmental agencies, must be coordinated with the Department of Planning and Zoning. The Contractor is expected to fully cooperate with requests for information and provide same in a timely manner. The Contractor is further advised that the City of Lowell will not entertain a delay claim due to the time required to modify or obtain the environmental permits. As a supplement to Section 7.00 of the Standard Specifications, the Contractor is reminded that no debris of any type shall be allowed to enter water or wetland resource areas, either temporarily or permanently.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION FILE NUMBER SIGN (Supplementing Subsection 7.01)

This project is subject to Massachusetts General Laws, Chapter 131, Section 40 as amended. Signs shall be in accordance with the latest MHD Construction Standards. All costs for the manufacture, erection, maintenance, moving, and removal of the signs shall be absorbed by the contractor with no additional compensation other than the contract unit prices.

CONSTRUCTION ACCESS

Construction Access information to be obtained through contact with the City of Lowell DPD and the following email:

Address: plucken@lowellma.gov.

II - DESCRIPTION OF ITEMS

ITEM 101.	CLEARING OF GRUBBING	ACRE
ITEM 102.	SELECTIVE CLEARING & THINNING	ACRE
ITEM 102.5	ROADSIDE TREE PROTECTION	EACH
ITEM 103.	TREE REMOVED - DIAMETER UNDER 24 INCHES	EACH
ITEM 104.	TREE REMOVED - DIAMETER 24 INCHES AND OVER	EACH
ITEM 105.	STUMPS REMOVED	EACH
ITEM 120.1	UNCLASSIFIED EXCAVATION	CUBIC YARD
ITEM 121.	CLASS 'A' ROCK EXCAVATION	CUBIC YARD
ITEM 151.	GRAVEL BORROW-SPREAD, COMPACTED	CUBIC YARD
ITEM 180.1	HEALTH AND SAFETY PLAN	LUMP SUM
ITEM 180.2	IMPLEMENTATION OF HEALTH AND SAFETY PLAN	HOUR
ITEM 180.3	PERSONNEL PROTECTION LEVEL 'C' UPGRADE	HOUR
ITEM 180.4	MONITORING/HANDLING AND STOCKPILING OF CONTAMINATED SOILS	CUBIC YARD
ITEM 180.5	LICENSED SITE PROFESSIONAL	HOUR
ITEM 180.6	MISCELLANEOUS SOIL TESTING	EACH
ITEM 181.1	DISPOSAL OF CONTAMINATED SOIL	TON
ITEM 223.	FRAME AND GRATE-REMOVED AND RESET (CATCH BASIN)	EACH
ITEM 420.	ASPHALT SIDEWALK-BASE COURSE	TON
ITEM 460.	ASPHALT SIDEWALK-TOP COURSE	TON
ITEM 464.	BITUMEN FOR TACK COAT	GAL
ITEM 597.	EDGING REMOVED AND DISCARDED	FEET
ITEM 644.072	72 INCH CHAIN LINK FENCE	FEET
ITEM 655.3	WOOD RAIL FENCE	FEET
ITEM 665.	FENCE - REMOVED AND STACKED	FEET
ITEM 693.	MODULAR BLOCK RETAINING WALL	SQUARE FOOT
ITEM 697.	SEDIMENTATION FENCE	FEET
ITEM 707.8.	STEEL BOLLARDS	EACH
ITEM 748.	MOBILIZATION	LUMP SUM
ITEM 750.01.	BICYCLE RACK ITEMS	EACH
ITEM 751.	LOAM BORROW	CUBIC YARD
ITEM 756.	NPDES STORMWATER POLLUTION PLAN	EACH
ITEM 765.	LOAM AND SEED (4" DEPTH, HYDROSEED)	CUBIC YARD
ITEM 767.4	WOOD CHIP MULCH	CUBIC YARD
ITEM 767.8.	BAYS OF HAY FOR EROSION CONTROL	EACH
ITEM 775.	MISCELLANEOUS TREE/SHRUB PLANTING	EACH

ITEM 852.	SAFETY SIGNAGE FOR CONSTRUCTION OPERATION (AS NEEDED)	EACH
ITEM 853.1	PORTRABLE BREAKAWAY BARRIERS	EACH
ITEM 860.	4 INCH WHITE LINE PAINTED	FEET

III - TECHNICAL SPECIFICATIONS

FORWARD

For the purpose of governing the work to be done under this Contract, the Owner has adopted as its Standard Specifications format the "Standard Specifications for Highways and Bridges", published by the Commonwealth of Massachusetts, Massachusetts Highway Department, dated 1988 including the Supplemental Specifications dated June6, 2006. These Standard Specifications arc herein referred to as the "Standard Specifications."

This Standard Specifications shall apply as if reprinted herein except as modified by the General Conditions, Special Conditions and the following Technical Specifications.

In case of conflict between these documents, the Supplement to Standards and the Special Provisions of these Specifications will govern.

PRESERVATION OF EXISTING VEGETATION

The Contractor shall take all necessary care when excavating or working in the vicinity of existing trees so that the foot systems, trunks and branches arc not damaged. All precautions shall be taken to insure that heavy equipment does not damage any roots, including those that lie below the limits of excavation.

Do not store equipment or stockpile materials within drip line of trees or in areas enclosed by tree protection fencing.

Extreme care shall be exercised during excavation operations beneath the canopy of trees designated to be preserved. All excavation within ten feet of designated trees shall be performed by hand labor to preserve the root system of the tree.

Avoid any direct soil contamination in root zone area by petroleum, petroleum products or solvents, salts or any other pollutant during construction.

All cutting or trimming of trees to be preserved shall be executed by a Massachusetts Certified Arborist. The Contractor shall provide the Engineer with a copy of the certification prior to any work on trees.

Trees that, in the judgment of the Engineer, have been irreparably damaged by the Contractor shall be replaced in kind and in size, or, with a quantity of 2" caliper replacement trees (the quantity of which shall be determined by the Engineer) such that the cumulative caliper of the replacement trees shall be up to the equivalent of diameter of the lost tree at breast height. Cost of replacement trees shall be paid by the Contractor.

All costs associated with the removal of the destroyed tree, including roots and stump, as well as the cost of replacement trees, shall be paid for by the Contractor.

ITEM 101. CLEARING & GRUBBING

DESCRIPTION

101.20 General.

This work shall consist of clearing, grubbing, cutting, removal and disposal of all vegetation and debris from areas either within or outside of the Right-of-Way as shown on the plans or designated

by the Engineer. The work shall also include the preservation from injury or defacement of all vegetation and objects designated by the Engineer to remain.

CONSTRUCTION METHODS

101.60 General.

The burning of trees, brush, stumps, etc., will not be permitted. The Contractor shall provide others satisfactory methods of disposal without additional compensation.

The Contractor shall obtain written permission of the Engineer for use of storage areas within the Right-of-Way requiring clearing and grubbing or selective clearing and thinning. Any clearing for the Contractor's convenience shall be done at his own expense. All such areas shall be restored to a condition acceptable to the Engineer including necessary mulching, seeding, and planting without additional compensation.

The Engineer shall be provided with notarized copies of agreements between the Contractor and owners of land used as disposal or storage areas. When fencing is installed outside normal clearing areas, every reasonable effort shall be made to preserve trees or shrubs whose removal is not essential to the installation of the fencing.

Acceptable material obtained on the project may be used to produce wood chip mulch. The Contractor shall use an approved chipper and 1/4 inch knife setting as described under Subsection M6.04.3. Wood Chip Mulch. Material obtained from Elm trees shall not be accepted for use.

Wood chips produced on the project from clearing and grubbing shall be stockpiled within the location and used where and as directed.

Except for materials used for making wood chip mulch, the Contractor shall make all arrangements and negotiations necessary for the satisfactory disposal of trees, shrubs, stumps, roots, dead wood and other litter, in areas outside the Right-of-Way and in such manner that no conditioner accumulation of material shall be permitted to disfigure or mar the finished landscape.

101.61 Clearing and Grubbing.

The stumps of all trees, brush and major roots shall be grubbed and removed in all excavation areas and under all embankments where the original ground level is within 3 ½ feet of the subgrade or slope of embankments. All trees, stumps, and brush shall be cut off within 6 inches of the ground in embankment areas where the original ground level is more than 3 ½ feet below the subgrade or slope of embankments. Trees and shrubs that are specifically designated by the Engineer not to be cut, removed, destroyed or trimmed shall be saved from harm and injury.

All damage done to trees by the Contractor's operation and all branches of trees extending within the roadway shall be trimmed and painted where cut as directed to provide a 20-foot minimum vertical clearance including selective trimming of such trees as directed.

101.62 Selective Clearing and Thinning

A. General.

The work under this item shall consist of the removal of hazardous growth and dead, dying or diseased plant material; the removal of groups and individual plants which interfere with the growth of more desirable types of trees and the clearing away of lesser growth that may obscure outstanding trees, tree groups, or scenic views. Any part of tree trunks or base of plant material located on the Location Lines shall be considered within the State Highway Limits.

Densely wooded areas shall be thinned to provide space for healthy growth by eliminating thinner,

weaker trees and the reduction of number of varieties.

The Contractor's attention is called to the requirements for work under this item. The desired appearance to be attained in certain areas of heavy growth may require three or more operations. First, the obvious dead, dying and diseased trees and undergrowth shall be cut and cleared out of the area. This work includes removal of any previously fallen trees, branches, uprooted stumps and other debris as directed. Next, the area is to be thinned out, as directed, by removing the less desirable trees and brush which interfere with the growth of the better plant material. Finally, clear out lesser growth which may obscure outstanding trees, tree groups or scenic views.

Tree up-branching and shaping under this item will be restricted to trees which have limbs and branches restricting sight distance, extending over roadways, shoulders, tumouts, etc. Up-branching or trimming will be required to produce a 20-foot minimum vertical clearance over all locations described hereinbefore, and the removal of limbs and branches involved in this operation shall be accomplished as outlined hereafter.

B. Prosecution of Work (Supplementing Subsection 8.03).

Quality of work must conform with accepted tree trimming practices. All trimming and pruning shall conform to recognized tree surgery practices, and particular note should be made that painting with an approved tree dressing or paint, will be required on all cuts 2 inches or over in diameter.

The dressing or paint shall be applied no later than two days after the cuts are made. Recognized tree surgery practices include among many others, the fact that all limbs and branches which require removal and all stubs regardless of age must be cut flush either to a union with the next larger sound limb or branch or flush to the trunk of the tree.

The cutting shall be performed by experienced woodsmen. Trained tree climbers are required for pruning of tall growth. Care shall be exercised by the Contractor to prevent injury to trees and shrubs designed to be preserved. Any injury to limbs, bark or roots of such plants shall be repaired by the Contractor, as directed, or the plants replaced without additional compensation for such repair or replacement.

C. Cutting and Treatment of Stumps and Stubble.

Standing trees, undesirable brush and existing stumps to be removed shall be cut flush with the ground and a 2' ,tolerance permitted and the resulting stumps or stubble then brushed or sprayed with a chemical spray material conforming to the requirements of M9.02.0 of Division II, Materials.

Application shall be by brush or spray so as to give complete coverage and wetting to the point of runoff. This application shall be completed within two days after the cutting.

As the specified chemical herbicide is harmful to desirable roadside growth, the Contractor shall apply the chemical in such a manner that damage will not occur either from the direct spray or from drift of the chemical to any desirable growth.

The Contractor shall use all necessary precautions to prevent injury to crops or damage to other desirable growth on private abutting property, as well as to those within the Right-of-Way, and shall assume full responsibility for any damage.

D. Disposal of Cuttings.

The Contractor may dispose of cut material by processing into a wood chip mulch as described in Subsection M6.04.3 and spreading uniformly throughout the cleared and thinned areas as directed by the Engineer.

101.63. Disposal of Trees.

All trees to be cleared shall become the property of the Contractor, and the satisfactory disposal of the wood in such trees outside the Right-of-Way shall become his responsibility. The trees, including cuttings and slash shall be disposed after cutting as soon as practicable and in such a manner as not to detract from the appearance of the roadside. If the existing ground in the area is disturbed by any of the work or equipment, the Contractor shall rough-grade and loam and seed if necessary the disturbed areas, if so directed, without additional compensation.

101.64. Disposal of Stumps and Brush.

After removal, all stumps including the major root system shall be disposed by the Contractor at his own responsibility outside the layout where the material will not cause obstructions to streams and will not detract from the appearance of the roadside.

101.65. Disposal of Dutch Elm Diseased Wood.

Dutch Elm diseased wood shall be disposed of in accordance with the provisions of General Law, Chapter 87, Section 5 and Chapter 132, Sections 8 and 11, as amended; and in accordance with any additional local regulations.

Where the work includes the removal of elm trees or the limbs of elm trees, such trees or limbs thereof shall be disposed of immediately after cutting or removal and in such a manner as to prevent the spread of Dutch Elm disease. This shall be accomplished by covering them with earth to a depth of at least 6 inches in areas outside the highway location where the Contractor has arranged for disposal. Where the work includes the removal and disposal of stumps of elm trees, such stumps shall be completely disposed of immediately after cutting in the manner specified above.

COMPENSATION

101.80 Method of Measurement.

Clearing and grubbing shall be measured by the horizontal plane area and will be the number of acres within the limiting stations of the project and/or as designated by the Engineer and the outside limits of measurement shall extend to a point 5 feet beyond the top or bottoms of slopes, excluding existing roadway and shoulder surfaces, streams or bodies of water.

Areas outside of the limits specified above, when cleared and grubbed in connection with the construc-tion of fences shall be computed on the basis of a ten foot width multiplied by the total length of fencing installed, and when done in connection with excavating ditches or trenches the width shall be limited to 5 feet beyond the outer edges of the excavation.

Measurement of selective clearing and thinning will be based on the actual number of acres which receive the required attention. Approximate locations will be shown on the plans or detail sheets and as designated in the field by the Engineer. Only such trees as have a shortest diameter of at least 9 inches and less than 24 inches shall be included in the item of Trees Removed (Diameter Under 24 Inches). Only such trees as have a shortest diameter of 24 inches or more shall be included in the item of Trees Removed (Diameter 24 Inches and Over).

The item of Stumps Removed shall include the removal and satisfactory disposal of all tree stumps which remain in their original position and measure 9-inches or more in shortest diameter at the cutoff point, where the trees have been previously removed by others. A stump shall not be construed as a tree under these specifications unless the trunk extends over 6 feet above the average ground.

Trees or stumps to be removed which have the shortest diameter specified for payment will be measured in place by the following procedure:

Where the tree consists of a single trunk extending more than a 3 foot vertical height above the

average natural ground line, the shortest diameter shall be measured at the 3 foot level above the average elevation of the original ground.

Any tree whose main trunk separates into multiple trunks or which has limbs or branches growing out from the main trunk below the 3 foot level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins.

The shortest diameter of a stump shall be measured at the cutoff except that where multiple growth begins below cutoff, the shortest diameter shall be measured at the main trunk where multiple growth begins.

Measurement for payment under the respective items shall be such that any individual growth to be classed as a tree stump shall be measured in a manner to limit payment to one single tree or stump at each particular location of the individual growth. When multiple trunks with a common root system are separated at ground level each separate trunk shall be considered as an individual growth under these specifications.

The quantity of trees or stumps to be paid for will be the number actually removed by the Contractor in the completed and accepted work as determined by count. Wood chip mulch produced from Clearing and Grubbing will be measured by the cubic yard (truck load measure) at time of spreading.

101.81 Basis of Payment

Clearing and Grubbing and Selective Clearing and Thinning will be paid for at the contract unit price per acre.

When Clearing and Grubbing is not included in the Proposal as a payment item, payment for any such work will be included in the items of Earth Excavation or Borrow except as herein provided for the removal of trees and stumps.

The removal of trees, including the stumps there of and required spray material will be paid for at the con-tract unit price each for the particular kind of work involved, as defined herein be fore when a quantity is given in the Proposal under their respective items, otherwise this work will be paid for at the contract unit price for excavation or at the contract unit price per acre of Clearing and Grubbing or Selected Clearing and Thinning, whichever is applicable. The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations. The contract unit price for the respective items shall not include any trees or stumps removed from the area paid for under the item of Clearing and Grubbing or Selected Clearing and Thinning.

No payment shall be allowed for preparation and spreading of wood chip mulch used from areas included under Selective Clearing and Thinning. Wood chip mulch directed to be produced from Clearing and Grub-bing shall be paid for complete in place at the contract unit price. Only such trees or stumps as have a shortest diameter of 9 inches and over, measured as stipulated in Subsection 101.80 shall be included for payment.

Payment Items

101. Clearing and Grubbing	Acre
102. Selective Clearing and Thinning	Acre
103. Tree Removed (Diameter Under 24 Inches)	Each
104. Tree Removed (Diameter 24 Inches and Over)	Each
105. Stump Removed	Each
767.4 Wood Chip Mulch	Cubic Yard

ITEM 102. SELECTIVE CLEARING AND THINNING ACRE

Work under this item shall conform to the applicable provisions of Section 101 of the Standard Specifications and the following:

The stumps of all trees, brush and major roots shall be cut flush with the ground within the limits shown on the Plans. The Contractor shall clearly mark the limits of clearing and limits of selective clearing and thinning for review by the Engineer prior to any tree clearing operations. The Contractor shall take all measures necessary to protect existing vegetation that is tagged "To Be Saved" by the Engineer. Special care shall be taken to maintain as much of the existing screening between the pedestrian walk and abutting homes. All clearing shall be done under direct supervision of the Engineer. Provide and maintain protection fencing around trees to remain within the limits of clearing as labeled on the contract drawings or as directed by the Engineer. Fencing shall be placed a minimum of ten (10) feet from the base of the tree trunks unless otherwise directed by the Engineer. Install fencing prior to construction and maintain until substantial completion with the approval of the Engineer. Fencing damaged during construction shall be immediately reinstalled at the direction of the Engineer at no additional cost to the City.

Do not stockpile fill or building materials around bases of trees to remain. Existing trees designated to be saved which have, in the opinion of the Engineer, become damaged, shall be replaced with trees of similar size and pecies, and all expenses involved therein and so incurred shall be paid by the Contractor. All branches of trees extending within the limits shown shall be trimmed as directed, to provide a 14 foot minimum vertical clearance, including selective trimming of such trees as directed.

Where selective trimming is directed, all dead, dying, broken and certain other limbs and branches shall be removed along with any dead, dying or broken twigs that are accessible to the tree climber in the area in which he is working. No climbing irons will be allowed. Any part of tree trunks or base of plant material located along the defined limit shall be considered within the limits of work. All cuttings shall be processed into a wood chip mulch and spread uniformly adjacent to clearing limits or as directed. All trimming and pruning shall conform to recognized tree surgery practices and no painting will be required.

ITEM 102.5 ROADSIDE TREE PROTECTION EACH

The purpose of this item is to prevent damage to branches, stems and root systems of existing individual trees to remain and to ensure their survival. Provisions under this item include steps to minimize soil and root disturbance and to construct protection measures for trees close to construction areas.

The work under this item shall conform to the relevant provisions of Sections 101 and 771 and the following:

EXAMINATION OF CONDITIONS

The Contractor shall be solely responsible for judging the full extent of the work requirements, including, but not necessarily limited to any equipment and materials necessary for providing tree protection.

Prior to any construction activities, the Contractor and certified Arborist shall walk the site with the Resident Engineer, City Planner, and City Tree Warden to identify which trees will require protection and to determine approved measures. The Arborist shall make recommendations as to appropriate methods to trees. The Engineer will have final decision as to trees and methods.

The Contractor is responsible for the protection of all existing trees and plants within and immediately adjacent to the construction area that are not designated to be removed for the length of the construction period. Incidental to the cost of these items, the Contractor shall retain the services

of a certified arborist, who shall make recommendations as to the specific appropriate treatment of trees within or near the work zone.

SUBMITTALS

Incidental to this item, the Contractor shall provide to the Engineer one copy each of:

"Standards for Pruning Shade Trees" of the National Arborist Association, 174 Route 101, Bedford, New Hampshire, 03102

American National Standards Institute (ANSI) Standard Z-133.1

A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance, Part 1:

Pruning.

These references shall be kept by the Resident Engineer at his office for the length of the Contract. Prior to start of work, the Contractor shall submit to the Engineer the name and certification number of the Massachusetts Certified Arborist referenced herein. Cost for Certified Arborist for all activities pertaining to this Item shall be incidental to this item.

MATERIALS

Fence and temporary fence posts shall be subject to the approval of the Engineer.

Fencing for individual plants shall be polyethylene fencing or chain link fence (new or used), as specified under Standard Item 657., Temporary Fence.

Staking for individual tree protection fencing shall be steel posts or 2x4 inch stock as directed and approved by the Engineer.

Wood chips shall conform to provisions of Wood Chip Mulch under Materials Section M6.04.3.

Trunk protection shall be 2x4 inch cladding, at least 8 feet in length, clad together with wire.

Trunk protection shall include burlap.

Incidental to these items, the Contractor shall provide water for maintaining plants in the construction area that will have exposed root systems for any period during construction.

CONSTRUCTION

To the extent possible, to avoid soil compaction within the root zone, construction activities including, but not limited to, vehicle movement, excavation, embankment, staging and storage of materials or equipment shall not occur underneath the canopy (drip line) of trees to remain. Where these activities will occur within 10 feet of the canopy of trees, the Contractor shall provide Individual Tree Protection as specified herein.

TREE FENCING AND ARMORING

For individual tree protection, the Contractor shall set posts and fencing at the limits of the tree canopy. Where construction activities closer to the trees is unavoidable, the Contractor shall tie branches out of the way and place wood chips to a depth of six inches on the ground to protect the root systems. The Contractor shall wrap the area of the trunk of the tree with burlap prior to armoring with 2x4 inch cladding. Cladding for tree trunks shall extend from the base of the tree to at least eight feet from the base.

Where excavation within canopy is unavoidable, the Contractor shall use equipment and methods that shall minimize damage to the tree roots, per recommendations of the Certified Arborist. Such methods may require root pruning prior to, as well as during, any excavation activities.

All fencing, trunk protection, branch protection, and wood chips shall be maintained throughout the duration of the contract. Protective fencing shall be repaired and wood chip mulch replaced as necessary during the duration of the contract at no additional cost.

CUTTING AND PRUNING

Some pruning of roots and branches may be a necessary part of construction. Pruning will be performed on the same side of the tree that roots have been severed.

The Contractor shall retain the services of a Massachusetts State Certified Arborist to oversee any cutting of limbs, stem or roots of existing trees. All cuts shall be clean and executed with an approved tool. Under no circumstances shall excavation in the tree protection area be made with mechanical equipment that might damage the existing root systems.

Any tree root area exposed by construction shall be covered and watered immediately. Exposed tree roots shall be protected by dampened burlap at all times until they can be covered with soil.

WATERING

Water each tree within the construction area where work is in progress twice per week until the surrounding soil of each tree is saturated for the duration of construction activities.

REMOVAL OF PROTECTION

After all other construction activities are complete, but prior to final seeding, wood chips, temporary fencing, branch protection, and trunk protection materials shall be removed and disposed off site by the Contractor at no additional cost.

TREE DAMAGE

The Contractor shall be held responsible for the health and survival of the existing trees in the immediate vicinity of the of the construction area. Damage that, in the Engineer's opinion, can be remedied by corrective measures shall be repaired immediately. Broken limbs shall be pruned according to industry standards. Wounds shall not be painted. Trees or shrubs that are damaged irreparably shall, at the Engineer's discretion, be replaced per the requirements of Division I of these Special Provisions. Cost of replacement trees shall be borne by the Contractor.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Where the plans show specific, individual trees to remain and where grading or other disturbance is shown within the drip line of these trees or where the Engineer determines that an individual tree must be protected, these trees shall be protected and paid for under Item 102.5, Roadside Tree Protection.

Item payment shall be scheduled throughout the length of contract: 30 percent of value shall be paid upon installation, 30 percent approximately halfway through the contract, and the remainder to be paid at the end of the contract after completion of construction operations that would disturb plants and after the protection materials have been removed and properly disposed of offsite by the Contractor. Compensation for Roadside Tree Protection will be paid for at the contract unit price per each under Item 102.5. This shall include full compensation for all labor, equipment, materials and incidentals for the satisfactory completion of the work, including the services of a certified arborist, water and fertilizer, and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract. Cost of wood chips, as required, shall be incidental to these items.

SECTION 120 EXCAVATION

DESCRIPTION

120.20 General.

This work shall consist of excavation, disposal or compaction of all materials not being removed under some other item which is encountered within the limits of the Contract in accordance with the specifications and in close conformity with the lines, grades, thicknesses and cross sections shown on the plans or established by the Engineer. All excavation will be classified as "Earth Excavation", "Class A Rock Excavation" , "Muck Excavation' " "Topsoil Excavated and Stacked", "Bituminous Concrete Excavation by Cold Planer", and "Unclassified Excavation", as hereafter described.

Materials from all classes of excavation which are unsuitable, and any surplus of suitable materials remaining after completing the formation of embankments, shoulders, approaches, widening of roadway or embankment slopes as directed or backfilling, will be known as waste and shall be disposed of by the Contractor outside the Right-of-Way at his responsibility and expense, unless otherwise directed. Waste material shall not be disposed of in the flood channel areas of any stream.

120.21 Earth Excavation.

Earth Excavation shall consist of all excavation not included as Class A Rock Excavation or excavation which is otherwise classified and paid for.

Unless otherwise provided for in the Contract, Earth Excavation shall also include as incidental to the general work the removal and disposal of abandoned junk cars, trash, signs, fences, guardrail, guide posts, bituminous concrete berms and debris of every nature.

120.22 Class A Rock Excavation.

When encountered within the limits of roadway or channel excavation unless otherwise provided for the Proposal. Class A Rock Excavation shall consist of:

Igneous, metamorphic and sedimentary rock which cannot be excavated without blasting or the use of rippers.

All rock, stone, parts of stone, brick or cement concrete pavement, parts of cemented stone walls or masonry structures measuring one (1) cubic yard or more that require blasting for removal.

120.24 Topsoil Excavated and Stacked.

The work to be done under this item consists of excavating topsoil from certain locations listed on the details sheets and where directed, to the depths shown on the cross sections or as directed, and stacking the topsoil in accordance with the provisions of Subsection 120.65.

120.25 Bituminous Concrete by Cold Planer.

The work to be done under this item consists of removing, by Cold Planer, bituminous concrete in designated areas.

120.26 Unclassified Excavation.

This work shall consist of all excavation not provided for elsewhere in the Contract.

CONSTRUCTION METHODS

120.60 General.

A. Sequence of Operations.

When required, the Contractor shall so prosecute his work that traffic will be maintained over and

through the work with a maximum of safety and convenience in accordance with the provisions of Subsection 7.09, "Public Safety and Convenience".

The sequence of all excavation operations, earth or rock, shall be such as to insure the most efficient utilization of excavated materials into embankments (as specified in Section 150) and the use of a minimum amount of borrow. When the plans require excavation in areas in close proximity to existing roads, structures and utilities it shall be the responsibility of the Contractor at his expense to construct suitable drainage ditches or use other satisfactory means and methods to protect and maintain the stability of such roads, and structures located immediately adjacent to but outside the limits of excavation.

The Contractor's attention is directed to the requirements of the Prevention of Water Pollution and Erosion. The Contractor shall prosecute the work as to prevent the ponding of water. Each lift of excavation shall be visibly crowned to allow drainage of surface and rain water.

B. Disposal of Excavated Materials.

All suitable materials obtained from the excavation or from the removal of present structures shall be used either in the formation of embankments, shoulders, slopes, loam or clay hardening, etc., or for backfill under, over, or around structures, pipe culverts or drains and at such other places as directed and the material shall be placed and compacted in a manner conforming to the specifications for the particular type of work required without additional compensation. It shall be the Contractor's responsibility to obtain from the Engineer approval for the use and placing of various materials encountered in excavation.

It shall be the Contractor's responsibility to dispose of material designated as unsuitable and any excavated material which is not required, except as noted in Paragraph C of this subsection, outside of the Right-of-Way in such a manner as not to obstruct streams or otherwise impair the drainage, appearance, safety or efficiency of any structure or any other part of the road.

No materials from the excavation, nor from construction, shall be deposited in flood plains nor within 100 feet of any body of water without compliance under provisions of Chapter 131, Section 40 of the Massachusetts Wetlands Protection Act. Notification to the Engineer, in writing, will be required wherein such filling has been authorized by the local Conservation Commission.

No excavated material shall be placed outside of and adjacent to the Right-of-Way without the written approval of the Engineer. The Contractor shall certify he has proper releases from property owners within 500-feet of Right-of-Way which is used as disposal areas for unsuitable material.

The Contractor shall construct sod or other adequate retaining banks around perimeters of the disposal areas outside the project to protect existing roads, stream channels, and adjoining properties (including under-ground water supplies) against the spread of, or contamination by, the excavated material. Stream channels and ditches within and adjacent to the project shall be maintained as at present or as specifically altered by the design of the project.

All waste areas shall be thoroughly stabilized by means of drains, proper grading, mulching, loaming and seeding as required to promote vegetation and to insure the areas will not be subject to erosion.

C. Grading Outside of the Location.

Where directed, earth, loam, or borrow of the kind required shall be used for grading outside of the Right-of-Way and the surface shall be raked, smoothed and rolled. Excavation shall be made as directed on slopes or surfaces outside of and adjoining the location.

When temporary or existing roads are abandoned within the limits of highway work and beyond the limits of the main roadway slopes, their surfaces shall be removed and graded and loamed for a neat and natural appearance for proper drainage of surface water, as directed.

120.61 Earth Excavation.

This work shall be performed in the manner specified in Subsection 120.60 and Subsection 170.60.

120.62 Class A Rock Excavation.

Class A Rock Excavation shall be performed in accordance with the requirements specified in Subsection 120.60, with the following additional requirements:

The Contractor shall prosecute his work so that all rock available for disposal in embankments shall be removed previous to the final embankment formation. Rock shall be partially or completely stripped of over-burden, as directed, before removal operations are begun. Loose or shattered fragments of rock which may be a hazard to traffic shall be removed from the slopes.

120.65 Topsoil Excavation and Stacking.

This work shall consist of removing topsoil and stacking it where and as directed in accordance with the relevant requirements of Sections 120 and 121.

Much of the topsoil as will be selected, after testing by Department of material obtained from test pits, shall be stacked neatly outside the limits of the proposed slopes within the Right-of-way or such material may be temporarily stacked by the Contractor outside the Right-of-Way for his own convenience, with the approval of the Engineer, in which case the Contractor shall be responsible for all arrangements and negotiations. If the material stacked outside the Right-of-Way is not available when needed for use on the project, the Contractor will furnish at his expense an equal volume of equal material.

If the temporary storage areas outside the Right-of-Way require clearing and grubbing, the Contractor shall do such work without additional compensation. Storage areas shall be cleared, grubbed and rough graded so that maximum amount of stacked material will be available for reuse.

The Contractor shall take reasonable care to avoid leaving any unsightly condition and to avoid unneces-sary damage or injury to natural surroundings and roadside growth. The landscape shall be left in a satisfactory, neat and trim condition upon completion of the work.

COMPENSATION

120.80 Method of Measurement.

All classes of excavation except topsoil will be measured in their original position by the cross section method except where such measurement is impracticable the volume shall be measured by such other methods as the Engineer may determine.

In any case, payments will be made only for excavation to lines and grades as indicated on the plans or as directed. Pay limits for rock excavation actually removed will be as follows:

1. For side slopes.
   (a) In excavation for side-slopes up to a limit of 24 inches beyond and parallel to slope lines either shown on the plans or ordered in writing by the Engineer.
   (b) No allowance will be made for rock excavation beyond these specified lines in side slopes except that if ordinary borrow is required for the work and excess rock excavation is used in embankments such rock will be paid for as ordinary borrow.
2. Rock Excavation in curb and edging trenches not already paid for in previous rock excavation will be paid up to a width of 18 inches, providing rock extends to that width.
3. For area between side slopes.
   (a) in excavation to subgrade an allowance of a depth of 6 inches below subgrade lines.
   (b) In any other rock excavation an allowance of a depth of 6 inches below lines of proposed excavation.

Boulders which are to be included in the item for rock excavation will be measured at the point of removal.

Pre-splitting of rock will be measured by the square yard of exposed rock face, measured from the top of exposed rock to the bottom of the Class A Rock Excavation at the pre-split face, as directed.

Topsoil excavation will be measured in its original position by measuring the surface area of topsoil to be removed and measuring the depth to be removed by test pits prior to removal, or by the cross section method as determined by the Engineer.

120.81 Basis of Payment.

All classes of excavation will be paid for at the contract unit price per yard of the particular type of excavation as defined hereinbefore.

In Contracts where ordinary borrow is required, excavated material taken by the Contractor with the prior written permission of the Engineer, and used on the project for purposes other than for forming embankments will be paid for at the contract price for the purpose of which it is used, in addition to the payment to be made for excavation, provided that any additional filling material made necessary by such use shall be replaced except Bituminous Concrete excavated by Cold Planer.

The amount of borrow to be replaced shall be as follows:

If Class A Rock Excavation is used in revetment, the revetment shall be measured in its final position, and this computed quantity shall be divided by 1.20 and the resulting quantity shall be the amount of borrow to be replaced.

If Earth Excavation is used for gravel borrow, special borrow, etc., the amount of gravel borrow, special borrow, etc., as computed (including any percentage added to in place measurement) shall be the amount of borrow to be replaced.

Payment shall be made only for the purpose the borrow was used until such time as replacement borrow is supplied, at which time an equal volume of excavation will be paid for. In Contracts where excavated materials are used as described in the paragraph above and DO additional filling material is required, the following will govern:

Material such as gravel, sand, special borrow, or impervious soil borrow obtained in excavation and used as gravel, sand borrow, special borrow or impervious soil borrow will be paid for only at the contract price for the purpose used.

Topsoil obtained in excavation and stacked for future use on the project will be paid for at the contract unit price for the item of Topsoil Excavated and Stacked (which price will include excavating for test pits required) but if such future use necessitates rehandling and spreading, payment will also be made at the contract unit price for Topsoil Rehandled and Spread.

No deduction from the item of Class A Rock Excavation will be made on account of the use of boulders or rock fragments in masonry or in revetment. Pre-splitting of rock will be paid for at the contract unit price per square yard of exposed pre-split rock face. Bituminous Concrete Excavation by Cold Planer will be paid for at the contract unit price per square yard.

120.82 Payment Items.

120. Earth Excavation Cubic Yard

120.1 Unclassified Excavation Cubic Yard

12l. Class A Rock Excavation Cubic Yard

125. Topsoil Excavated and Stacked Cubic Yard

129. Bituminous Concrete Excavation by Cold Planer Square Yard

SECTION 150 EMBANKMENT

DESCRIPTION

150.20 General.

Construction of all embankment fill shall be done in accordance with the relevant provisions of Sections 120, ISO and 170 and in accordance with the procedures described herein.

This work comprises the formation of embankments with suitable material obtained from excavation and borrow, thoroughly compacted to produce a stabilized embankment. The work shall be performed in accor-dance with the lines and grades shown on the plans as directed.

Material available from widened cuts outside the slopes as indicated on the plans or as ordered by the Engineer may be used in embankments or elsewhere upon written request by the Contractor and subsequent written approval by the Engineer. The Engineer shall determine the suitability of any excavation material for incorporation in the embankment.

If the Contractor desires to waste excavated material and provide borrow to replace it for his own convenience, he may do so only after obtaining the written approval of the Engineer and after satisfactory arrange-ments have been made for the measurements and disposal of the material.

When it is determined by the Engineer that there is not sufficient material available either from excavation within the Right-of-Way or the slope lines of the section under Contract for the formation of embank-ments' roadbeds in cut sections, foundations, shoulders, or backfill the Contractor shall obtain such additional material as may be necessary from outside the location, and this material will be borrow material.

150.21 Borrow Pit Restrictions.

With the exception of commercial borrow pits, the location, material removal operation and final shap-ing and finishing of borrow pits, regardless of location, must conform with all local and State regulations, and for the purpose of preventing water pollution shall be subject to approval by the Engineer prior to use, during the material removal operation and upon completion. Borrow pits shall be so graded and finished after material removal is completed that there can be no reasonable possibility of a safety hazard nor ponding of water nor water pollution caused by later erosion of the pit.

Borrow pits located adjacent to the Right-of-Way shall be finished by extending the slope of the cross section to a berm to be constructed or left within the Right-of-Way at the side line. The berm shall be a minimum of 5 feet high and 2 feet wide across the top with natural slopes in both directions, or as otherwise directed.

The floor of the pit shall slope away from the location line at a minimum rate of one inch per foot for at least 50 feet.

Portions of borrow pits (within 500 feet of the project or any other highway location line) which may be noticeable from a travelled way, residence or place of business, shall be neatly trimmed and left in a condition satisfactory to the Engineer. Particular attention shall be given to make the slopes harmonize with the general appearance of the adjacent landscape, provided however, that no slope shall be steep enough to constitute a public menace. No unsightly accumulation of material shall be permitted which may in any manner deface the finished landscape.

The cost for the final shaping and finishing of borrow pits shall be included in the contract unit price of the type of borrow furnished with no additional compensation.

MATERIALS

150.40 General.

All embankment materials, whether coming from excavation or borrow shall consist of solid, sound mineral aggregate. It shall be free from deleterious, organic, elastic or foreign matter and shall be adequately graded for satisfactory compaction into a stabilized soil structure.

These materials will be classified into particular groups according to AASHTO Designation M 145, The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes".

All borrow material to be furnished shall meet the requirements specified in the following Subsections of Division II, Materials:

Ordinary Borrow Ml.01.0

Gravel Borrow Ml.03.0

Sand Borrow Ml.04.0 Type b

Special Borrow Ml.02.0

Impervious Soil Borrow Ml.08.0

Crushed Stone for Drainage, Revetment and M2.01.1

Water Work Foundations

CONSTRUCTION METHODS

150.60 General.

Prior to starting work, the Contractor shall obtain approval for the compaction equipment to be used. Unless otherwise required in the Special Provisions, each layer of embankment material shall be thoroughly compacted with power rollers or tamping rollers. Other equipment or equivalent compactive capacity may be used subject to trial on the project and approval by the Engineer. Compacting equipment will not be used for any other purpose during compaction operations.

The use of tractors, trucks, scrapers or other equipment designed primarily for purposes other than compaction and being used for purposes other than solely compaction will not be considered as compaction equipment, but traffic of such vehicles shall be distributed over this fill in such a manner as to take advantage of the additional compaction afforded thereby. Sufficient leveling and compacting equipment shall be provided to do the work of spreading and compacting the material promptly after it has been deposited. When, in the Engineer's judgment, such equipment is inadequate to spread and compact the material properly, the Contractor shall reduce the rate of excavation and placing of the fill to a rate not to exceed the capacity of the leveling and compacting equipment or employ additional equipment.

The Contractor shall plan his grading operation to use all rock possible from all excavation either as backfill in excavated muck areas or in areas of greatest depth.

Before placing of any fill, the areas under embankments shall be cleared, grubbed, and stripped as specified in Section 101 and 120.

Frozen material shall not be placed on embankments nor shall embankment be placed on material frozen to a depth of over 3 inches. If during the construction of an embankment, the top layer becomes frozen to a depthofover3 inches, the frozen material shall be removed before a succeeding layer is placed on the embank-ment. This work shall be performed at no additional expense to the Department.

Frozen excavated material which will be suitable when dry shall be allowed to thaw and dry and then be placed in the embankment. No compensation will be allowed for the storing and rehandling

of these materials.

Embankments shall be formed by placing successive layers of material uniformly distributed and compacted over the full width of the cross section unless otherwise directed. Stumps, rubbish. sod. Frozen or other unsuitable materials shall not be incorporated in the embankment.

The Contractors ball prosecute his work so that no damage will occur to drainage pipe lines or masonry or brick structures (See Subsection 150.64).

150.61 Preparation of Foundation Areas.

The foundation areas shall be cleared, grubbed and stripped as required, and any soft, spongy or other material unsuitable for embankment foundation shall be removed. When in the Engineer's judgment, there is reasonable doubt as to the suitability of the existing material for embankment foundation. no further work shall be performed in the area in question until the material is tested and approved for use or remedial methods are ordered by the Engineer.

Embankment areas 3 feet or less in height from the subgrade to the existing ground shall be rough graded and compacted to not less than 95-percent of the maximum dry density of the material as determined by the AASHTO Standard Method of Test T99. Method Cat optimum moisture content. As determined by the Engineer, without additional compensation before placing any fill. If the material retained on the #4 sieves is 50% or more of the total sample this test shall not apply and the material shall be compacted to the satisfaction of the Engineer.

For embankments greater in height than 3 feet below the proposed subgrade to existing ground no additional embankment foundation area preparation will be required, provided the material within the area is suitable for the purpose.

Regardless of the height of fill, where embankment material is to be placed against existing earth slopes steeper than 3-to-1, the slope shall be broken up into steps of random width as the fill is placed in order to provide a suitable bond between the existing ground and the new embankment. Both the material cut out and the bot-tom of the area cut into shall be compacted along with and to the same degree as the material being placed in the embankment without additional compensation for excavation, benching or compacting.

Where foundations for bridges, culverts (span 8 ft or more) and major wall structures are to be founded on the embankment, the embankment to the extent shown on the plans shall be constructed of Gravel Borrow for Bridge Foundations and/or Crushed Stone for Bridge Foundations.

At the sites of footings for abutments, piers or other structures having pile foundations, the material shall be placed in embankment prior to driving piles and shall be of a quality and grading that will not obstruct driving of the piles. Where foundations for structures are to be supported on newly formed embankments and where flying wingwalls are to be constructed, the embankment shall be placed to an elevation of at least 2 feet above the bottom of the proposed foundation or flying wingwalls and thoroughly and satisfactorily compacted.

After the above work is completed the material within the area of the proposed foundation or flying wing-walls will be excavated to the grade of the bottom of the concrete. Excavation of this compacted fill will be paid for under the item of Bridge Excavation as stipulated in Subsection 140.21.

150.62 Embankment Construction With Materials Other Than Rock.

Embankment construction with materials other than rock shall not be placed from December 1 to April I, except with written permission of and under such special conditions and restrictions as may be imposed by the Engineer.

Embankment 10-feet or more in height from the elevation of the subgrade to the original ground

elevation shall be constructed to the elevation of the proposed subgrade and then allowed to settle for 60 days (or such time period as the Engineer shall direct in writing) before the pavement structure is constructed thereon. If the condition of the subgrade is suitable, not frozen or muddy and is shaped, compacted and fine graded within he tolerance provided in the Specification. the Contractor may apply and the Engineer may approve the placing but not the fine grading of the subbase prior to the termination of the 60 day waiting" period.

Earth embankment shall be placed and compacted in uniform layers not exceeding 12 inches in depth, loose measurement; each layer of material shall be spread on the entire width of the embankment and leveled if by approved equipment. The embankment materials shall be compacted to not less than 95 percent of the maximum dry density of the embankment material as determined by AASHTO Standard Method of Test T99, Method C at r optimum moisture content. If the materials retained on the #4 sieves is 50 percent more of the total sample, this test shall not apply and the material shall be compacted to the satisfaction of the Engineer. The Contractor shall, without additional compensation, employ whatever measures that may be necessary to adjust the natural water content of the suitable embankment material to permit the placement and compaction as hereinbefore specified. The Engineer, during the progress of the work, may make tests as required, determining the in-place density of the soil by one of the following Standard Methods of Test: Density of Soil and Soil Aggregate in place by Nuclear Methods (Shallow Depth), AASHTO 1'238; Density of Soil In-Place by the Sand-Cone Method, AASHTO T191; or Density of Soil In-Place by the Rubber-Balloon Method, 1'205.

Each lift of compacted. materials shall be visibly crowned to allow drainage of surface and rain waters off the surface of the embankment. No stones larger than 3 inches shall be used to fill where piles are to be driven. Embankment constructed in basement areas of demolished buildings and other areas restricting the use of power rollers, etc., shall be compacted by mechanical tamping with approved power tools.

If the natural-in-place moisture of the excavated material makes it impractical to compact the soil, the Contractor shall dry the soil by disking, harrowing, blading, rotary mixing or by other approved means, or compaction of the layer of wet material may be deferred until the layer has dried so that it can be properly compacted. If these above methods do not produce the desired results, or when in the judgment of the Engineer, excess moisture resulting from climatic conditions beyond the control of the Contractor is considered to have affected adversely the stability ofthepreviouslyplacedandsatisfactorilycompactedembankmentmaterials, the Engineer may direct the placement of single layers of "Special Borrow" to act as stabilizing drainage layers. When so ordered by the Engineer, the Contractor shall place a layer of ••Special Borrow" having a depth of not more than 12 inches in thickness, loose measure. Such materials shall be placed completely over the entire width between the limits designated by the Engineer, and shall be compacted as hereinafter specified before the succeeding layer of suitable embankment materials from the roadway excavation is placed.

The work may be ordered suspended if the weather and climactic conditions are such that the embank-ment and excavation cannot be performed in accordance with the specifications. No additional compensation will be allowed to the Contractor for such suspension of work. If the work is ordered suspended due to weather or other climatic conditions not under the control of the Contractor, an extension of time may be granted to the Contractor by the Engineer.

150.63 Rock in Embankment.

Where rock is used in embankments the materials shall be carefully spread so that all large stones shall be well distributed and the interstices of each layer shall be practically filled with smaller stones and suitable material from excavation or borrow to form a solid and dense layer of embankment. No rock in excess of6 inches in its largestdimensionshallbeincorporatedinthetop2 foot

layer of embankment immediately below the subgrade.

The maximum size of boulders or ledge fragments used in embankments shall be such that they can be incorporated into layers not exceeding 3. feet in depth. Any stones or fragmented material too large to be placed in 3 foot layers shall be broken down by blasting or other means to appropriate size.

Rock in fills shall not be placed adjacent to masonry or brick structures or to any pipe lines. At bridge abutments rock fill shall not be placed within 20 feet of the parapet.

150.64 Backfilling for Structures and Pipes.

A. General.

All back filling shall consist of suitable materials uniformly distributed and thoroughly compacted. When suitable backfilling materials cannot be obtained from excavation, the material shall consist of satisfactory borrow. When directed, mechanical tampers shall be used in compacting backfill for trenches, and in hard to reach areas around masonry.

No backfill whatever shall be placed on or against structures, pipes, or other masonry, until permitted by the Engineer. It shall be formed of successive layers not more than 6 inches in depth, uniformly distributed and each layer thoroughly compacted.

B. Structures.

The backfill in back of abutments and wingwalls of bridges shall consist of gravel. The gravel shall meet thespecificationsofSubsectionM1.03.0,Typeb. Measurement of "Gravel Borrow" under this work will not include any filling made beyond a vertical plane 1 foot outside the footings except as directed.

Whenever backfill is placed in back of or over arches, culverts or rigid frames, the fill shall be first placed midway between the ends of the structure. The remainder of the fill shall then be placed to equal depths on both sides of the structure, working equally both ways from the center of the structure toward the ends. This procedure shall continue up to the bottom of the subbase of the roadway.

In all cases the filling material shall be thoroughly tamped. Puddling or jetting the backfill will not be permitted, except with written approval of the Engineer.

150.68 Crushed Stone for Drainage, Revetment, and/or Water Works Foundations.

When directed in writing by the Engineer to place crushed stone in the bottom of the excavation of revetment, drainage and water system installation to stabilize the foundation, the work will be performed under this item. The minimum total depth of crushed stone to be placed under this item of work shall be 6 inches. No compaction will be required for depth up to 12 inches. For any depth over 12 inches, the crushed stone shall be placed and compacted in layers not to exceed 6 inches. Compaction will be accomplished by means of mechanical or pneumatic tampers. Compaction effects shall continue until the stones are firmly interlocked and the surface is unyielding.

COMPENSATION

150.80 Method of Measurement.

All borrow with the exception of sand borrow and crushed stone will be measured in place. When this method of measurement is impracticable and the Engineer, prior to the start of construction, so directs and the Contractor agrees in writing, borrow, with the exception of sand borrow and crushed stone, will be measured in its original position in the pit after stripping by the cross-section method.

When ordinary borrow is paid for as measured in place, it shall be measured from existing or

compacted old ground surface to the lines and grades applicable to embankment as shown on the plans or as directed. The volume of ordinary and special borrow when in place measure is necessary, shall be determined as follows:

Measure the total volume of embankment in place;

Add 12.5 percent of this quantity (for compaction);

Deduct the total volume of all suitable materials available for embankments, including rock excavation; except that excavated under Section 140.60;

Deduct an additional 25 percent of the volume of rock excavation.

When not measured in its original position in the pit by the cross section method, gravel borrow used in subbase, gravel for base course, gravel for surfacing, gravel for bridge foundations and gravel for backfilling around structures and pipes, will be paid for as measured in place plus 15%.

When not measured in its original position in the pit by cross section method gravel borrow used in slope stabilization and other miscellaneous uses will be paid as measured in place plus 12.5%.

If material that is measured in place is taken from across sectioned pit, the amount of material to be deducted from the cross-section pit quantity shall be equal to the material measured in place plus any allowable percent added to the in place measurement.

Sand borrow will be measured by the cubic yard by load measurement. The quantity shall be the volume of the load, as measured, divided by 1.15. If stone screenings are used the volume shall be obtained from its weight using 2700 pounds as the weight of a cubic yard of stone screenings.

Crushed stone complete in place will be measured by the ton.

The weight slips shall be countersigned on delivery by the Engineer, and no weight slip not so counter-signed shall be included for any payment under the Contract. No overhaul allowance will be made for any kind of borrow.

150.81 Basis of Payment.

Payment for the formation of embankments as specified will be included in the items of excavation or borrow. Excavated material used with the permission of the Engineer for other than the formation of embankments will be paid for as specified in Subsection 120.81 and such payment shall include full compensation for the formation of the required embankments. The contract unit prices for the aforesaid items shall consti-tute full compensation for the satisfactory performance and completion of the entire work.

Borrow will be paid for at the contract unit price per cubic yard, complete in place, which shall include such test pits and borings necessary to procure samples to establish the suitability of the materials and all required stripping operations. Crushed stone will be paid for at the contract unit price per ton, complete in place.

150.82 Payment Items.

150. Ordinary Borrow	Cubic Yard
150.1 Special Borrow	Cubic Yard
151. Gravel Borrow	Cubic Yard
151.2 Gravel Borrow for Backfilling Structures and Pipes	Cubic Yard
154. Sand Borrow	Cubic Yard
156. Crushed Stone for Drainage, Revetment, and or Water Works Foundations	Ton

ITEM 180.1 HEALTH AND SAFETY PLAN LUMP SUM

It is the Contractor's ultimate responsibility to ensure the health and safety of all the Contractor's employees and subcontracting personnel, the Engineer and his representatives, and the public from any on-site chemical contamination.

A Health & Safety Plan (HASP) shall be prepared by a Certified Industrial Hygienist or other experienced individual with the appropriate training required by OSHA to prepare such a plan, and it shall include the components required by OSHA 29 CFR 1910.120(b). The preparer's name and work experience shall be included as part of the Health and Safety Plan submittal. The HASP must be stamped by a Certified Industrial Hygienist certifying that it complies with all applicable laws, regulations, standards and guidelines, and that it provides a degree of protection and training appropriate for implementation on the project during the execution of this contract.

The HASP shall be designed to identify, evaluate, and control health and safety hazards associated with the work on this project and provide for emergency response if needed. The HASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions (e.g. OSHA, RCRA, CERCLA). In addition, guidelines of NIOSH, OSHA, USCG, EPA, etc., shall be followed. Equipment used for the purpose of health and safety shall be approved and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the Health and Safety Plan shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the Department, Contractor and subcontractors. The employee's signature on the Health and Safety Plan shall be deemed prima facie evidence that the employee has read and understands the plan.

A copy of the plan with signatures shall be submitted to the Engineer at the conclusion of the Contract, or at the Engineer's request. Signature sheets shall be submitted monthly, or at the request of the Engineer.

The work to be done under this Item shall be paid at the Contract Lump Sum Price under Item 180.1 for the development and preparation of the HASP by a qualified individual.

ITEM 180.2 IMPLEMENTATION OF HEALTH AND SAFETY PLAN HOUR

For all construction activities which require handling or exposure to potentially hazardous materials, the Health and Safety Plan shall specify an on-site Safety Officer. The Site Health and Safety Officer duties shall include, but are not limited to: implementation of the site Health and Safety Plan, training, evaluating risks, safety oversight, determining levels of personnel protection required, and performing any required monitoring at the site. A Daily Log shall be kept by the on-site Safety Officer and provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personnel protection being employed, monitoring data and any other information relevant to on-site safety conditions. The Site Health and Safety officer shall sign and date the Daily Log.

In the event that subsurface contamination is discovered during construction, the Site Safety Officer shall be present to oversee all handling, storage, sampling, and transport of such contaminated materials.

The level of protection, relative to respiratory and dermal hazards, required to ensure the health and safety of on-site personnel will be stipulated in the Health and Safety Plan and will be subject to modification by the on-site Safety Officer based on changing site and weather conditions and the

following factors: type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and equipment, and type of equipment to be utilized.

The Contractor shall be required to provide appropriate personnel protective equipment for anyone who is working in an area either containing or suspected of containing a hazardous environment. This work will include both individuals physically working in these areas and those directing the work of same. Contingencies for upgrading the level of protection for on-site workers will be identified in the Health and Safety Plan and the contractor shall have the necessary materials/equipment on hand to implement the level of protection upgrade in a timely manner. Payment for this level of upgraded protection shall be paid for under Item 180.2. Implementation of the Health and Safety Plan will be paid at the contract bid price per hour of implementing the plan and shall include the cost of enforcement by an on-site Safety Officer.

Personnel protective clothing and equipment below Level "C" shall be considered incidental to the project and shall be a cost borne by the contractor.

ITEM 180.3 PERSONNEL PROTECTION LEVEL 'C' UPGRADE HOUR

The Contractor shall provide to all workers disposable, protective clothing appropriate to the hazard level of the work. The protective equipment and its use shall be in strict compliance with the Health and Safety Plan (Item 180.1), and all appropriate regulations that address employee working conditions.

Payment for Item 180.3 will be at the contract unit price, per hour, per man, required in level 'C' personnel protection.

ITEM 180.4 MONITORING/HANDLING AND STOCKPILING CUBIC YARD OF CONTAMINATED SOILS

The On-Site Safety Officer or Environmental Consultant shall be responsible for evaluating soil with non-natural discoloration, petroleum or chemical odor, the presence of petroleum liquid or sheening on the groundwater surface or any abnormal gas or materials in the ground which are known or suspected to be contaminated with oil or hazardous materials. Soil suspected of gasoline contamination shall be field tested using the jar headspace procedures according to Department of Environmental Protection Bureau of Waste Site Cleanup Interim Policy #WSC-94-400 (Remedial Waste Management Policy for Petroleum Contaminated Soil) and the Bureau of Waste Prevention Policy #COMM-97-001 (Reuse and Disposal of Contaminated Soil and Massachusetts Landfills).

The Engineer shall be contacted immediately when any results indicate contamination requiring soil removal or when contamination not detectable by on-site instrumentation is suspected.

The Contractor shall be required to supply all personnel and materials necessary to comply with this section and to support the anticipated levels of protection and monitoring described above.

Within limited areas of the project site, it is likely that excavated soils may be contaminated. Where possible, all soils originally in contact with groundwater will be replaced in the same trench up to the existing groundwater level. All soils determined to be contaminated by metals or petroleum products, through the monitoring/evaluation program will be stockpiled for disposal in accordance with all Massachusetts Department of Environmental Protection statutes, policies, and regulations.

The Environmental Consultant/Contractor shall be responsible for identifying a disposal/recycling facility and obtaining all permits, approvals, Bill of Lading, etc. prior to the removal of the contaminated soil from the site. Any soils contaminated with hazardous materials that are not of petroleum origin shall be handled on a case-by-case basis. The contractor shall obtain at least three

bids for the handling and disposal of any contaminated material. All

manifest, bills of lading, etc. will be the responsibility of the Contractor with copies provided to the Department. The Contractor is also responsible for hiring a Licensed Site Professional (LSP), as needed, for oversight and Bills of Lading, etc.

Work under this Item shall be measured and paid for at the Contractor bid price, per cubic yard of contaminated material monitored, handled and/or stockpiled as described under Item 180.4, which payment shall be considered compensation for all labor, tools, equipment and materials needed to do the work as described above.

ITEM 180.5 LICENSED SITE PROFESSIONAL HOUR

A Licensed Site Professional (LSP) will be required to provide the services necessary to comply with the requirements of the Massachusetts Contingency Plan (MCP), 310 CMR 40.000, with respect to the scope of work for this Contract. These services will include, but are not limited to, sampling and analysis of potentially contaminated media, preparation of IRA, URAM and RAM Plans, status reports, transmittal forms, release notification forms, completion statements and related documents required pursuant to the MCP. The LSP will be responsible for obtaining all permits related to the characterization, treatment, and disposal of contaminated media. The LSP will provide oversight of handling, stockpiling, re-use, treatment and disposal of contaminated media, including preparation of Bills of Lading, Manifests, and related shipping documents.

Environmental technicians, including but not limited to personnel conducting field monitoring and sampling, data interpretation and support services directly related to MCP compliance, are also included in this Item.

The name and qualifications of the LSP will be submitted to the Engineer for review and approval at least two (2) weeks prior to initial site activities. The LSP shall have significant experience in the oversight of MCP activities at active construction sites.

The LSP will coordinate all activities with the City of Lowell and the Massachusetts Department of Environmental Protection through the Engineer or his/her designee.

The LSP will be responsible for adequately characterizing contaminated media to insure that it meets the requirements of the MCP and, in the case of contaminated media to be disposed of offsite, to insure that it meets the acceptance criteria set forth by the disposal facility. The LSP will be responsible for adequately characterizing subsurface conditions prior to backfill in areas where contaminated soil/sediments are excavated. The cost of laboratory analyses conducted in accordance with the sampling and assessment requirements for compliance with the MCP will be paid for within the unit bid price for Item 180.4 - Monitoring/Handling and Stockpiling of Contaminated Soils and Item 181.1 - Disposal Options for Contaminated Soil.

Work under this Item shall be paid at the Contractor Bid Price per Hour of service provided to perform the work as described above. The bid price shall reflect the cost of the LSP and any environmental technicians providing the services described above.

ITEM 180.6 MISCELLANEOUS SOIL TESTING EACH

The work under this item shall conform to all relevant provisions of the Standard Specifications, the Special Provisions and the following:

The Engineer may, from time to time, direct the Contractor to obtain soil samples from various locations within the project area and to perform laboratory analyses on those soil samples to assess reuse or disposal options.

Sampling and Analysis

The Contractor shall collect discrete soil sample(s) from locations within individual soil piles or specific land area identified by the Engineer. The soil samples shall be collected at a depth specified by the Engineer. The samples shall be delivered to a Massachusetts certified laboratory using proper chain-of-custody documentation for the analysis of Resource Conservation and Recovery Act (RCRA) 8 metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polyaromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (Method 1311) for metals.

Data Evaluation and Report

The Contractor shall review and summarize the laboratory data from the soil sampling analyses. The data will be compared to Massachusetts Contingency Plan (MCP) soil standards and acceptance criteria for soil recycling and landfill disposal facilities. A letter report shall be delivered to the Engineer outlining the soil sampling methods, laboratory analyses results and proposed options for reuse or disposal of the soil.

METHOD OF MEASUREMENT

Miscellaneous Soil Testing shall be measured by each round of samples collected, tested and reported to the Engineer. A round of samples shall include a total of three samples.

BASIS OF PAYMENT

The work to be done under this item shall be paid at the contract unit price bid per each and shall be considered full compensation for all labor, tools, equipment, materials, testing, loading, transportation, approvals, and permits necessary for the completion of the work.

ITEM 181.1 DISPOSAL OF CONTAMINATED SOIL TON

The definitions under 310 CMR 40.0000 are applicable to this item. All work shall be conducted under the supervision of a Licensed Site Professional and is to be conducted in accordance with all Massachusetts Department of Environmental Protection statutes, policies and regulations. Reuse is the preferred option.

The LSP shall be responsible for identifying a disposal/recycling facility and obtaining all permits, approvals, Bill of Lading, etc. prior to the removal of the contaminated soil and/or sediment from the site. Any soils and/or sediments contaminated with hazardous materials that are not of petroleum origin shall be handled on a case-by-case basis. All manifest, bills of lading, etc. will be the responsibility of the Contractor with copies provided to the Engineer.

The contractor shall be responsible for the proper disposal or recycling of contaminated soils. The proper methods of disposal and recycling of contaminated soils shall comply with the methods described under Item 180.4.

The work shall be measured and paid for at the contractor's unit bid price, per ton of contaminated material removed from the site and delivered to an approved landfill, disposal facility, or recycling facility. Payment shall be considered full compensation for the services of a Licensed Site Professional, sample testing, labor, tools, equipment, permits, approvals, testing, transportation and disposal, and shipping papers required to do the work as described above.

SECTION 220

ADJUSTMENT, REBUILDING AND REMODELING OF DRAINAGE STRUCTURES

220.20 General.

The work shall consist of rebuilding, removing, replacing and adjusting the masonry and castings of present structures, as required, to conform to newly proposed line and grade changes; to change in type of structure, or changes in type of castings; all in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

MATERIALS

220.40 Materials.

Such materials as will be required shall conform to Subsection201.40.

CONSTRUCTION METHODS

220.6 General.

When the line or grade or body. the line and grade of the structure changes by 6 inches or less, the structure shall be adjusted to line and grade. The masonry shall be removed to such depth as directed by the Engineer and new masonry shall be constructed to conform to the proposed design and in conformity with the requirements of the applicable pans of Section 201.

When the line or grade or both the line and grade of the structure changes more than6 inches the structure shall be remodeled. The sloped masonry and the vertical masonry shall be removed to such depths as directed. by the Engineer and new masonry shall be constructed to conform to the proposed design and in conformity with the requirements of the applicable parts of Section 201.

When a change in type of structure is required, as converting a basin to a manhole, the masonry shall be removed to such a depth as directed by the Engineer and new masonry. including a brick invert, shall be con-structed to conform to the proposed design.

When in the judgment of the Engineer the masonry shows deterioration. the structure shall be rebuilt. The casting and deteriorated masonry shall be removed in a neat manner until a clean sound base is obtained upon which concrete blocks and clay bricks may be set to rebuild the structure. Gravel borrow shall be furnished for backfill where required when excavated material is unsuitable. The casting shall be sot to line and grade with a concrete collar and surfaced with a minimum of one and one half inches of Class I Bituminous Concrete Top Course as directed.

The new masonry construction, replacing of castings, highly early strength concrete collars. backfilling around structures and other incidental work shall be as specified in Section 201.

220.61 Protection of Work.

The Contractor will be held responsible for the protection of the castings. Any frames. grates, or covers damaged in any manner during the progress of the construction shall be replaced with new castings by the Contractor, at his expense.

Prior to the actual removal of the present castings a count will be made and recorded of all castings which are in satisfactory condition for reuse. The Contractor shall supply the number of castings recorded in the initial count, when they are required for reuse or when they are to be removed from the project by the Owner.

COMPENSATION

220.80 Method of Measurement.

Adjustment of structures to line or grade or both line and grade when the change is 6 inches or less, will be measured in place by the unit each, complete and approved. When the adjustment of structures to line or grade or both line and grade is greater than 6-inches, the structure will be

included in the item for structures remodeled.

Structures changed in type will be measured in place by the unit each, complete and approved.

Structures remodeled will be measured in place by the writ each, complete and approved.

Structures rebuilt shall be measured by the average height in vertical feet and tenths of feet from the bottom row of rebuilt masonry to the bottom of the casting. The removal and resetting of the casting will be measured by the unit each, complete and approved for all work described above.

Transportation, delivery and installation of all new castings will be included in the contract: unit bid price for the kind of structure involved.

220.81 Basis or Payment.

Adjustment of structures to line and/or grade or both line and grade when the change is 6 inches or less will be paid for at the contract unit price each under the item for Drainage Structure Adjusted. Structures, changed in type will be paid for at the contract unit price each under the item for Drainage Structure, Changed in Type.

Structures remodeled will be paid for at the contract unit price under the item Drainage Structure Remodeled.

Structures rebuilt will be paid for at the contract unit price per vertical foot. Castings removed and reset for Drainage Structures Rebuilt will be paid for at the contract unit price each under the item Frame and Grate (or Cover) Removed and Reset. Furnishing new castings will be paid for at the contract unit price each under the items for Frame and Grate or Cover, -inch Hood.

220.82 Payment Items.

220.	
220.2 Drainage Structure Rebuilt	Vertical Foot
220.3 Drainage Structure Change in Type	Each
220.5 Drainage Structure Remodeled	Each
220.7 Sanitary Structure Adjusted	Each
22l. Frame and Cover	Each
222. Frame and Grate	Each
222.1 Frame and Grate MDPW Cascade Type	Each
223. Frame and Grate (or Cover) Removed and Reset	Each
224.* -inch Hood	Each

**Pipe or appurtenance size will be included a span of the item numbering order to differentiate between the sizes.*

SECTION 420

CLASS I BITUMINOUS CONCRETE BASE COURSE, TYPE 1-1

DESCRIPTION

420.20 General.

This type of base course shall be composed of mineral aggregate, mineral filler and bituminous material. The base course shall be constructed in one or more courses as shown on the plans and as

directed on the prepared or existing sub-base in accordance with these specifications and in close conformity with the lines, grades, compacted thickness, and typical cross section shown on the plans.

The Engineer may require the Contractor to remove and replace at his own expense, any defective mix not conforming to the specified job mix formula within the stipulated tolerances; on the basis of the Department testing. Samples of the actual mixture in use will be taken as many times daily as necessary and the mixtures shall be maintain uniform for the project as specified herein. The Engineer may suspend further approval for use of the Plant mixtures in Department work if the mixtures are not uniformly furnished as specified; until any necessary changes have been made so that the mixtures do conform to the specified requirements.

420.21 Composition and Compaction Acceptance Tests.

Where plant inspection is maintained, the material will be considered acceptable for use when the speci-fied tests from samples obtained at the production plant indicate conformance to M3.11.09.

Pavement density shall be determined as outlined in M3.11.09.

The bituminous mixture andthe labor for obtaining these samplesin the field shall be furnished without charge by the Contractor. The samples shallbe taken in accordance with AASHTO 1'230.

MATERIALS

420.40 General.

Material shall meet the requirements specified in Section M3.11.00 ofDivision ill, Materials, and the following Subsections:

Mineral Aggregate M3.11.04

Mineral Filler M3.11.05

Bituminous Materials M3.11.06

Composition of Base Course Mixture (see Table "AU), M3.11.02.

CONSTRUCTION METHODS

420.60 General.

The bituminous concrete base course shall be constructed in accordance with relevant provisions of Section 460 for Class 1 Bituminous Concrete Pavement, Type I-I.

The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width, and crown by means of fully automated controls for both longitudina1and transverse slope. The use of any other type of equipment for spreading and finishing shall require the prior written approval ofthe Engineer.

COMPENSATION

420.80 Method of Measurement.

Bituminous concrete shall be measured by the ton and shall be the actual and verified tonnage, complete in place and approved. The quantity shall be determined only by weightslips that have been properly counter-signed by the Engineer at the time of delivery.

Bitumen used for prime coat, if required by plans or specifications or ordered by the Engineer, will be measured as specified in Subsection 468.80.

420.81 Basis of Payment.

The tonnage of bituminous concrete, determined as provided above, will be paid for at the contract

unit price per ton of the kind of bituminous concrete required, complete in place.

Bitumen as specified herein to bepaid for as prime coat, ifrequired, will be paid for at the contract unit price per gallon under the item for Bitumen for Prime Coat, complete in place.

480.82 Payment Items.

420. Class I Bituminous Concrete Base Course, Type 1-1 463. Bitumen for Prime Coat Ton/ Gallon

SECTION 430

CEMENT CONCRETE BASE COURSE

DESCRIPTION

430.20 General.

Cement concrete base course shall be constructed in one course on the prepared sub-base in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

MATERIALS

430.40 General

Materials shall meet the requirements specified in the following Subsections of Division ill, Materials: *3,000 psi, 1 1/2", 470 Cement Concrete M4.02.00 Preformed Joint Filler M9 .14.0 Hot Poured Joint Sealer M3.05.0

*The concrete shall have a slump of2 inches with a tolerance of plus or minus 1/2 inch.

CONSTRUCTION METHODS

430.60 General.

The cement concrete base course may be constructed by the Slip-Form Method or the Fixed-Form Method. Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition.

Grade control survey and staking shall conform to Subsection 5.07. The Contractor shall furnish, set, and maintain all line and grade stakes for grading and paving.

430.61 Side Forms.

The forms where required shall be an approved wood or metal type, of a width equal to the depth of the concrete, true to line, free from warp and of sufficient strength, when staked, to resist the pressure of the concrete without springing and so designed that the various sections may be fastened together in such a manner as to prevent the vertical or horizontal movement of the ends.

The forms shall be jointed neatly and tight, shall be set true to line and grade, well staked and braced, and shall have uniform bearing on the sub-base through the entire length. In general the setting of forms shall proceed at least 500 feet in advance of the mixing and placing of concrete.

The forms shall be thoroughly cleaned before any concrete is placed against them and shall be made tight to prevent the leaking of mortar from the concrete.

430.62 Fine Grading.

The fine grading of the foundation shall conform to Subsection 476.61.

460.63 Joints.

The Contractor shall construct weakened plane transverse contraction joints in the concrete base course every 30 to 50 feet or as shown on the plans. These joints shall consist of surface slots constructed in accordance with the requirements of Subsection 476.68C for transverse contraction joints.

Expansion joints shall be formed about all structures and framers projecting through or into the pavement and between the pavement slab and adjacent curbing. Unless otherwise indicated, such joints shall be 1/2 inch in width and shall be filled with preformed joint filler as specified in Subsection M8.14.0and sealed with joint filler compounds as specified in Subsection M3.05.0in the same manner as specified for transverse expansion joints in Subsection 476.68B. There will be no additional compensation for joints.

430.64 Placing Concrete.

Concrete shall be placed on a moist, firm and smooth sub-base in accordance with the requirements of Subsection 476.64 except that it shall be placed in one layer.

430.65 Finishing Concrete.

The surface of the concrete shall be struck off with a template shaped so as to leave the concrete with a smooth, even contour surface and crown as shown on the plans and in the typical cross section. The template shall be so constructed that it shall have sufficient strength to retain its shape under all working conditions. This template shall be moved with a longitudinal and crosswise motion and always in the direction in which the work is progressing. The surface of the concrete shall be finished to the elevations, contours and crowns required with a tolerance allowance of 1/4 inch in 10 feet.

The surface of the concrete shall be made free of footprints, ruts, depressions or other imperfections and shall then be lightly broomed, as directed, with approved stable or wire brooms.

430.66 Protection and Curing.

The pavement shall be protected and cured as required in Subsection476.71 except that membrane compounds not compatible with bituminous materials shall not be used.

COMPENSATION

430.80 Method of Measurement.

Cement concrete base course will be measured in place by the square yard conforming to the length, width and depth required by the plans or as directed. The Contractor shall have no claim for extra payment if thickness of pavement exceeds that shown on the plans or as directed.

430.81 Basis of Payment

Standard cement concrete base course will be paid for at the contract unit price per square yard under the item for Cement Concrete Base Course.

High early strength concrete base course will be paid for at the contract unit price per square yard under the item for ~Early Strength Cement Concrete Base Course. The price paid per square yard shall also include all sprinkling or treating the roadway to keep down dust.

480.82 Payment Items.

430. Cement Concrete Base Course Square Yard

431. High Early Strength Cement Concrete Base Course Square Yard

SECTION 440

ROADWAY DUST CONTROL

DESCRIPTION

440.20 General

This work shall consist of fumes bing and applying approved dust control material to the surface of the subgrade or elsewhere as directed in accordance with these specifications.

MATERIALS

440.40 Materials.

The material for this work shall be of the kind shown on the plans and shall meet the requirements of the following Subsections of Division Ill, Materials. Sand Ml.04.0, Type a Calcium Chloride M9.01.0 Bituminous Material:

Cutback Asphalt M3.02.0

Asphalt Emulsion M3.03.0

CONSTRUCTION METHODS

440.60 General.

The required material shall be properly applied where directed by the Engineer and distributed uniformly at the rate specified or ordered. The means of distribution shall depend upon the kind of material used, and the method and equipment used shall be satisfactory to the Engineer. The number and frequency of applications shall be as determined by the Engineer.

440.61 Treatment with calcium Chloride.

Calcium chloride shall be uniformly applied at the rate of 1~ pounds per square yard orate any other rate. As directed by means of a mechanical spreader, or other approved methods.

440.62 Treatment with Bitumen.

Bituminous material shall be applied by means of an approved pressure distributor of a type that will distribute the material uniformly under a pressure of not less than 30pounds per square inch without streaks or spots. It shall be so designed as to enable its operator to "cut out" any portion of the roadway, to control the flow, and to avoid any surplus deposit of a material on the roadway or elsewhere. The bitumen shall be applied at the rate specified on the plans or as directed by the Engineer.

440.63 Sand Cover.

When and if directed by the Engineer, the bitumen shall be covered with a sufficient quantity of sand to absorb all surplus bitumen.

440.64 Treatment with Water.

Water shall be applied at locations at such times, and in the amount as directed by the Engineer. Quantities of water wasted or applied without authorization will not be paid for.

Watering equipment shall consist of pipelines, tanks, tank trucks, or other devices, approved by the Engineer, which are capable of applying a uniform spread of water over the surface. A suitable device for a positive shut-off and for regulating the flow of water shall be located so as to permit positive operator control.

COMPENSATION

440.80 Method of Measurement.

The pound will measure calcium chloride.

Bituminous material will be measured by volume in gallons in accordance with the provisions of Section 468.

Sand will be measured by the cubic yard by load measurement. The quantity shall be the volume of the load, as measured, divided by 1.15. Water will be measured for payment by the number of M gallons (1000 gallons). The water will be measured in tanks or tank trucks of predetermined capacity, or by means of satisfactorily installed meters. The Contractor shall furnish any and all measuring devices.

440.81 Basis of Payment.

Calcium chloride will be paid for at the contract unit price per pound under the item for Calcium Chloride for Roadway Dust Control, complete in place. Bituminous material will be paid for at the contract unit price per gallon of Bitumen for Roadway Dust Control, complete in place. Sand will be paid for at the contract unit price per cubic yard under the item for Sand Borrow (Cover), complete in place as specified. Water will be paid for at the contract price per "M" gallons for

Water for Roadway Dust Control which price shall include all water, labor, tools and equipment required to furnish and measure the water applied to surfaces designated by the Engineer and at the times specified.

440.82 Payment Items.

440. Calcium Chloride for Roadway Dust Control

441. Bitumen for Roadway Dust Control

443. Water for Roadway Dust Control

154.1 Roadway Dust Control Water for Roadway Dust Control Sand Borrow (Cover) Pound Gallon M. Gallons Cubic Yard

SECTION 445

SHOULDERS

DESCRIPTION

445.20 General.

Shoulders shall be constructed of approved materials in accordance with these specifications and inconformity with the lines, grades and typical cross sections shown on the plans.

Shoulders shall be composed of excavated material or borrow of the kind required or as shown on the plan. Where shown on the plans, the top portions of shoulders shall be paved with surfacing material of the kind specified.

MATERIALS

445.40 General.

Materials shall meet the requirements specified in the following Subsections of Division ill, Materials. Ordinary Borrow Ml.0l.0 Gravel Borrow Ml.03.0, Type C Loam Borrow Ml.05.0 Sodding (Field) M6.05.0 Seed M6, 03.0

445.41 Surfacing Materials.

The surfacing materials for paving the top portion of shoulders shall conform to the requirements of the particular sections of these specifications relating to the kind of pavement or surfacing required.

CONSTRUCTION METHODS

445.60 General.

The subgrade for shoulders, if required, shall be prepared as required in Section 170 (Subgrade). Portions of the shoulders, of sufficient width to hold the pavement in its proper place, shall be

built in conjunction with the pavement and shall be rolled to a width of at least 12 inches with each rolling of the roadway base course or surface course.

Whenever the plan shows that sodding, loaming, paving or other similar work affecting shoulder construction adjacent to the roadway pavement is required, the Contractor will be required to construct temporary shoulders of suitable material to support the roadway pavement adequately during rolling operations. After the pavement is constructed, the temporary shoulders shall be carefully removed and satisfactorily disposed of by the Contractor prior to construction of the permanent shoulders. Where necessary, temporary shoulders shall be constructed in conjunction with the construction of paved shoulders in the same manner as prescribed above for roadway pavement. When shoulders are to be loamed and seeded, the construction method shall be as specified in Section 765 for such work.

Sodding of shoulders shall be done in conformity with the requirements of Section770 for Field Sodding.

Ordinary borrow, gravel borrow and loam shall be furnished, placed and rolled in accordance with the requirements of Section 150 and as specified herein. Paving ofshoulders shall be done in the manner specified in the particular section of these specifications relating to the kind of pavement or surfacing to be used in this work.

At all times construction shall be so carried on that effective and adequate drainage will be provided.

The full widths of all shoulders except paved or sodded areas shall be reformed, trimmed, raked and rolled

before the final completion of the work and the surface when finished shall conform to the proposed grade and cross section.

COMPENSATION

445.80 Method of Measurement.

All borrow materials for shoulders will be measured by the cubic yard in accordance with the provision of Subsection 150.80.

Surfacing materials for paving shoulders will be measured as specified in the particular section for the kind of pavement required.

Sodding will be measured by the square yard as specified in Subsection 770.80.

445.81 Basis of Payment.

Payment for grading of shoulders composed of material obtained from excavation will be included in the price paid for removal and disposal of the type of excavation used.

When composed of borrow, shoulders will be paid for at the contract unit price per cubic yard of borrow, of the kind required as specified in Subsection 150.81. Compensation for the removal and disposal of temporary shoulder material will be included in the contract unit price under the item for the kind of material used in the roadway pavement or permanent shoulder.

When shoulders are paved with surfacing materials, such materials will be paid for at the contract unit prices for the kinds of materials used in the pavement as specified in the particular section relating to the kind of pavement or surface ordered.

When sodding is used on shoulders, it will be paid for at the contract unit price per square yard under Item for Field Sodding, complete in place, as specified in Subsection 770.81. The fine grading and rolling of the subgrade upon which shoulders are constructed will be paid for at the contract unit price per square yard under Item 170. Fine Grading and Compacting (In Subgrade Areas).

SECTION 460

CLASS I BITUMINOUS CONCRETE PAVEMENT

TYPE 1-1

DESCRIPTION

460.20 General.

This type of pavement shall be composed of mineral aggregate, mineral filler and bituminous material. The pavement shall be constructed in courses as shown on the plans and as directed on the prepared or existing base in accordance with these specifications and in close conformity with the lines, grades, compacted thickness and typical cross section shown on the plans.

460.21 Composition and Compaction Acceptance Tests.

Where plant inspection is maintained, the material will be considered acceptable for use when the specified tests from samples obtained at the production plant indicate conformance to M3.11.09.

The densities of the completed pavement shall not be less than 95 % of the density obtained from laboratory compaction of a mixture composed of the same materials in like proportions. Laboratory compaction will be performed by Department Standard Methods as outlined in M3.11.00.

The bituminous mixture and the labor for obtaining these samples in the field shall be furnished without charge by the Contractor. The samples shall be taken in accordance with AASHTO 1'230.

MATERIALS

460.40 General.

Materials shall meet the requirements in the following Subsection of Division II, Materials:

Mineral Aggregate M3.11.04

Mineral Filler M3.11.05

Bituminous Materials M3.11.06

CONSTRUCTION METHODS

460.60 General.

The Engineer may require the Contractor to remove and replace at his own expense, any defective mix not conforming to the specified job mix formula within the stipulated tolerances; on the basis of the Department testing. Samples of the actual mixture in use will be taken as many times daily as necessary and the mixtures shall be maintained uniform for the project as specified herein. The Engineer may suspend further approval for use of the Plant mixtures in Department work if the mixtures are not uniformly furnished as specified; until any necessary changes have been made so that the mixtures do conform to the specified requirements.

If, at any time before the final acceptance of the work, any soft, imperfect places or spots shall develop mechanical means to the present surface, at the rate of application of either 1120 gal/s.y. or that and by the method indicated on the plans or as directed by the Engineer, immediately prior to laying the bottom course of the new pavement.

When and if the surface is in a condition which in the Engineer's judgment, is unsatisfactory for the direct placement of the surface course; it shall be sprayed as specified above with tack coat in the amount and by

the method directed by the Engineer. When a tack coatis required and its need is found to be the direct fault of the Contractor the surface shall be treated with a tack coat as directed by the Engineer and the entire cost for such treatment shall be entirely borne by the Contractor.

The existing surface shall be cleaned of all foreign matter and loose material and shall be dry before the tack coat is placed.

460.63 Spreading and Finishing.

The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width, and crown by means of fully automated controls for both longitudinal and transverse slope.

The pavers shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. They shall be equipped with a quick and efficient steering device and shall have reverse as well as forward traveling speeds.

The pavers shall employ mechanical devices such as equalizing runners, straight edge runners, evener arms or other compensating devices to adjust the grade and confine the edge so the mixture to true lines. They shall be capable of spreading the mixture without segregation is layers to the depths and widths required. They shall be equipped with automatic joint matching attachment for use on adjacent mat or curb; automatic grade and slope control with floating beam mobile reference system with minimum length of beam (“ski”) of thirty feet for averaging longitudinal errors in the grade over which paving is being performed. The joint matching attachment and floating beam mobile reference system shall be employed on all paving courses unless otherwise directed by the Engineer.

When extension serrated to the paver, they shall be provided with the same vibrating screed or tamper action as the main unit of the paver, except for paving variable width areas. The

extensions shall also be equipped withal continuation of the automatically controlled spreading augers. The screed and any extensions shall be provided with an approved method of heat distribution.

The screed shall be adjustable for profile and shall have an indicating level attached.

An approved device will be required for heating the screed to the temperature required for the laying of the mixtures without pulling or marring.

The term “screed “includes any “strike-off” device operated by cutting, crowding, or other practicable action, which is effective on the mixture sat permissible workable temperatures without tearing, shoving, or gouging and which produces a finished surface of the evenness and texture required.

The pavers employed on projects requiring in excess of 15,000 tons shall be capable of operating by the use of a sensing grid for operation to a string line and matching shoe for joints.

The pavers shall operate while bituminous mixture is being spread at a speed, which will produce a uniform surface texture free of any rippling or unevenness.

The paver employed on deep lift construction shall be capable of satisfactorily feeding the mix without intermittent stopping during the discharge of the mix from the trucks into the paving machine.

If during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas or produces other permanent blemishes in the pavement which are not satisfactorily corrected by the scheduled operations: the use of such equipment shall be discontinued and other satisfactory spreading and finishing equipment shall be provided by the Contractor.

The mixtures shall be placed and compacted only at such times as toper mitt he proper inspection and checking by the Engineer.

The mixtures shall only be placed in the work when they can be efficiently and satisfactorily placed by the methods stipulated herein. Unless otherwise permitted by the Engineer for special particular conditions, only machine methods of placing shall be used.

The construction of bituminous concrete pavement shall terminate November 15 and shall not be resumed prior to April 1 except as determined and directed in writing by the Engineer depending upon the necessity and emergency of attendant conditions: weather conditions, and location of the project.

When the air temperature falls below 50 "F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials, placing, and compacting the mixtures.

of at least eight tons and shall be equipped with an automatic disconnect device to disconnect the vibratory mechanism when the roller is not in motion. They shall also be equipped with a manual over-ride device to disconnect the vibratory mechanism if the automatic device should fail.

All vibratory rollers shall also be equipped with the following equipment: a large and clearly visible speed indicator; an amplitude setting indicator and a frequency setting indicator. They

shall also have instructional Plates attached which shall include operational instructions and recommended amplitude and frequency settings. The Engineer shall also provide a vibratory tachometer with each roller for use.

Vibratory rollers shall nonbiased on bridges or other structures and their use in urban areas may be restricted. They shall not be used on thin overlays one (1 ") or less in thickness, except that vibratory rollers of the double drum type may be used in a static condition to compact such overlays, provided that when so opera. Acted they shall be able to obtain the degree of density and smoothness required to conform to the specifications.

When vibratory rollers are used for the compaction of base and binder material they shall be operated at a high amplitude setting and a low frequency setting in the range of 1500 to 1700 VPM. When used for the compaction of surface courses they shall be operated at a low amplitude setting at a minimum frequency setting of at least 2200 VPM or higher, if higher frequency settings recommended by the manufacturer of the roller. The use of a vibratory roller incapable of being operated at a frequency setting oat least 2200 VPM will not be permitted on surface courses. No deviation from this latter requirement will be allowed. In compacting surface courses a vibratory roller shall not be operated at a speed in excess of three (3) miles per hour.

A vibratory roller shall be operated with the vibration drum or drums in the direction of the paver and the vibrating action of the roller shall be completely shut off during change of direction. Due care shall be exercised to start the vibratory action only when the roller is in motion. During the rolling of layered pavement, in order to prevent creeping and aggregate crushing, care shall be taken not to exceed two passes with the vibrator in action. For deep lift pavements, these passes shall normally not exceed two in each direction, except that the number of vibratory passes in either direction may be varied in order to obtain the required density.

The final rolling fall courses shall be performed with a steel wheeled roller of sufficient weight for final smoothing of the surface.

The use of a vibratory roller may be suspended by the Engineer if, in his opinion, satisfactory results are not being obtained and no further amount of mix shall be spread in such case until a sufficient number of approved rollers are on the project site to satisfy compaction requirements.

A plate shall be attached to each conventional roller, which shall show the ballasted and ballasted weight per inch of tread.

The number of rollers required shall be governed by the tonnage of hot-mix being placed daily. A sufficient number shall be provided to compact the mixture in accordance with the specifications. The number of passes required may be varied and shall be governed by compaction results. The Engineer may require that a stand-by roller be provided if in his opinion it is necessary in the event of a breakdown.

Each roller shall be operated by a competent, experienced roller operator and shall be kept in as nearly continuous operation as practicable while work is underway. The mixture shall be rolled longitudinally, diagonally and transversely as may be necessary to produce the required contour for surface. Longitudinal rolling shall start at the side and proceed toward the center of the pavement, except on super elevated curves where the rolling shall begin on the low side and progress to the high side, overlapping on successive trips by at least 12 inches. The rolling shall

be continued and so executed that all roller marks, ridges, porous spots and impressions are eliminated and the resulting surface has the required grade and contour. The motion of the rollers shall at all times be slow enough to avoid any displacement of the hot mixture. Any displacement or marring of the surface occurring as a result of reversing the direction of the rollers, or from any other cause, shall be corrected. To prevent adhesion with the mixture, the wheels of the steel rollers shall be kept lightly moistened with water but excess water will not be permitted. The use of oil for this purpose will not be allowed.

To prevent "roll-off' of the pavement edges and longitudinal joints on deep lift paving, the outer 8 "± of the deep lift mixture shall be left unrolled until the temperature of the mix ranges between 150 F and 180 F, whereupon it shall be compacted by the steel roller.

Along curbs, structures and all places not accessible with a roller, the mixture shall be thoroughly compacted with mechanical tamping devices. The surface of the mixture after compaction shall be smooth and true to the established line and grade.

The densities of the completed pavement shall not be less than 95% of the density obtained from Laboratory compaction of a mixture composed of the same materials in like proportions. Department Standard Methods will perform laboratory compaction.

460.65 Joints.

Placing of the mixture shall be as nearly continuous as possible and the roller shall Passover the unprotected end of the newly placed mixture only when the placing of the course is to be discontinued for such length of time as would permit the mixture to attain initial stability. In all such cases, including the formation of joints as herein specified, provision shall be made for proper bond with the new surface for the full specified depths of the courses.

The maximum length of the longitudinal joint shall be such that the temperature of the mixture of the joint shall be not less than 200 F, when abutting mixture is placed.

If the paving sequence or other conditions cause the joint temperature to fall below 200 F,the joint shall be treated prior to laying the next lane of bituminous concrete as follows:

The joint shall be coated with a hot poured rubberized asphalt sealant meeting the requirements of Federal Specification SS-S-1401 or SS-~164.

The hot poured rubberized asphalt shall be applied to the joint from a double-jacketed heating kettle with a positive drive gear pump that is connected to a suitable applicator. The nozzle of the applicator shall be set to deliver sufficient sealant to effectively bond and seal the longitudinal paving joint between two adjacent lanes of bituminous concrete.

Longitudinal and transverse joints shall be made in a careful manner, well bonded and sealed, and true to line and grade. Where and as directed, longitudinal and transverse joints for both top and bottom courses placed under this or previous contracts shall be cut back to expose the full depth of the course and, when the lying of the course is resumed; the exposed edge of the joint shall be treated as above.

The above temperature requirements do not apply to open graded mixtures.

In making joints along any adjoining edge such as curb, gutter or an adjoining pavement, and after the mixture is placed by the mechanical spreader, just enough of the hot material shall be placed by hand-method to fill any space left open. These joints shall be properly "set-up “with the back of a rake at the proper height. And level to receive the maximum compaction. The work of "setting-up" these joints shall be performed only by competent workmen.

Where and as directed, the first width of any course shall be placed not less than one foot wider than the first width of top course, and successive widths of top and as any other courses shall be so placed that there will be at least a one-foot overlap between the joints in the top course and the other course.

The rolling of the successive widths of courses shall over lap and shall be performed so as to leave smooth, uniform joints and cross sections.

460.67 Testing Surfaces.

The plane of the finished surfaces of the base courses and/or binder course and the top course of compacted mixtures, shall be tested with a 16-foot straightedge, except that a 100foot straightedge may be used on vertical curves. The straightedge shall be carefully applied immediately after first compaction by rolling and, from then on, as may be necessary until and after the final compaction of the material in place. The straight edge shall be held in successive positions parallel to the road centerline and in contact with the road surface; and the entire area checked from one side to the other of the pavement. Any irregularities which vary 1/4" from a true surface in base or binder course shall be corrected.

The top course of resurfaced streets which contain man hole covers, Watergate boxes,etc.,shall be tested as specified hereinbefore except that a ten (10) foot straightedge shall be used. Any irregularities, which vary more than 1/4 of an inch from a true finished surface shall be corrected.

Irregularities, which may develop before the completion of rolling and while the material is still workable, may be remedied by loosening the surface mixture and removing or adding material as necessary. Should any irregularities or surface defects remain after final compaction the defective work shall be corrected by removing and replacing the new material, as specified to form a true and even surface of regular texture. All minor surface projections, joints and minor honeycombed surfaces shall be ironed out smoothly to grade, as may be directed.

Adequate and approved straight edges shall be furnished and used by the Contractor with supervision and inspection by the Engineer. The Contractor shall provide or design at competent employee whose duty shall be to carefully use the straight edge to check the compacted surfaces.

The entire cost for furnishing adequate and approved straightedges with the use of same and the repair or removal and replacement of pavement, as maybe required by the Engineer, shall be born by the Contractor as part of the payment made to him for the relevant contract items.

460.68 Opening to Traffic.

No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate ability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

COMPENSATION

460.80 Method of Measurement.

Bituminous concrete shall be measured by the ton and shall be the actual and verified tonnage, complete in place and approved. The quantity shall be determined only by weight slips that have been properly countersigned by the Engineer at the time of delivery.

Bitumen used fortalice coat, if required by plans or specifications or ordered by the Engineer, will be measured as specified in Subsection 468.80.

460.81 Basis of Payment.

The tonnage of bituminous concrete, determined as provided above, will be paid for at the contract unit price per ton of the kind of bituminous concrete required. Complete in place including butt joint sealant, if required. Bitumen as specified herein to be paid for as tack coat, if required, will be paid for at the contract unit price per gallon under the item for Bitumen for Tack Coat, complete in place.

460.82 Payment Items.

460.	Class I Bituminous Concrete Pavement, Type I-I	Ton
460.2	Class I Bituminous Concrete Pavement Type I-I Open Graded	Ton
461.	Class I Dense Bituminous Concrete, Type ST	Ton
462.	Class I Dense Binder Course for Bridges	Ton
464.	Bitumen for Tack Coat Ton Ton Ton	Gallon

SECTION 466

STRESS ABSORBING MEMBRANE INTERLAYER

DESCRIPTION

466.20 General.

This work consists of the application of hot, rubberized asphalt to a paved surface and immediately embedding aggregate there in by spreading and rolling in accordance with these specifications. This item may also be referred to as SAMI.

MATERIALS

466.40 General.

Asphalt: Asphalt cement for the asphalt rubber mixture shall be AC-1O or AC-20, complying with the requirements ofM3.0l.0. IfAC-1O is used, the SAMI shall be over layed within ten (10) days.

Rubber: Thegranulatedrubbershallbeavulcanizedrubberproductfromtheambienttemperature processing of pneumatic tires.

The granulated rubber type shall meet the following gradations:

Sieve Designation Percent Passing

#8	100
#10	95-100
#16	---
#30	0-10
#50	0-5

Aggregate shall conform to the requirements of M2.01.0 for crushed stone. Crushed gravel stone will not be permitted. Gradation requirements will conform to M2.01.6. Percentageofwearas determined by the Los Angeles Abrasion Test (AASHTO-T96) shall be a maximum of 30.

CONSTRUCTION METHODS

466.60 General.

Preparation of Existing Surface.

Prior to application of the rubberized asphalt, the entire paved surface to be treated shall be cleaned by sweeping, blowing and other methods until free of d in and loose particles. Potholes, depressions, cracks larger than 3/4 n and other irregularities will be patched with hot bituminous mix and compacted. No water shall be present on the surface. A leveling course shall be placed on planed, milled or existing surface if required.

Seasonal and Weather Limitations. Construction shall not proceed when the ambient temperature has been below 50 Fwithin the previous 12 hours, when rain is falling, or when conditions are unfavorable to obtaining a uniform spread.

466.61 Asphalt Rubber Mixing and Reaction

The percent of rubber shall be 23 ± 2 % as indicated by the mixture design for specific project requirements by weight of total mixture, that is, by total weight of asphalt cement, plus granulated rubber.

The temperature of the asphalt shall be between350 Fand 425 F at the time of addition of the vulcanized rubber. The asphalt and rubber shall be combined and mixed together in a blender unit and reacted in the distributor for a period of time as required by the Engineer which shall be based on laboratory testing by the rubberized asphalt supplier. The temperature of the rubberized asphalt mixture shall be above 325 F during the reaction period.

After the reaction between asphalt and rubber has occurred, the viscosity of the hot rubberized asphalt mixture may be adjusted for spraying and or better "wetting" of the cover material by the addition of a diluent. The diluent shall comply with the requirements of ASTM -D 369, Grade #1 Fuel Oil and shall not exceed 7.5 percent by volume of the hot asphalt rubber mixture.

When a job delay occurs after full reaction, the rubberized asphalt may be allowed to cool. The rubberized asphalt shall be reheated slowly just prior to application, but not to a temperature exceeding 325 F. An additional quantity of diluent not exceeding 3 percent by volume of the hot rubberized asphalt mixture may be added after reheating.

Viscosities shall be run, by the applicator, on each blended load of rubberized asphalt rubber using a Hake Field viscometer. One viscosity priority the induction of the diluent and one after the induction of the diluent blended into the asphalt and rubber mixture. The viscosity of the final product shall be in the range of 2000 to 5000 centipoise.

466.62 Equipment.

1. Distributor Truck.

At least two pressure-type bituminous semi-distributor trucks in good condition will be required. The distributor shall be equipped with an internal heating device capable of heating the material evenly up to 425 F; have adequate pump capacity to maintain a high rate of circulation in the tank; have adequate pressure devices and suitable manifolds to provide constant positive cut off to prevent dripping from the nozzles. The distribution bar on the distributor shall be fully circulating. Any distributor that produces a streaked or irregular distribution of the material shall be promptly repaired or removed from the project.

Distributor equipment shall include a tachometer, pressure gauges, volume measuring devices, a thermometer for reading temperature of tank contents, and an intimal auger to maintain proper mixture and blending of asphalt and rubber. Controls for spray bar shall be located in cab of truck, for controlling width and rate of spray of product.

It shall be so constructed that uniform applications may be made at the specified rate per square yard within a tolerance of plus or minus 0.05 gal.per sq. yd.

2. Brooms.

Revolving brooms shall be so constructed as to sweep clean or redistribute aggregate without damage to the rubberized-asphalt membrane or surface treatment.

3. Pneumatic-Tired Roller.

There shall be at least two multiple wheel self-propelled pneumatic-tired rollers with provisions for loading eight to twelve tons as deemed necessary. Pneumatic-tired rollers shall have a total

compacting width of at least 60inchesandshall have minimum tire pressure of 60 pounds per square inch. A minimum of three rollers are required, two pneumatic and one steel.

4. Power Rollers.

Shall be self-propelled steel rollers weighing between 1.5 ton and 5 ton.

5. Asphalt Heating Tank.

To heat the asphalt cement to the necessary temperature for blending with the rubber, tank shall be a minimum 3000 gallon capacity and capable of heating product at a minimum rate of 60 F per hour.

6. Mechanical Blender.

For proper proportioning and thorough mixing of the asphalt and rubber together to produce the specified rubber content material. This unit shall have both an asphalt totalizing meter (gallons) and a flow rate meter (gallons per minute), positive placement auger to feed rubber properly to mix chamber at the specified rate, and an auger in mixing chamber running through a static motionless mixer.

7. Distributor.

Shall include a tachometer, pressure gauges, volume measuring devices, a thermometer, a 12" auger capable of blending and maintaining proper blending of material and an 8" dual positive placement gear head pump capable of spraying the rubberized asphalt at a viscosity of 2000 to 5000 centipoise.

A "boot man" shall accompany the distributor and ride in a position so that all spray bar nozzles are in his full view and readily accessible for unplugging.

8. Chip Spreader.

This equipment shall be self-propelled and be adjustable to control and spread accurately the given amounts of cover aggregate per square yard. It shall have a width of spread of not less than twelve (12) feet. Cut off plates shall be provided to permit the width of spread to be reduced in increments of six (6) inches or one (1) foot from the maximum width specified. The spreader shall be equipped with a hitch at the rear so it can lock onto the hauling trucks while they are discharging into the spreader. Two (2) conveyor belts shall supply aggregate from the hopper to the element which spreads the cover aggregate over the road surface. Screen below screw auger at bottom of hopper shall be in place.

466.63 Construction Requirements.

The rubberized asphalt mixture shall be applied at a temperature of 290 F to 340° F. at a rate of 0.60 ±0.050 gal. per sq.yd. Transverse joints shall be constructed by placing building paper across sand over the end of the previous rubberized asphalt application. Once the spraying has progressed beyond the paper, the paper shall be removed immediately and disposed of as directed by the Engineer. Longitudinal joints shall be overlapped from 4 to 6 inches.

If rubberized asphalt is applied directly to an old existing Portland Cement Concrete pavement; Band-Aid strips shall be placed prior to the rubberized asphalt treatment on all transverse and longitudinal joints. The strips shall be Pave-Prep, Poly-guard, Rol-Glas or equal and shall be placed 18" wide. The SAMI Shall be applied within four days of the placement of the Band-Aid strips.

SECTION 468

PEASTONE COVER FOR BITUMINOUS CONCRETE PAVED SHOULDERS

DESCRIPTION

468.20 General.

Pea stone cover for bituminous concrete paved shoulders will consist of an application of bitumen on the finished surface of the shoulder and then a cover of pea stone spread and rolled in accordance with these specifications.

MATERIALS 468.40 General.

Materials shall meet the requirements of the following Subsections of Division ill, Materials:

Crushed Stone Aggregate M2.01.0

Pea stone Cover (Gradation) M2.01.6

Bituminous Material

Asphalt Cement M2.01.0

Asphalt Emulsion M3.03.0

Cationic Emulsified Asphalt M3.03.1

Cutback Asphalts M3.02.0

CONSTRUCTION METHODS

468.60 General.

The width of the treatment shall be as shown on the plans and as directed. The surface to be treated shall be clean and cleared of all leaves, twigs, and other foreign or objectionable material with brooms or other approved method.

468.61 Applying Bitumen.

The bitumen shall be applied uniformly at the specified rate with a pressure distributor. Distributors shall be in good mechanical condition, with an accurate tachometer, and capable of spraying satisfactorily for a width of knotless than 15 feet at apressure of between 40 and 60

pounds per square inch. The distributor shall be equipped with a system for heating evenly the entire volume of the bitumen under efficient and positive control at all times.

Distributors shall also be equipped with satisfactory thermometers for measuring the temperature of the material to be applied and shall have either a steam or air-kerosene system for the clearing of the lines and pumps. Evidence of fluxing with kerosene or emulsification by steam will be sufficient cause for rejection of the delivery.

Deliveries of bitumen will be refused when the above conditions are not fulfilled. A hose attachment on the distributor shall be used to apply bitumen wherever necessary to touch up any areas missed or inaccessible to the distributor. The bitumen shall be applied at the temperature recommended in the Department Specifications for Bituminous and Allied Materials for the type of asphaltic material being used. No bituminous work shall be done during rainy weather or when weather conditions as to temperature or otherwise are, in the Engineer's judgment, unfavorable for obtaining satisfactory results.

468.62 Spreading and Rolling Stone.

The bitumen shall be immediately covered with a sufficient amount of 3/8-inch pea stone to take up the excess bitumen and then thoroughly rolled. Means of a mechanical or box type chip spreader shall spread the pea stone evenly. Spreading shall not be done with a power grader or directly from trucks. The application of pea stone shall be performed in conjunction with the application of the bitumen and a rate to assure proper bonding before cooling takes place.

Rolling shall be performed with a steel wheel roller weighing not less than 240 pounds per inch of tread or an approved pneumatic tired roller. The surfaces of the wheels of the roller shall be kept clean at all times. Precautions shall be taken to prevent the depositing of dirt or other foreign material on the shoulders. Only enough rolling will be done to settle stone and bond it to the shoulder. Excess rolling that will crush the stone will not be permitted.

The stone shall be free of all deleterious material sand if, in the opinion of the Engineer, it is deemed necessary for the proper bonding to the bitumen, the stone shall be lightly treated at the plant with a cut back asphalt or other suitable vehicle.

No trucks or other vehicles shall be allowed to pass over a section for at least 12 hours after the stone has been placed.

COMPENSATION

468.80 Method of Measurement.

Pea stone for cover will be measured by the ton. The Engineer shall countersign the weight slips on delivery, and no weight slip not so countersigned shall be included for any payment under the contract.

Bitumen delivered in tank trucks or tank feeders shall be weighted on scales and the volume computed on the basis of the current tabulation of Weights per Gallon of Bituminous Materials, as approved by the Department.

Scales used in weighing shall be standard scales furnished by and at the expense of the Contractor. Such scales shall be sealed as often as necessary to insure their accuracy, at the expense of the Contractor. A sworn weighed to be compensated by the contractor shall weigh all bitumen required to be weighed. The Engineer may witness the weighing of such materials.

Bitumen delivered in tank cars, when not actually weighed shall be measured by volume at the loading temperature, and this quantity converted to the volume at the applying temperature. The coefficient of expansion or contraction per degree F, shall be .00035 for asphalt, .00025 for asphaltic emulsions, .0004 for cutback asphalt and .0003 for tar.

In no case shall the total number of gallons of bituminous material for any car be in excess of the United States Interstate Commerce Commission's rating for the car, plus the expansion based on the volumetric change between the loading and the specific application temperature.

468.81 Basis of Payment.

Pea stone for Cover will be paid for at the contract unit price per ton under the item for Crushed Stone for Pea stone Cover.

Bitumen for Pea stone Cover will be paid for at the contract unit price per gallon, under the item for Bitumen for Pea stone Cover, applied, complete in place.

468.82 Payment Items.

468. Crushed Stone for Pea stone Cover

469. Bitumen for Pea stone Cover Ton Gallon

SECTION 580

CURB OR EDGING REMOVED AND RESET; REMOVED AND STACKED OR REMOVED AND DISCARDED

DESCRIPTION

580.20 General.

This work shall consist of removing the present curb, edging, curb comer sand curb inlets of every type and cross section made of granite, concrete or granite-faced and resetting or stacking them or discarding them in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

MATERIALS

580.40 Curb Edging, Curb Inlets and Curb Corners.

Curb, edging, curb inlets and curb comers shall consist of so much of the same as is suitable, in the Engineer's judgment to be reset or stacked.

580.41 Gravel.

Gravel shall conform to the requirements of Subsection MI.03.0 Type C of Division III, Materials.

CONSTRUCTION METHODS

580.60 Removal.

A trench of sufficient width and depth shall be excavated so that the present curb, edging, curb comers and curb inlets can be removed without damage.

580.61 Protection.

The Contractor shall protect all curb or edging and keep it in satisfactory condition until the acceptance of the entire contract. Particular care will be required to prevent any unsatisfactory discoloration of the curb or edging. The Contractor shall replace any existing curb, edging, curb comers and curb inlets that is to be reset, which is lost or damaged as a result of his operations, or because of his failure to store and protect it in a manner that would eliminate its loss or damage.

580.62 Adjustment.

The length of any section of curb or edging, shall be altered by cutting in order to fit closures as necessary. The ends of all stones shall be square with the planes of the top and face so that when the stones are placed end-to-end as closely as possible no space shall show in the joint at the top and face of more than 3/4 inch for the full width of the top and for 8 inches down on the face.

580.63 Relaying.

The Construction methods for resetting all curbing or edging, in the final location shall conform to the requirements of Subsections 501.60 to 501.62, 501.65 and 501.67.

580.64 Stacking.

The Contractor shall accept and hold entire responsibility for the removal, handling, stacking at a location convenient for removal by owner, and protection of all curbing or edging until its final removal as designated in accordance with the following:

Any curbing or edging damaged through lack of protection or carelessness by the Contractor shall be replaced at his expense. The Contractor's responsibility will cease upon final acceptance of the work or 60 days from the time a certified notice. with copy to the Engineer, is sent by Contractor to owner of material that all material is available for removal.

580.65 Discarding.

Any curb. edging. curb comers and curb in lets not damaged through lack of protection or carelessness by the Contractor but deemed by the Engineer as unsatisfactory for relaying or stacking, will be discarded. h will be the Contractor's responsibility to dispose of any discarded curb, edging, curb comers and curb inlets without additional compensation.

COMPENSATION

580.80 Method of Measurement.

The quantity of curb and edging to be paid for will be the length actually removed and reset, and measured as specified in Subsection S01.80. The quantity of curb or edging measurement will be the length actually removed and stacked. and measured along the front arras line at the location stacked. The quantity of curb or edging removed and discarded will be the length ordered to be removed and actually removed. but not included for payment under the item so if Removed and reset or Removed and Stacked.

Each curb inlet or curb comer removed and stacked or discarded will be considered as 1 unit.

Any remaining curb or edging removed which is not included for payment under the items listed above shall be classified as Earth Excavation (See Subsection 120.21).

580.81 Basis of Payment.

Removing and resetting curb and edging will be paid for at the contract unit price per linear foot of Curb Removed and Reset or Edging Removed and Reset at new location. Removing and resetting curb inlets will be paid for at the contract unit price each for Curb Inlets Removed and Reset. Removing and resetting curb corners will be paid for at the contract unit price each, Curb Comers Removed and Reset. Removing and stacking curb or edging will be paid for at the contract unit price per linear foot under the respective item. Removing and stacking of curb inlets and curb comers will be paid for under the items for Curb Inlets Removed and Stacked, and Curb Comers Removed and Stacked, respectively. Removing and discarding curb or edging will be paid for at the contract unit price per linear foot under the respective item. Removing and discarding of curb inlets and curb comers will be paid for under the items for Curb Inlets, Removed and Discarded, and Curb Comers Removed and Discarded, respectively.

580.82 Payment Items.

580. Curb Removed and Reset Linear Foot

581. Curb Inlet Removed and Reset Each

582. Curb Comer Removed and Reset Each

583. Edging Removed and Reset Linear Foot

590. Curb Removed and Stacked Linear Foot

591. Curb Inlet Removed and Stacked Each

592. Curb Comer Removed and Stacked Each

593. Edging Removed and Stacked Linear Foot

594. Curb Removed and Discarded Linear Foot

595. Curb Inlet Removed and Discarded Each

596. Curb Comer Removed and Discarded Each

597. Edging Removed and Discarded Linear Foot

121. Class A Rock Excavation Cubic Yard

151. Gravel Borrow Cubic Yard

SECTION 600

HIGHWAY GUARD, FENCES AND WALLS

SECTION 601 HIGHWAY GUARD

DESCRIPTION

601.20 General.

This work shall consist of the construction of guardrail in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer. The type of guardrail is designated as follows:

Highway Guard Steel Beam Type SS. The construction of guardrail shall include the assembly and erection of all components parts and materials complete at the locations shown on the plans or as directed.

MATERIALS

601.40 General.

Materials shall meet the requirements specified in the following Subsections of Division ill, Materials: Steel Beam Highway Guard Type S5 M8.07.0

CONSTRUCTION METHODS

601.60 Posts.

Posts shall be set plumb, in hand or mechanically dug holes, or driven, then backfilled with acceptable material placed in layers and thoroughly compacted.

If driven the post shall be provided with suitable driving caps and equipment used, which will prevent battering, or injury of posts. Posts damaged or distorted as result of driving shall be removed and replaced with approved posts. Guard posts to be set in areas of proposed bituminous concrete surfacing shall be erected prior to laying the surrounding finished surface unless otherwise permitted by the Engineer.

601.61 Spacing of Posts.

Posts shall be spaced as shown on the plans.

601.62 Steel Beam Rail.

The rail shall be erected so as to form a smooth continuous rail conforming to the required line and grade. The rail element shall be spliced by lapping in the direction of the traffic or by other approved methods. The holes in the rail element nearer the posts shall be slotted to facilitate erection and to permit expansion. The rail shag make full contact at each splice.

All bolts, except where otherwise required at expansion joints shall be drawn tight. Bolts through expansion joints shall be drawn up as tightly as possible without being too tight to prevent the rail elements from sliding past one another longitudinally.

COMPENSATION

601.80 Method of Measurement.

Steel beam highway guard will be measured along the top edge of the rail element from center to center of end posts. The unit of measurement of individual posts will be each post set complete in place. Single faced steel beam terminal sections and double faced steel beam terminal sections will each be conside red as a unit. Buried ends will be measured as a unit for installation of the 37.5 feet of highway guard as directed. I.e. adding and trailing ends will be measured as units for the25 feet of highway guard. Hard ware and necessary work to complete installation as directed.

601.81 Basis of Payment.

Highway guard will be paid for at the contract unit price per linear foot.

Single faced and double faced steel beam terminal sections will be paid for at the contract unit price each under the items for Steel Beam Terminal Section (Single Faced) and Steel Beam Terminal Section (Double Faced) respectively.

Buried ends will be paid for at the contract unit price each. Leading and trailing ends will be paid for at the contract unit price each.

Where posts occurring waterway aprons the cutting of holes and replacement of aprons shall be done without additional compensation. Rock excavation. If necessary, will be paid for at the contract unit price per cubic yard under the item for Class B ROCK Excavation.

601.82 Payment Items.

602. Individual Post Each

620.1 St. Bm. Hwy. Guard-Type SS (Single Faced) Linear Foot

620.3 St. Bm. Hwy. Guard-Type SS (Single Faced- Curved) Linear Foot

620.4 St. Bm. Hwy. Guard-Type SS Buried End (Single Faced) Each

621.1 St. Bm. Hwy. Guard-Type SS (Double Faced) Linear Foot

621.3 St. Bm. Hwy. Guard-Type SS (Double Faced) (Curved) Linear Foot

621.4 St. Bm. Hwy. Guard-Type SS Buried End (Double Faced) Each

622.1 St. Bm. Hwy. Guard-Type SS (Single Faced Wood Posts) Linear Foot

622.3 St. Bm. Hwy. Guard-Type SS (Single Faced Wood Posts- Curved) Linear Foot

622.5 St. Bm. Hwy. Guard-Type SS Buried End (Single Faced- Wood Posts) Each

624.1 St. Thrie Bm. Hwy. Guard-Type SS (Single Faced) Linear Foot

624.3 St. Thrie Bm. Hwy. Guard-Type SS (Single Faced- Curved) Linear Foot

624.4 St. Thrie Bm. Hwy . Guard-Type SS Buried End (Single Faced) Each

625.1 St. Thrie Bm. Hwy . Guard-Type SS (Double Faced) Linear Foot

625.3 St. Thrie Bm. Hwy. Guard-Type SS (Double Faced- Curved) Linear Foot

625.4 St. Thrie Bm. Hwy. Guard-Type SS Buried End (Double Faced) Each

626.1 St. Bm. Hwy . Guard-Type SS (Single Faced/SP Base Anch.) Linear Foot

626.2 St. Bm. Hwy. Guard-Type SS(Double Faced/SP Base Anch.) Linear Foot

626.3 St. Thrie Bm. Hwy. Guard-Type SS (Single Faced/SP Base Anch.) Linear Foot

626.4 St. Thrie Bm. Hwy. Guard-Type SS (Double Faced/SP Base Anch.) Linear Foot

627.1 St. Bm. Terminal Section (Single Faced) Each

627.2 St. Bm. Terminal Section (Double Faced) Each

627.3 St. Thrie Bm. Terminal Section (Single Faced) Each

627.4 St. Thrie Bm. Terminal Section (Double Faced) Each

627.5 Special St. Bm. Terminal Section (Single Faced) Each

628.1 Leading End for St. Bm. Hwy. Guard at Bridge Each

628.2 Trailing End for St. Bm. Hwy. Guard at Bridge Each

628. Leading End for St. Thrie Bm. Hwy. Guard at Bridge Each

628.4 Trailing End for St. Thrie Bm. Hwy. Guard at Bridge Each

144. Class B Rock Excavation Cubic Yard

SECTION 600 HIGHWAY GUARD, FENCES AND WALLS

SECTION 601 HIGHWAY GUARD

DESCRIPTION

601.20 General.

This work shall consist of the construction of guard rail in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer. The

type of guard rail is designated as follows:

Highway Guard Steel Beam Type SS. Theconstruction of guard rail shallinclude theassembly anderectionofallcomponents partsand materials complete at the locations shown on the plans or as directed.

MATERIALS

601.40 General.

Materials shall meet the requirements specified in the following Subsections of Division ill, Materials: Steel Beam Highway Guard Type S5 M8.07.0

CONSTRUCTION METHODS

601.60 Posts.

Posts shall be set plumb, in hand or mechanically dug holes, or driven, then backfilled with acceptable material placed in layers and thoroughly compacted.

Ifdriven the post shall be provided with suitabledriving caps and equipment used which will prevent bat-tering orinjury ofposts.Postsdamaged ordistortedasaresult ofdriving shallbe removed and replaced with approved posts. Guard posts to be set in areas of proposed bituminous concrete surfacing shall be erected prior to laying the surrounding finished surface unless otherwise permitted by the Engineer.

601.61 Spacing of Posts.

Posts shall be spaced as shown on the plans.

601.62 Steel Beam Rail.

The rail shall be erected so as to form a smooth continuous rail conforming to the required line and grade. The rail element shall be spliced by lapping in the direction ofthe traffic or by other approved methods. The holes in the rail element nearer the posts shall be slotted to facilitate erection and to permit expansion. The rail shaJJ make full contact at each splice.

All bolts, except where otherwise required at expansion joints shall be drawn tight. Bolts through expansion joints shall be drawn up as tightly as possible without being too tight to prevent the rail elements from sliding past one another longitudinally.

COMPENSATION

601.80 Method of Measurement.

Steel beam highway guard will be measured along the top edge of the rail element from center to center of end posts. The unit of measurement ofindividual posts will be each post set complete in place. Single faced steel beam terminal sections and double faced steel beam terminal sections will each be considered as a unit. Buried ends will be measured as a unit for installation of the 37.5 feet of highway guard as directed. I.eading and trailing ends will be measured as units for the 25 feet of higbway guard hardware and necessary work to complete installation as directed.

601.81 Basis of Payment.

Highway guard will be paid for at the contract unit price per linear foot.

Single faced and double faced steel beam terminal sections will be paid for at the contract unit price each under the items for Steel Beam Terminal Section (Single Faced) and Steel Beam Terminal Section (Double Faced) respectively.

Buried ends will be paid for at the contract unit price each.

Leading and trailing ends will be paid for at the contract unit price each.

Whereposts occur in waterway aprons the cutting of holes and replacement of aprons shall be done without additional compensation. Rock excavation. ifnecessary, will be paid for at the contract unit price per cubic yard under the item for Class B ROCK Excavation.

601.82 Payment Items.

602.	Individual Post	Each
620.1	St. Bm. Hwy. Guard-Type SS (Single Faced)	Linear Foot
620.3	St. Bm. Hwy. Guard-Type SS (Single Faced) (Curved)	Linear Foot
620.4	St. Bm. Hwy. Guard-Type SS Buried End (Single Faced)	Each
621.1	St. Bm. Hwy. Guard-Type SS (Double Faced)	Linear Foot
621.3	St. Bm. Hwy. Guard-Type SS (Double Faced) (Curved)	Linear Foot
621.4	St. Bm. Hwy. Guard-Type SS Buried End (Double Faced)	Each
622.1	St. Bm. Hwy. Guard-Type SS (Single FacedlWood Posts)	Linear Foot
622.3	St. Bm. Hwy. Guard-Type SS (Single FacedlWood Posts) (Curved)	Linear Foot
622.5	St. Bm. Hwy. Guard-Type SS Buried End (Single FacedlWood Posts)	Each
624.1	St. Thrie Bm. Hwy. Guard-Type SS (Single Faced)	Linear Foot
624.3	St. Thrie Bm. Hwy. Guard-Type SS (Single Faced) (Curved)	Linear Foot
624.4	St. Thrie Bm. Hwy . Guard-Type SS Buried End (Single Faced)	Each
625.1	St. Thrie Bm. Hwy . Guard-Type SS (Double Faced)	Linear Foot
625.3	St. Thrie Bm. Hwy. Guard-Type SS (Double Faced) (Curved)	Linear Foot
625.4	St. Thrie Bm. Hwy. Guard-Type SS Buried End (Double Faced)	Each
626.1	St. Bm. Hwy . Guard-Type SS (Single Faced/SP Base Anch.)	Linear Foot
626.2	St. Bm. Hwy. Guard-Type SS(Double Faced/SP Base Anch.)	Linear Foot
626.3	St. Thrie Bm. Hwy. Guard-Type SS (Single Faced/SP Base Anch.)	Linear Foot
626.4	St. Thrie Bm. Hwy. Guard-Type SS (Double Faced/SP Base Anch.)	Linear Foot
627.1	St. Bm. Terminal Section (Single Faced)	Each
627.2	St. Bm. Terminal Section (Double Faced)	Each
627.3	St. Thrie Bm. Terminal Section (Single Faced)	Each
627.4	St. Thrie Bm. Terminal Section (Double Faced)	Each
627.5	Special St. Bm. Terminal Section (Single Faced)	Each
628.1	Leading End for St. Bm. Hwy. Guard at Bridge	Each
628.2	Trailing End for St. Bm. Hwy. Guard at Bridge	Each
628.	Leading End for St. Thrie Bm. Hwy. Guard at Bridge	Each
628.4	Trailing End for St. Thrie Bm. Hwy. Guard at Bridge	Each
144.	Class B Rock Excavation	Cubic Yard

SECTION 644 CHAIN LINK FENCE AND GATES

DESCRIPTlON

644.20 General.

This work shall consist of the construction of chain link fence and gates in accordance with these specifications, and in close conformity with the lines and grades shown on the plan or established by the Engineer. Chain link fence shall be either Type 1 Zinc-Coated Steel or Type 2 Aluminum-Coated Steel.

MATERIALS

644.40 General.

Materials shall meet the requirements specified in the following Subsections of

Division II, Materials:

Chain Link Fences and Gates M8.09.0

Bonded Vinyl Coated Chain Link Fences, Posts, Rails, Fabric, Gates and Accessories M8.09.2

4000 psi, 1-1/2", 565 Cement Concrete Bases M4.02.00

Paint, High Zinc Dust Content - Galvanizing Repair M7.04.11

CONSTRUCTION METHODS

644.60 General.

The posts shall be set true to the line and grade of the proposed fence. End, Corner and Intermediate Brace Posts shall be set in concrete bases as shown in the Construction Standards. The posts in masonry walls shall be set in pipe sleeves or sockets.

All line posts, except those which are unstable due to soil condition as described hereinafter, shall have drive anchor assemblies as shown in the Construction Standards. Line Posts, which in the opinion ofthe Engineer are unstable due to soil condition, (such as in swamps or seasonal wet areas) shall be placed in a concrete base as shown in the Construction Standards.

Where solid rock is encountered without an overburden of soil, line posts shall be set a minimum depth of 8 inches, and end, corner, gate and intermediate posts a minimum of 12 inches in the solid rock. The hole shall have a minimum width or diameter of one inch greater than the largest dimension of the post section to be set. The posts shall be cut, before installation to lengths which will give the required length of post above ground, or if the Contractor so elects he may use an even length of post above ground, or if the Contractor so elects he may use an even length of post set at greater depth into the solid rock.

After the post is set and plumbed the hole shall be filled with grout consisting of one part Portland cement and one part clean, well graded sand. The grout shall be thoroughly worked into the hole so as to leave no voids. Where posts are set in the above manner, concrete footings will not be required.

Where solid rock is covered by an overburden of soil or loose rock, the posts shall beset to the full depth shown on the standard drawing unless the penetration into solid rock reaches the minimum depths specified above, in which case the depth of penetration maybe terminated. Concrete footings shall be constructed from the solid rock to the top ofthe ground as designated. Grouting will be required on the portion of the posts in solid rock.

Intermediate Brace Posts as used in these specifications, shall be spaced at SOO-foot maximum intervals. Gate, end, corner, and intermediate brace posts shall be braced as shown on the standard drawing. Changes in line of 30 degrees or more shall be considered as corners.

644.61 Foundation Bases.

Forms for placing concrete bases will not be required. Chamfer or bevel edges will not be required.

Where chain link fences are used to enclose Engineers field office and material buildings, the posts shall be set in ground without concrete bases to facilitate ease in removal later.

644.62 Top Rail.

Top rails shall pass through the ornamental tops off-line posts, forming a continuous brace from end to end of each stretch offence. Lengths of top rail shall be jointed by sleeve type couplings. Top rails shall be securely fastened to terminal posts by pressed steel fittings.

On curves with a radius of less than 500 feet the top rail shall be bent true to the curve.

644.63 Top Tension cable.

Top tension cable shall pass through the ornamental top of the line posts. One continuous length of cable shall be used between pull posts. The cable shall pass through the pull post top and down to the base of the next line post where it shall be attached to the base of line post with a turnbuckle. Sufficient tension shall be applied to the cable to allow a maximum sag of1/4 inch between posts after the chain link mesh has been attached to the cable. The Contractor shall provide temporary bracing on intermediate brace posts when applying tension to one length of cable at a time, to prevent undue stresses in the intermediate brace post.

After tension has been applied to the cables, a wire rope clip shall be placed around both cables one on each side of the intermediate brace posts, and the clips securely tightened. Clips shall be placed as close to the posts as possible to minimize the deflection of the post if one of the cables should be parted.

The cable shall be fastened to the top of the end intermediate brace post with an eyebolt through the post and a turnbuckle connecting the eye bolt to the cable. The end intermediate post shall be braced to the bottom of the end post with a short length of cable attached. A length of cable shall connect the end intermediate brace and the end post at the top.

Eye bolts shall have a shoulder on the eye end and shall be provided with a nut and lock washer. Where he eye bolt is to be installed through a pipe section, 2 lead washers shall be placed against the shoulder of he eye, and a lead washer backed and the nut tightened sufficiently to seal the hole in the pipe.

A galvanized iron strap114inch inthicknessby2inches in width, formed as shown on the standard drawing, shall be provided for the attachment of eye bolts to the base of "H" column post in order to take the strain of the cable tension off the web of the "H" column.

All holes drilled in steel post sections shall be cleaned and painted before the eye bolts are installed with ~ coats of paint, High Zinc Dust Content -Galvanizing Repair (M7.04.11). The ends of all cables shall be seized with annealed iron wire passed around the end of cable and the line cable. The seizing shall be at least 1 inch in width.

644.64 Spring Tension Wire.

Spring tension wires shall be placed ten inches (10") from the top and bottom of the line posts, comer posts, end posts and intermediate brace posts. The spring tension wire shall be fastened to each line post with No.6 gauge steel clip. The wires shall be fastened to end posts, comer posts and intermediate brace posts with an end band and minimum of five (5) turns around the spring tension wire to end the installation. One continuous length of spring tension wire shall be used between intermediate brace posts (500 ').

Sufficient tension shall be applied to create a tension in the spring tension wire so that no sag is visible. On completion of the installation the spring tension wire shall be attached to the fence fabric

with hog rings of No. 11 gauge placed every twelve (12) inches ± top and bottom.

644.65 Fence Fabric.

Chain link fabric over 5 foot fence shall be placed on the face of the post away from the highway, and on fences 5-feet or less, erect, fabric on the face of the posts designated by the Engineer, except that on curves the fabric on all types of fence shall be placed on the face of the post which is on the outside of the curve.

The chain link: fabric shall be placed approximately 2 inches above the ground and on a straight grade between posts.

The fabric shall be stretched taut and securely fastened to the posts. Stretching by motor vehicle will not be permitted. Fastening to end, gate, comer, and intermediate brace posts shall be with stretcher bars and fabric ands spaced at one foot intervals. The fabric shall be cut and each span attached independently at all intermediate brace and comer posts. Fastening to post, top rail, top tension cable or spring tension wire shall be with wire, metal bands, hog rings, or by other approved method.

Rolls of wire fabrics shall be joined by weaving a single strand into the ends of the rolls to form a continuous mesh.

644.66 Gates.

Chain link fabric shall be fastened to the end barsof the gate frame by stretcher bars and fabric bands, and to the top and bottom bars of the gate frames by tie wires in the same manner as specified for the chain link fence fabric; or by other standard methods ifapproved by the Engineer.

The height of the gate frame shall be approximately as follows:

6' Fence 5'6" 4' Fence 3 '6"

5' Fence 4'6" 3' Fence 2 '6"

COMPENSATION

644.80 Method of Measurement.

Chain link fence will be measured, approximately parallel to the ground by the linear foot of completed fence, exclusive of openings from outside of to outside of end posts. Gates with gate posts will be measured between centers of the gate posts.

644.81 Basis of Payment.

Chain Link Fence will be paid for at the contract unit price per linear foot, complete in place, except for rock excavation, which shall include all drive anchors, line posts, fabric, top rail, cable or wire, fasteners, clips and all material and equipment necessary to complete the work in a satisfactory manner. Allowance for rock excavation will be as specified under Class B Rock Excavation.

Gates with Gateposts will be paid for at the contract unit price per linear foot of the height specified and the respective widths shown on the plans complete in place. Allowance for rock excavation will be made as specified under Class B Rock Excavation.

End post including brace will be paid for at the contract unit price each under item for Chain Link Fence End Post, complete in place. Corner and intermediate brace post will be paid for at the contract unit price each for Chain Link Fence Corner and Intermediate Brace Post, complete in place. The chain link fence posts shall be of the type used throughout the installation.

Concrete bases for line posts, if required, shall be paidforunderItem901.3 4000psi,1Vz ", 565 Cement Concrete Masonry for Post Foundation, which shall include the excavation, except rock

excavation, which shall be paid under Class B Rock Excavation.

644.82 Payment Items.

*644.1 In. Chain Link Fence (Spring Tension Wire) Ty 1 -(Line Post -Option)	Linear Foot
*644.2 In. Chain Link Fence (Spring Tension Wire) Ty 2 -(Line Post -Option)	Linear Foot
644.3 In. Chain Link Fence (Spring Tension Wire) Vinyl Coated -(Line Post -Option)	Linear Foot
*645.1 In. Chain Link Fence (pipe Top Rail) Ty 1-(Line Post -Option)	Linear Foot
*645.2 In. Chain Link Fence (Pipe Top Rail) Ty 2 -(Line Post -Option)	Linear Foot
645.3 In. Chain Link Fence (Pipe Top Roll) Vinyl Coated -Line Post -Option)	Linear Foot
*646.1 In. Chain Link Fence (Cable Top) Ty 1 -(Line Post -Option)	Linear Foot
*646.2 In. Chain Link Fence (Cable Top) Ty 2 -(Line Post -Option)	Linear Foot
646.3 In. Chain Link Fence (Cable Top) Vinyl Coated -(Line Post -Options)	Linear Foot
*647.1 In. Chain Link Fence (pipe Top Rail) With Barbed Wire Ty 1 (Line Post -Option)	Linear Foot
*647.2 In. Chain Link Fence (Pipe Top Rail) With Barbed Wire Ty 2 (Line Post-Option)	Linear Foot
*648.1 In. Chain Link Fence (Cable Top) With Barbed Wire Ty 1 -(Line Post-Option)	Linear Foot
*648.2 In. Chain Link Fence (Cable Top) With Barbed Wire Ty 2 (Line Post-Option)	Linear Foot
*649.1 In. Chain Link Fence (Spring Tension Wire) With Barbed Wire Ty 1 -Option)	Linear Foot
	(Line Post -Option)
*650.1 In. Chain Link Gate, Type 1 With Gate Posts	Linear Foot
*650.2 In. Chain Link Gate, Type 2 With Gate Posts	Linear Foot
*651.1 In. Chain Link Gate, Type 1 With Gate Posts and Barbed Wire	Linear Foot
*651.2 In. Chain Link Gate, Type 2 With Gate Posts and Barbed Wire	Linear Foot
*652. In. Chain Link Fence End Post	Each
*653. In. Chain Link Comer and Intermediate Brace Post	Each
*654. In. Chain Link Fence Fabric	Linear Foot
144. Class B Rock Excavation	Cubic Yard
901.3 4000 psi, 1-1/2", 565 Cement Concrete Masonry for Post Foundation	Cubic Yard

*Inset height of fence or gate at beginning of nomenclature, item number will reflect this height when possible. When option is stipulated in above items the Contractor will be required to indicate his choice.

ITEM 655.3 WOOD RAIL FENCE FOOT

Work under this item shall consist of furnishing and installing timber rail fence fastened to wood posts at locations where indicated on the plans or as directed by the Engineer in conformance with the dimensions and details shown on the plans and the relevant provisions of Section 600 of the Standard Specifications and the following:

Materials

All timber posts and rail components shall conform with the following:

- Commercial lumber grade No. 1 or better after treatment;
- AASHTO M 168;
- Minimum tabulated design bending value of 1350 psi

• Planed or S4S (surface four side) Southern Yellow Pine or Douglas Fir- Larch with nominal dimensions as indicated on the plans. Variations in the size of any dimension shall not be more than + ¼"

• All timber components shall be pressure treated with ACZA conforming to AWPA Standard P5 to a minimum net retention of 0.60lb/cubic foot in the assay zone in accordance with AWPA Standard C14.

• All timber components shall be fabricated (including but not necessarily limited to cutting, drilling, dapping and chamfering) prior to treatment.

• All timber components shall be free of excess preservative and solvent at the conclusion of the treating process. Post treatment cleaning shall be by expansion bath or steaming in accordance with AWPA Standard C2;

• Kiln or air dried to a maximum moisture content of 25% after treatment (KDAT - 25);

• Grade-marked after treatment by an agency certified by the American Lumber Standard Committee (ALSC).

• Damaged post and rail elements will not be accepted.

Round head bolts including nuts and washers shall be manufactured in accordance with ASTM A307 Grade A specifications. All round head bolts including nuts and washers shall be hot-dipped galvanized in accordance with ASTM A153 Class C.

CONSTRUCTION

Wood rail fence posts shall be set plumb, backfilled with ordinary borrow, as required, and compacted to the lines and grades given.

The Contractor is cautioned that within the limits of any project, buried cables for illumination or utilities, which may be energized, may be present.

The Contractor shall be required to furnish extra length posts at transition areas or where field conditions warrant. These posts shall be of such length that the minimum depth in the ground, as shown on the plans, is maintained.

METHOD OF MEASUREMENT

Wood Rail fence shall be measured by actual fence installed and accepted by foot.

BASIS OF PAYMENT

Payment will be made at the contract unit price per foot, complete in place. This payment shall be considered as full compensation for all labor, tools, equipment and materials, including all required excavation, backfill, fasteners, bolts, nuts, and washers necessary to complete the work in a satisfactory manner.

ITEM 665.FENCE - REMOVED AND STACKED FEET

SECTION 665

FENCES AND GATES REMOVED AND RESET: REMOVED AND STACKED

DESCRIPTION

665.20 General.

This work shall consist ofremoving present fences and gates and resetting or stacking themin accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

.MATERIALS

665.40 General.

The materials removed shall be utilized in the fence and gates for resetting except, where necessary, new posts and bases shall be furnished by the Contractor. Any materials missing, damaged or lost during or subsequent to removal shall be replaced by the Contractor without additional compensation.

All new materials required shall be equal in quality and design to the materials in the present fence or gates.

CONSTRUCTION METHODS

665.60 Removal.

The present fences and gates together with all appurtenances shall be carefully removed and satisfactorily stored and protected until required for resetting. Old post holes shall be backfilled with suitable material properly compacted.

665.61 Erection.

Fences shall be reset plumb on the new line and grade as required and shall conform to the original fence or as the Engineer directs. Backfilling around the posts shall consist of suitable material satisfactorily com-pacted. If the fence posts were originally set in concrete bases they shall be reset in their new locations in concrete bases, conforming to M4.02.00 for 4000 psi, II", 565 Cement Concrete. If repainting offences which have been painted originally is required, such work shall be done as directed. Gates shall be reset where and as directed. Painting, if required, shall be done as directed.

665.62 Stacking.

The fencing, posts, braces and gates shall be carefully removed from their present locations, transported and stacked neatly on wooden planks at the locations directed on the project, to be available and convenient 'or final removal from the project by the owner.

The Contractor will be held responsible for the fencing, posts, braces and gates, and any damage to same or to final removal from the project, but the Contractor's responsibility will cease upon final acceptance of the work, or 60 days from the time a certified notice (with copy to the Engineer) is sent by Contractor to Owner of material that all material is available for removal.

COMPENSATION

665.80 Method of Measurement.

The measurement of Fences Removed and Reset, shall be made in the final position from outside to outside of end posts or top rail whichever is the greater. Any remaining fence not required to be stacked shall become the property of the Contractor and shall be removed from the work without additional compensation.

Fences Removed and Stacked will be measured in its original position and the quantity to be paid for will be the length actually removed and stacked, including wooden gates.

Gates with gate posts removed and reset, complete in place, will be considered as a unit.

Chain Link Gates with gate posts removed and stacked will be considered as a unit.

665.81 Basis of Payment.

Removing and resetting fences will be paid for at the contract unit price per linear foot of Fences Removed and Reset, complete in their final positions. Removal and resetting of gates with gate posts will be paid for at the contract unit price each under the respective item. Removing and stacking fencing will be paid for at the contract unit price per linear foot offences removed and stacked. Removing and stacking of chain link gates with gate posts will be paid for under the item for Chain Link Gates (*inch) with Gate Posts Removed and Stacked. Allowance for rock, if not already paid for under previous rock excavation, shall be made in accordance with the provisions as stipulated under Class B Rock Excavation.

665.82 Payment Items.

665. Fence Removed and Reset Linear Foot

*666. Inch Chain Link Fence. Removed and Reset Linear Foot

*667. In. Chain Link Fence Gate with Gate Posts Removed and Reset Each

668. Iron Fence Removed and Reset Linear Foot

669. Stock Fence Gate Removed and Reset Each

670. Wood Gate Removed and Reset Each

67l. Fence Removed and Stacked Linear Foot

*672. In. Chain Link Fence Removed and Stacked Linear Foot

*673. In. Chain Link Gate with Gate Posts Removed and Stacked Each

144. Class B Rock Excavation Cubic Yard

*Height to be inserted.

ITEM 693. MODULAR BLOCK RETAINING WALL SQUARE FOOT

The work to be done under this item includes furnishing and installing modular block retaining walls at the locations shown on the plans.

Modular block retaining walls shall be installed in locations as shown on the plans or as directed by the Engineer. Construction of modular block retaining walls shall be done in accordance with the manufacturer's requirements and as directed by the Engineer.

The contractor shall submit the following to the Engineer, for approval, prior to performing any work under this Section:

Material Submittals:

The Contractor shall submit manufacturers' certifications two weeks prior to start of work stating that the Modular Block Retaining Wall Units and geosynthetic reinforcement meet the requirements of this Section. The manufacturers/suppliers of the geosynthetic reinforcement shall have demonstrated construction of similar size and types of modular block retaining walls on previous projects.

Shop Drawing:

The Contractor shall submit for approval before placing his order for materials detailed design calculations and shop drawings for the wall units. A separate submittal shall be made for each wall location and shall include wall elevations showing reinforcement, as required, and all elevations necessary to construct each wall. The type, strength and placement location of the reinforcing geosynthetic, as required per manufacturer’s recommendations, shall be included on the Shop Drawings. All calculations and drawings shall be prepared and stamped by a professional Civil Engineer (P.E.) experienced in modular block retaining wall design and licensed in Massachusetts.

Samples:

Color and texture samples shall also be provided for approval.

A. Contractor shall check materials upon delivery to assure that specified type and grade of materials have been received and proper color and texture of wall units have been received.

B. Contractor shall prevent excessive mud, wet concrete, epoxies, and like materials that may affix themselves, from coming in contact with materials.

C. Contractor shall store and handle materials in accordance with manufacturer's recommendations.

D. Contractor shall protect materials from damage. Damaged materials shall not be incorporated into the retaining wall.

Modular Block retaining Wall Units

A. Wall units shall be machine formed, Portland Cement concrete blocks specifically designed for retaining wall applications.

B. Color of modular block retaining wall units shall be Charcoal / Earth Tone Blend

C. Finish of wall units shall be weathered split faced. A weathered split-face is a straight-face unit that is mechanically finished to create rounded corners and edges similar in appearance to naturally-worn stone or cobbles.

D. Wall unit faces shall be of straight geometry.

E. Wall unit heights shall be both four and six inches (minimum).

F. Wall units shall be designed to stack in 10-inch high (minimum) by 24-inch wide (minimum) “panels” consisting of the three wall unit types that can be stacked in varied patterns to create a random look.

G. Wall units (not including aggregate fill in unit voids) shall provide a minimum weight of 105-psf wall face area.

H. Wall units shall be solid through the full depth of the unit.

I. Wall units shall have a depth (front face to rear) to height ratio of 2:1, minimum.

J. Wall units shall be interlocked with connection pins, which provide 0.75-inch setback from the unit below (four and six-inch high are stacked alternately, yielding an overall 8.5 degree minimum cant from vertical).

K. Wall units shall be capable of being erected with the horizontal gap between adjacent units not exceeding 0.125-inch.

L. Wall units shall be capable being installed with a continuous, level course at every 10 inches minimum of height so geosynthetic reinforcement layers can be placed level within the wall face.

M. Wall units shall be capable of providing overlap of units on each successive course of a corner so that walls meeting at corner are interlocked and continuous.

Wall units that require corners to be mitered shall not be allowed.

N. Wall units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the structure. Cracking or excessive chipping may be grounds for rejection. Units showing cracks longer than 1/2" shall not be used within the wall. Units showing chips visible at a distance of 30 feet from the wall shall not be used within the wall.

O. Concrete used to manufacture wall units shall have a minimum 28 days compressive strength of 3,000 psi and a maximum moisture absorption rate, by weight, of 8% as determined in accordance with ASTM C140. Compressive

strength test specimens shall conform to the saw-cut coupon provisions of ASTM C140.

P. Wall units 'molded dimensions shall not differ more than + 1/8 inch from that specified, in accordance with ASTM C1372.

Segmental Retaining Walls Unit Connection Pins

Wall units shall be interlocked with connection pins, 6.8 inches in height, with a section that can snap-off, yielding a 4.6 inch high pin. The pins shall consist of glass-reinforced nylon made for the expressed use with the wall units supplied.

Geosynthetic Reinforcement

Geosynthetic reinforcement shall consist of geogrids or geotextiles manufactured as a soil reinforcement element. Reinforcement shall be installed according to the manufacturer's instructions.

Leveling Pad

Material for leveling pad shall consist of compacted sand, gravel, or combination thereof (USCS soil types GP,GW, SP, & SW) and shall be a minimum of 6 inches in depth. Lean concrete with a strength of 200-300 psi and three inches thick maximum may also be used as a leveling pad material. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lowermost wall unit.

Drainage Aggregate

Drainage aggregate directly behind the wall shall be angular, clean stone or granular fill meeting the following gradation as determined in accordance with ASTM D422.

Sieve Size	Percent Passing
1 inch	100
3/4 inch	75-100
No. 4	0-60
No. 40	0-50
No. 200	0-5

Underdrain

Underdrain pipe shall be a perforated or slotted PVC, or corrugated HDPE pipe. The drainage pipe shall be wrapped with a geotextile to function as a filter. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248.

Modular Block Retaining Wall Caps

Wall caps shall be properly aligned and glued to underlying units with a flexible, high-strength concrete adhesive. Rigid adhesive or mortar are not acceptable.

Caps shall overhang the top course of units by 0.75 to 1 inch. Slight variation in overhang is allowed to correct alignment at the top of the wall.

METHOD OF MEASUREMENT

Modular Block Retaining Wall will be measured by the square foot face of retaining wall constructed as measured from a line parallel to and at the top of the leveling pad to below the cap unit along the length of the wall.

BASIS OF PAYMENT

The contract unit price per square foot for Item 693 shall be considered as full compensation for providing all materials, equipment, labor, including geosynthetic reinforcement, leveling pad, drainage aggregate, backfill, under drain, wall caps, and incidentals necessary to construct the wall,

complete in place, at locations indicated on the plans in accordance with the manufacturer's requirements and as directed by the Engineer.

ITEM 698.3 GEOTEXTILE FABRIC FOR SEPARATION SQUARE YARD

The work to be done under this item consists of furnishing materials, labor, tools and equipment, and performing operations necessary to complete the placement of geotextile fabric, when shown on the contract drawings, and as directed by the Engineer.

Materials

Materials shall meet the requirements specified in Subsection M9.50.0 Geotextile Fabrics of Division III, Materials, of the Standard Specifications.

Installation

The area to receive the geotextile fabric shall be cleared of sharp objects, boulders, stumps, or any materials that may contribute to punctures or other damage to the fabric. The Engineer shall verify correct orientation of the geotextile fabric prior to placing gravel borrow or crushed stone.

The fabric shall be laid smooth and free of tension, stress, folds, wrinkles, or creases. Fabric shall be overlapped a minimum of 1 foot (12 inches). Any holes or tears in the fabric shall be repaired by placing a piece of the same material over the hole or tear so that an overlap of 1.0 feet (12 inches) results in all directions. Fabric may be temporarily secured in place with ballast (e.g., sand bags or soil) and pinning as necessary immediately after placement to prevent disturbance until cover materials is placed to secure the fabric. During the spreading of materials around the fabric, care should be taken to prevent damage to the fabric, as directed by the Engineer. Any fabric material damaged during installation shall be replaced by the Contractor at no additional cost to the City of Lowell.

METHOD OF MEASUREMENT

Geotextile fabric shall be measured for payment by the square yard of geotextile fabric for separation installed, complete-in-place.

BASIS OF PAYMENT

Geotextile fabric shall be paid for at the contract unit price per square yard of geotextile fabric for separation installed, complete-in-place. Payment shall be full compensation for furnishing all planning, supervision, materials, labor, equipment, tools, and incidentals necessary to install the geotextile fabric for separation at locations indicated on the plans or as directed by the Engineer.

ITEM 697. SEDIMENTATION FENCE FEET

ITEM 698.5 TREE ROOT BARRIER FOOT

Work under this item shall consist of furnishing and installing a root barrier system at locations shown on the plans or as directed by the engineer for purposes of preventing tree roots from penetrating the pavement structure of the proposed trail.

The root barrier shall be constructed of high density polyethylene (HDPE) material. HDPE root barrier shall conform to the following applicable standards: ASTM D 638, ASTM D 790-B, ASTM D 256-73, ASTM D 751, Procedure A, ASTM D 1004 or ASTM D 4833.

The material shall measure a depth of 24 inches with the thickness to conform to manufacturers published information. Additionally the material shall have a feel of being sturdy and suitable to the intended use. The material shall come in manufacturers standard lengths either in roll or panel form.

The Contractor shall install the root barrier at locations as shown on the drawings. The details of installation shall be as recommended by the manufacturer. The top of the proposed root barrier shall be placed a maximum of 1 inch (or as directed by the manufacturer) beneath the finished grade and covered with gravel borrow and/or loam borrow and seeded.

The quantity of Item 698.5, Tree Root Barrier, will be the number of feet actually installed.

Measurement will not be made for material used for repairs, seams or overlaps. As work incidental to this item the Contractor shall have the manufacturer's representative on site to instruct personnel in proper installation methods until all parties are satisfied that the product is being properly installed. The contract unit price per foot for Item 698.5 shall include the cost of furnishing all labor, equipment, and materials necessary to complete the work including excavation and backfill.

ITEM 707.8 STEEL BOLLARD EACH

The work to be done under this item shall conform to the applicable provisions of Section 700 of the Standard Specifications and the following:

The work shall consist of fabricating, constructing and installing removable barrier posts as shown on the plans at grade crossing locations and as directed to prevent the passage of motor vehicles on the trail with the exception of emergency and maintenance vehicles.

The barrier post is to be constructed in the center of the trail in accordance with the contract drawings.

Each post is to be painted with bright yellow enamel to provide visibility over a prime coat of Rustoleum New Metal Primer and shall conform to the applicable provisions of Section M7 of the Standard Specifications. In addition to painting, the posts shall be furnished with reflectorized tape as approved by the Engineer to further enhance visibility.

The cement concrete footing as shown on the plan shall conform to the applicable provisions of Section M4 of the Standard Specifications for Cement Concrete.

Full compensation shall be included in the bid price to include shop drawings, fabrication, painting, concrete footing and otherwise satisfactorily providing the work complete in place.

ITEM 748. MOBILIZATION LUMP SUM

ITEM 750.01 BICYCLE RACK EACH

The work under this item shall conform to the applicable requirements of Section 700 and Section M8 of the Standard Specifications for metal fabrication, amended and supplemented as follows:

Each bicycle rack, or "bike loop", shall conform to the dimensions and details shown on the plans and shall be installed at the locations indicated or as directed by the Engineer. Bicycle racks shall be standard units made from: ASTM A53 Schedule 80 steel pipe (2.375" OD x 0.154 wall), hydraulically bent with a mandrel, hot-dipped galvanized after fabrication.

For manufactured products, provide shop drawings and manufacturer's literature for approval by Engineer.

Compensation will be at the contract unit price for each bicycle rack, or bike loop, complete in place. This payment shall be considered as full compensation for all tools, labor, materials and equipment necessary for completion of the work.

ITEM 751. LOAM BORROW CUBIC YARD

LOAM BORROW, PLANTABLE SOIL BORROW, PROCESSED PLANTING

MATERIAL OR TOPSOIL REHANDLED AND SPREAD

DESCRIPTION

751.20 General.

This work shall consist of furnishing and placing loam borrow, processed planting material or topsoil rehandled and spread on an approved area in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

MATERIALS

751.40 General.

Material shall meet the requirements specified in the following Subsection of Division III, Materials: Loam Borrow M1.05.0 Topsoil and Plantable Soil Borrow MI.07.0 Processed Planting Material M1.06.1

CONSTRUCTION METHODS

751.60 Preparation of Areas on Which Loam, Plantable Soil Borrow, Top soil or Processed Planting Material Are to be Placed.

The area upon which the above materials are to be placed shall be raked, harrowed or dragged to form a reasonably smooth surface. All stones larger than 2 inches, undesirable growth over 2 inches and debris shall be removed from the area and disposed of by the Contractor outside the location.

When directed by the engineer, additional suitable material available from excavation or furnished under the Item of 150. Ordinary Borrow, shall be spread as required to repair gullies or depressions. The labor, equip-ment and materials necessary to place, compact and grade the additional material shall be paid for under the respective item from which the material is obtained.

751.61 Placing Loam, Topsoil or Processed Planting Material.

The loam, processed planting materials or the topsoil obtained from stacked piles shall be hauled, deposited and spread to the directed depths on the areas shown on the plans or designated by the Engineer once these areas have been properly prepared. All grass and weed growth on the areas designated to be loamed, shall be cut to a maximum height of 2inches,raked, harrowed or dragged before the loam is placed thereon. After the loam, topsoil or processed planting material has been spread, it shall be carefully prepared by spading or harrowing, and raking with iron rakes. All large, stiff clods, lumps, stones over 3 inches, brush, roots, stumps, litter and other foreign material shall be removed from the loam, topsoil or processed planting materials area and disposed satisfactorily.

The compaction shall be equivalent to that produced by a hand roller weighing from 75 to 100 pounds per foot of width. The compaction maybe obtained by rolling, dragging or any method that produces satisfactory results. All depressions caused by settlement or rolling shall be filled with additional materials and the surfaces shall be re-graded and rolled until it presents a reasonably smooth and even finish and is up to the required grade.

During hauling operations, the roadway surfaces shall be kept clean and any loam or other dirt which may be brought upon the surface shall be removed promptly and thoroughly before it becomes compacted by traffic. If necessary, the wheels of all vehicles used for hauling, shall be cleaned frequently and kept clean to avoid bringing any dirt upon the surface. The Contractor shall take all reasonable precautions to avoid injury to existing or planted growth.

751.62 Topsoil Rehandled and Spread

Topsoil which is obtained on the site, from piles of topsoil previously excavated and stacked in

accor-dance with the relevant provisions of Section 120 and designated as topsoil to be rehandled and spread shall be used as required, and as directed by the Engineer, on areas to be seeded or planted.

The topsoil must be approved before it is spread and the Contractor will be required, without additional compensation, to take corrective action as directed, in order to make the topsoil suitable for its intended use.

The Contractor is required under the item of seeding to adjust the acidity by the addition of limestone as determined by testing as required under Subsection 765.61 and to apply the fertilizer as required under Sub-section 765.62.

751.63 Plantable Soil Borrow.

Plantable soil borrow shall be used as specified in Subsection 751.61 except that it may be obtained out-side the project limits.

COMPENSATION

751.80 Method of Measurement.

The quantity of Loam Borrow, Plantable Soil Borrow, Processed Planting Material or Topsoil Rehan-dled and Spread shall be determined by measurement in place after compaction to the depth specified on the plans or as directed, and to the volume so ascertained there shall be added 20% to compensate for such loss as may be due to settlement, shrinkage and penetration into the underlying material.

The volume of Topsoil Rehandled and Spread including added percentage for settlement, shall not exceed the total volume of Item 125, Topsoil Excavated and Stacked, less any waste.

751.81 Basis of Payment.

Loam Borrow, Processed Planting Material and Topsoil Rehandled and Spread will be paid for at the contract unit price per cubic yard, complete in place, which prices shall also include the grading of areas where stock-piles of topsoil are removed.

751.82 Payment Items.

751. Loam Borrow	Cubic Yard
751.2 Plantable Soil Borrow	Cubic Yard
752. Topsoil Rehandled and Spread	Cubic Yard
759. Processed Planting Material	Cubic Yard

ITEM 756. NPDES STORM WATER POLLUTION PLAN LUMP SUM

Pursuant to the Federal Clean Water Act, effective March 10, 2003, construction activities which disturb one acre or more are required to apply to the U.S. Environmental Protection Agency (EPA) for coverage under the NPDES General Permit for Storm Water Discharges From Construction Activities (NPDES is the acronym for the National Pollutant Discharge Elimination System). On July 1, 2003 (68 FR 39087), EPA published the final NPDES construction general permit for construction activity. On August 4, 2003 (68 FR 45817), EPA reissued the General Permit for the Commonwealth of Massachusetts and included state specific requirements.

The NPDES General Permit requires the submission of a Notice of Intent (NOI) to the U.S. EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a seven (7) day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA

may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA or the Massachusetts Department of Environmental Protection (DEP) for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate filing to DEP is required. Filing fees may be associated with a DEP filing and shall be paid by the Contractor.

Separate NOI's must be submitted by the owner, City of Lowell, and the operator, the Contractor. In cases where the municipality or other party has control over the plans and specifications or day-to-day site operations, said party must also submit a NOI. The Contractor is responsible to ensure that all required parties have submitted an NOI and shall provide proof of same to the Engineer.

The General Permit also requires the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the afore-mentioned statutes and regulations. The Plan will include the General Permit conditions, Mass Highway Performance Standards an detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to complete the SWPPP to meet the requirements of the most recently issued CGP and, if applicable, the DEP requirements. The Contractor shall submit the Plan to the Engineer for approval at least four weeks prior to any site activities. It is the responsibility of the Contractor to be familiar with the General Permit conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to this project and to include in the Storm Water Pollution Prevention Plan the methods and means necessary to comply with applicable conditions of said permits.

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA Construction General Permit and DEP requirements, provide all information required, and obtain any and all certifications as required by the Construction General Permit. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

Included in the General Permit conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.5 inches in twenty-four hours. The Contractor shall choose a qualified individual who will be on-site during construction to perform these inspections. The Engineer must approve the contractor's inspector. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector.

Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next report period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the General Permit. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract.

Inspection of these controls is considered incidental to the applicable items. This Item addresses

acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, additional erosion controls beyond those specified in bid items elsewhere in this contract, which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate.

Payment for all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, and monthly reports are included in the Lump Sum for this Item. Upon final acceptance of the SWPPP by the Department, a payment equal to 50% of the Contract Lump Sum price shall be paid. The remaining 50% of the Lump Sum shall be paid in 10% increments distributed equally throughout the remaining period of the Contract, not including extensions of time.

ITEM 765. LOAM AND SEED (4" DEPTH, HYDROSEED) CUBIC YARD

SECTION 765

SEEDING

DESCRIPTION

765.20 General.

This work shall consist of seeding certain areas at the locations indicated on the plans or designated by the Engineer, in accordance with these specifications.

MATERIALS

765.40 General.

Materials shall meet the requirements specified in the following Subsection of Division ill, Materials:

Limestone M6.01.0
Fertilizer M6.02.0
Grass Seed M6.03.0
Crownvetch Seed M6.03.2

CONSTRUCTION METHODS

765.60 General.

The Contractor shall not proceed with the work of seeding until permission of the Engineer has been obtained.

Before the application of limestone, fertilizer and seed, the Contractor shall harrower roto-till to a depth on inches, when directed, all areas where loam or topsoil, has been placed under a previous contract when such areas are to be prepared for seeding under this contract. When loam borrow is placed, or topsoil is rehandled and spread; and they are paid for under the respective items of a contract, they will not require harrowing or roto-tilling.

The Contractor shall remove all debris and stones having any dimensions greater than 2 inches before the application of limestone, fertilizer and seed.

765.61 Application of Limestone.

Limestone may be applied in dry form or hydraulically as provided in Subsection 765.65. Limestone where necessary shall be spread and thoroughly incorporated in the layer of loam or topsoil to adjust the acidity of the loam or topsoil. The rate of application of the limestone will vary up to a maximum of 1 pound per square yard depending on the results of laboratory tests conducted by the Department. The limestone shall be thoroughly incorporated into the layer of loam or topsoil and the upper I inch of the underlying subsoil by harrowing or other methods satisfactory to the Engineer so as to provide a layer of thoroughly mixed material for the seed bed.

765.62 Application of Fertilizer for Grass.

Fertilizer may be applied in dry form or hydraulically as provided in Subsection 765.65.

After the application of limestone, if found necessary, on the seed bed, fertilizer shall be spread on the top layer of loam or topsoil at the rate of 800 pounds per acre and worked into the seed bed. The full depth of loam or topsoil shall then be spaded or harrowed and graded to the required cross section.

765.63 Seeding Grass.

After the loamed or topsoil areas have been prepared and treated as hereinbefore described, grass seed conforming to the respective formulas hereinbefore specified shall be carefully sown thereon at the rate of approximately 50 pounds per acre. Seeding shall be done in two directions at right angles to each other. Seeding on level areas and on slopes up to and including 4:1 slopes shall be done by means of an approved seeder that will seed and roll in one operation. On shoulders and other narrow areas, the seeding may be done longitudinally in one application.

765.64 Seeding Crownveteh.

When crownvetch (Emerald, Chemung or Pennigift variety) is to be planted by direct seeding, the slopes shall be prepared by spreading Limestone at the rate of two(2)tons per acre or 100 pounds per 1000 square feet. Fertilizer, granular 5-20-20, shall be applied to the slopes at the rate of 800 pounds per acre, or 800 pounds per acre of granular 0-20-20 plus 40 pounds per acre of N derived from organic material.

The Limestone and Fertilizer shall then be mixed into the soil on the slope by raking or other suitable method.

Crownveteh will not grow satisfactorily in soil with a ph factor of less than6.0 to 6.5.

Crownvetch seed, minimum 70% germination, including hard seed, shall be treated with an inoculants before sowing. A four (4) ounce package of inoculants is supplied with each 20 pounds of Crownvetch seed. The seed shall be moistened by pouring on a cup of saturate sugar solution and thoroughly mixed. Then the inoculants, a powder is blended with moistened seed by mixing.

The mixture shall then be sown by hand or a drill spreader (The hydraulic method will not be permitted) at a rate of 20 pounds of seed per acre of 7-1/4 ounces per 1000 square feet.

Perennial Rye grass seed shall then be spread at the rate of 15 pounds per acre or 5% ounces per 1000 square feet. This rate of seeding must not be exceeded at any time.

The seeds shall then be raked into the previously prepared slope.

Under no condition shall any other grass seed mixture, either plot or slope be sown in the areas of planting because of the competition between the desired crownvetch and the grass.

The slope shall then be covered with two (2) tons of Hay (long strands -minimum10 inch length) per acre.

765.65 Seeding Grass by Spray Machine.

A hydraulic spray machine, approved by the Engineer, and designed specifically for seed dissemination may be utilized. The application of limestone as necessary, fertilizer and grass seed may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area the resulting deposits of limestone, fertilizer and grass seed shall be equal in quantity to those quantities specified above in Subsections 765.61, 765.62 and 765.63.

A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of limestone, fertilizer, and grass seed, per 100 gals. of water. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above.

If the results of the spray operation are unsatisfactory, the Contractor will be required to abandon this method and to apply the limestone, fertilizer and seed in accordance with the requirements of Subsections 765.61, 765.62 and 765.63.

765.66 Care During Construction.

The Contractor shall be responsible for the watering of all seeded and grassed areas which shall be kept moist. The Engineer's decision will prevail in the event a dispute develops with the Contractor as to whether or not the seeded and grassed areas are moist. Seeded areas on which growth has stained shall be watered to a minimum depth of2 inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in an 8 hour period. If necessary, suitable signs and barricades of brush or other materials shall be placed to protect the seeded areas.

After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass.

The Contractor shall care for all of the seeded areas until the work has been physically accepted, without compensation in addition to the amount regularly to be paid under this item as hereinafter provided. Care shall include all re-grading, re-fertilizing, reseeding and mowing which may be necessary.

Prior to the acceptance of the project the Contractor will be responsible for mowing the grass when necessary on all flat or rolling slopes from level to and including 4 to 1 slopes to a height of 3 inches when the grass has attained a height of eight inches. The grass on all slopes steeper than 4 to I shall be cut when necessary to a height of 3 inches at such a time as a stable turf has been established in the Engineer's judgment.

765.67 Liability.

A satisfactory stand of grass, as determined by the Engineer, shall be required. To be acceptable, a stand of grass shall consist of a uniform stand of at least 60 percent established permanent grass species, with a uni-form count of at least 100 plants per square foot.

When all items of the contract, including the work specified under this item, have been acceptably completed except that a satisfactory stand of grass has not been produced, the contract may be

accepted.

The rate of establishment of the crownvetch seeding shall consist of a uniform stand of at least3 vigorous plants per twenty five (25) square feet. Before final acceptance, all areas twenty five (25) square feet or larger, devoid of suitable crownvetch seeding shall be planted with crownvetch plants as specified in Subsection 771.67 of this specification at the rate of one (I) plant per twenty five (25) square feet.

COMPENSATION

765.80 Method of Measurement.

The quantity of seeding shall be the number of square yards based on actual measurements made over the general contour of the areas seeded, complete in place, and accepted.

765.81 Basis of Payment.

This work, including all mowing, will be paid for at the contract unit price per square yard under the item for Seeding, completed in place. When a satisfactory stand of grass has not been established at the time of acceptance, no payment for seeding shall be allowed at the time of acceptance. At the time the final estimate is ready to be forwarded to the Contractor the seeded areas will again be inspected by the Engineer and if a satisfactory stand of grass has been established, the seeded areas with a satisfactory stand of grass will be included for payment.

765.82 Payment Items.

765 Seeding	Square Yard
765.5 Seeding Crownveteh	Square Yard

SECTION 766 REFERTILIZATION

DESCRIPTION

766.20 General.

This work shall consist of an application of fertilizer to seeded areas as indicated on the plans, or as designated by the Engineer, and in accordance with these specifications.

MATERIALS

766.40 General.

Materials shall meet the requirements specified in the Subsection of Division II, Materials. Fertilizer M6.02.0 Seed M6.03.0

CONSTRUCTION METHODS

766.60 General.

Work under this item shall be done in April, May, August or September. No permission will be granted to re-fertilize in months other than herein prescribed. Areas recently seeded shall be re-fertilized only after one season of growth of two months duration.

766.61 Application of Fertilizer.

The fertilizer shall have a composition of 10-10-10 and be applied at a rate of 500 pounds per acre. In addition, organic fertilizer derived from any commercial source shall be applied at the rate of 135 pounds of N per acre.

766.62 Seed.

Seed shall be included with the fertilizer at a rate of 10 pounds per acre.

COMPENSATION

766.80 Method of Measurement.

The quantity of re-fertilization shall be the number of square yards based on actual measurements made over the general contour of the seeded areas, complete in place.

766.81 Basis of Payment.

The work under this item will be paid for at the contract unit price per square yard, complete in place, which price shall include all labor, materials and equipment necessary to do the required work.

766.82 Payment Items.

766. Refertilization Square Yard

ITEM 767.4 WOOD CHIP MULCH CUBIC YARD

ITEM 767.11 MULCH FILTER TUBES FOOT

The purpose of this item is to provide a linear embankment of wood chip material, to be placed in the path of storm water flows for the purpose of filtering a substantial portion of the suspended sediments from the flow. This item shall conform to the requirements of Section 767 of the Standard Specifications, the Order of Conditions, and the following.

MATERIALS

Wood chip for filter tubes shall be an organic substance produced by reducing wood to small sizes. It can consist of a mixture of bark, wood shavings, wood chips, wood scraps and mineral grit that is an approved by-product of the lumber, paper, or landscaping industries. No manure, bio-solids, kiln dried wood, or construction debris shall be allowed. Organic matter content shall be between 20-100% (dry weight basis) as determined by ASTM D2974 (method A) Standard Test Methods for Moisture, Ash and Organic Matter of Peat and Other Organic Soils.

Moisture content shall be <150% by dry weight (<60% by wet weight) as measured by ASTM D2216 Standard Test Method for Laboratory Determination of Water Content of Soil and Rock and ASTM D2974 (cited above).

Particle size as measured by sieving shall be as follows:

Sieve Size %Passing

3 in 100%

3/4 in 70-100%

#4 30-75%

#20 20-40%

No particle may be longer than 6 inches.

Soluble salts shall be <5.0 mmhos/cm (dS/m)

The pH shall be between 5.5 and 8.0.

Tubes for compost shall be jute mesh or approved biodegradable material.

CONSTRUCTION METHODS

Filter tube construction may also consist of composted wood mulch filter material contained in a permeable woven mesh bag or enclosed sleeve. Bags shall be sized and filled to achieve at least 12 inches in height. Bags shall be tamped to ensure good contact with soil.

The filter tubes shall be securely fastened in place by staking as shown on the plans and per the manufacturer's requirements. The stakes shall be embedded a minimum depth of 1 foot.

Maintenance

The Contractor shall maintain the filter tubes in a functional condition at all times, including inspections after each rainfall and at least daily during prolonged rainfall. The Contractor shall immediately correct all deficiencies, such as overtopping, clogging with sediment, erosion or otherwise becoming ineffective. The contractor shall make a daily review of the location of the tube in areas where construction activity causes drainage runoff to ensure that the tube is properly located for effectiveness. Where deficiencies exist, such as overtopping or wash-out, additional mulch material shall be installed as approved or directed by the Engineer. Contractor shall remove sediment deposits as necessary to maintain the filters in working condition.

Removal

At the direction of the Engineer, the Contractor shall rake out filter tubes so that filter material is no greater than 3" in depth on soil substrate.

If filter has been wrapped in fabric or fabric bags, all bag material shall be cut and removed and disposed of off-site by the Contractor, at no additional cost to the project. Filter material shall be raked out per previous paragraph.

METHOD OF MEASUREMENT

Measurement for this item shall be the effective final length of filter tube per foot installed, approved, and maintained in place.

BASIS OF PAYMENT

Payment shall be the bid price and shall be compensation for all labor and materials necessary to complete the work including installation, fastening, maintenance, and removal. No additional payment will be made for the overlap length shown on the plans. Replacement of filter tubes, when directed, will be measured and paid for as specified herein.

ITEM 767.8. BAYS OF HAY FOR EROSION CONTROL EACH

SECTION 767 MULCHING; SEED FOR EROSION CONTROL

DESCRIPTION

767.20 General.

This work shall consist of furnishing and placing hay, straw, wood chip, wood fiber aged pine bark mulch, as particularly specified, in the required amounts on the areas indicated on the plans or as directed.

MATERIALS

767.40 General.

Materials shall meet the requirements specified in the following Subsections of Division II, Materials:

Hay Mulch M6.04.1

Straw Mulch M6.04.2

Wood Chip Mulch M6.04.3

Wood Fiber Mulch M6.04.4

Aged Pine Bark Mulch M6.04.6

Seed for Erosion Control M6.03.1

Bales of Hay for Erosion Control shall be fastened with wire and have a minimum size of 1.0 ft. by 1.5 ft. by 3.0 ft.

CONSTRUCTION METHODS

767.60 Preparation for Mulching.

The areas upon which mulch is to be spread shall be prepared by raking, harrowing or dragging to form a reasonably smooth surface. All stones larger than 2 ", undesirable growth over 2 " in height and all debris shall be removed from the area and disposed by the Contractor in a satisfactory manner. The disposal area shall be outside the location limits of the project, when required by the Engineer and shall be the responsibility of the Contractor without additional compensation.

When required by the Engineer, the Contractor shall spread, compact and grade additional acceptable material to repair gullies or depressions. Such additional material shall be obtained from suitable excavation or furnished by the Contractor under Item ISO., Ordinary Borrow. The labor and equipment required to fur-nish and place the additional material shall be paid for under the respective item from which the material is obtained without additional compensation.

Grading preparatory to mulching will be included for pavement under respective items of mulching.

767.61 Placing Mulch.

Hay or Straw Mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of4'h tons per acre, except over certain selected seeded areas where 2 tons of hay per acre shall be used, or as otherwise directed.

Hay or Straw Mulch may be applied by mechanical apparatus, if in the judgment of the Engineer the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80% of the hay or straw in lengths of 6"ormore, otherwise it shall be spread by hand without additional compensation.

Wood Chip Mulch and Aged Pine Bark Mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of 390 cubic yards per acre (approximately 3"in depth), or as otherwise directed.

Wood Chip Mulch and Aged Pine Bark Mulch may be applied by mechanical means, except that if the equipment breaks the mulch into small pieces or changes its desired texture, as determined by the Engineer, it shall be spread by hand without additional compensation.

Wood Fiber Mulch shall be uniformly spread over certain seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise directed. It shall be placed by spraying from an approved spraying machine having pressure sufficient to cover the slopes from bottom to top in one operation. Immediately before spraying, the mulching material shall be mixed with water in the sprayer and kept uniformly suspended in the water by agitation during the spraying operation.

767.62 Hay Mulch with Seed or Erosion Control.

The intent of these items is the prevention of slope erosion. If the sequence of operations is such that only portions of slopes have been completed, such portions shall be preserved by seeding and mulching when directed prior to completion of the remaining portions of the slope.

The work to be done under the above items consist of applying seed and hay mulch onto slopes that have been graded and completed to the required line and grade at locations designated on the plans and as directed by the Engineer.

The operations shall be separate with the seed applied first. This work may be applied by hand or by mechanical apparatus, if in the Engineer's judgment, the apparatus spreads the materials uniformly and does not break the hay mulch into fine or small particles or otherwise change the desired texture of the hay mulch.

The seed shall be uniformly applied at the rate of 75 pounds per acre.

767.63 Bales of Hay for Erosion Control.

Bales of hay shall be supplied and placed along the bottom of slopes, ditches and where directed. The bales shall be securely fastened in place by staking or pinning as shown on the plans or in a manner approved by the Engineer.

During the course of construction, it may be necessary to remove and relocate or replace bales of hay as directed. The removal of collected sedimentation and debris from behind these bales and disposal of same is included in this item. The bales shall remain in place until the removal is directed by the Engineer. The bales shall then become the Contractor's property and shall be disposed of off the site.

COMPENSATION

767.80 Method of Measurement.

Hay Mulch and Straw Mulch, applied as required, will be measured by the ton delivered on the project as determined from certified weight slips.

Wood Chip Mulch and Aged Pine Bark Mulch will be measured by the cubic yard based on either truck-load measurement as delivered on the projector in-place measurement, the method of measurement to be determined by the Engineer.

If truck-load measurement is used, wood chip mulch taken from this measured volume for mulching trees and shrubs other than placed in mass planting areas will be deducted on the basis of the volume of chips placed over the rated size of each planting pit at a depth of four (4) inches.

No deduction shall be made in mass planting areas for wood chip mulch ordinarily included in the unit price of the trees or shrubs planted therein. Wood Fiber Mulch will be measured by the ton delivered on the project, as determined from the net weight certified by the manufacturer on the containers, or as determined from weight slips accompanying delivery. Bales of Hay for Erosion Control will be measured by the unit in place, each. Ordinary Borrow will be measured as specified in Subsection 150.80 or by truck load measurement, as determined by the Engineer. Seed for Erosion Control will be measured by the pound.

767.81 Basis of Payment.

Hay Mulch, Straw Mulch and Wood Fiber Mulch will be paid for complete in place at the contract unit price per ton under the item for the particular type of mulch. Wood Chip Mulch will be paid for complete in place at the contract unit price per cubic yard. Aged Pine Bark Mulch will be paid for complete in place at the contract unit price per cubic yard. Bales of Hay for Erosion Control will be paid for each, which shall include all labor, material and equipment necessary to place the bales, relocate as directed and finally remove and dispose of the bales including the removal of sedimentation from behind the bales of hay. Replacement of Bales of Hay, when directed, will be

paid for each. Ordinary Borrow will be paid for complete in place at the contract unit price per cubic yard. Seed for Erosion Control will be paid for at the contract unit price per pound.

767.82 Payment Items.

767. Hay Mulch Ton

767.3 Straw Mulch Ton

767.4 Wood Chip Mulch Cubic Yard

767.5 Wood Fibre Mulch Ton

767.6 Aged Pine Bark Mulch Cubic Yard

767.8 Bales of Hay for Erosion Control Each

765.2 Seed for Erosion Control Pound

ITEM 775.MISCELLANEOUS TREE/SHRUB PLANTING EACH

SECTION 771 PLANTING TREES, SHRUBS AND GROUND COVER

DESCRIPTION

771.20 General.

This work shall consist of furnishing, transplanting, planting and/or transplanting trees, shrubs, vines, groundcover and seedlings of varieties and sizes specified in locations as shown on the plans and/or as directed by the Engineer.

The work shall include excavation of pits, placing of backfill mixture, mulching, watering, staking or guying, wrapping, liming, fertilizing, seeding, care of the plants and replacement of unsatisfactory plants and materials during the life of the contract.

MATERIALS

771.40 General.

Materials shall meet the requirements specified in the following Subsection of Division 1lI, Materials with the amendments and supplements contained herein: Loam Borrow M1.05.0 Peat Borrow Ml.06.0 Topsoil and Plantable Soil Borrow Ml.07.0 Lime Stone M6.01.0 Fertilizer M6.02.0 Bone Meal M6.02.1 Crown-vetch Seed M6.03.2 Woodchip Mulch M6.04.3 General Planting M6.06.0 Nursery Stock M6.06.1

Crown-vetch Potted Seedlings	M6.06.2
Tree Paint	M6.07.0
Materials for Guying & Staking	M6.08.0
Wrapping Material	M6.09.0
Water for Irrigation	M6.1O.0

The Contractor shall furnish written certificates of compliance in triplicate for each load of plant material showing where the plants were grown and listing all transplantings, age or size as specified, grade and quantity. All plants shall be tagged so that proper identification can be made.

All trees and shrubs shall be balled and burlapped, unless otherwise provided by the plans and specifications.

The caliper, height, age and other dimensions as specified for all planting material shall apply at the time planting is done and the plants will be inspected by the Engineer at this time as to these requirements as well as the quality or grade and varieties required. All plants not approved by the Engineer shall be removed from the project by the Contractor.

The trees, shrubs, vines and evergreen seedlings shall be Northern Grown Nursery Stock. Botanical and common names shall conform with the current edition of HortusThird, compiled by the staff of L.H. Bailey Honorium, Cornell University.

The current edition of U.S.A. Standard for Nursery Stock sponsored by the American Association of Nurserymen, Inc., shall be the Department's standard for all plants and for balling and burlapping sizes and requirements.

The term "plant" shall refer to any tree, shrub, seedling, vine or groundcover.

771.41 Storing of Materials.

Materials may be temporarily stored within the highway layout as directed by the Engineer. When materials are stored within the layout, the site shall be abandoned immediately upon completion of the project and the storage area returned to its original natural. condition at the sole expense of the contractor.

771 .42 Delivery and Protection.

Arrangements shall be so made so far as practicable to have plants delivered as the pits or beds are ready for them. Whenever plants cannot be planted on the day of arrival, all those with bare roots shall be "heeled-in" in moist soil in a satisfactory manner. All "heeled-in" plants shall be properly maintained by the Contractor until they are planted. In the event that "heeled-in" plant material must be held over until the next planting season, such material shall be lifted and replanted in a satisfactory manner in nursery rows as directed by the Engineer. The ball of roots of balled and burlapped plants, if not planted immediately after delivery and inspection, shall be adequately protected by loam covering until removed for planting and in a satisfactory manner appropriate to the condition. Throughout the work, care shall be exercised to keep the roots of all plants from drying out, to preserve the solidity of the balls of "B&B" plants, and to prevent plants from being broken, scarred or damaged in any way. All emergency storage of materials shall be at the entire risk of the Contractor.

771.43 Backfill Mixture for Bare-Rooted & Burlapped Plants.

A. Evergreen Trees and Evergreen Shrubs

1 part peat borrow

2 parts loam borrow

10 pounds bone meal per cubic yard of mixture

B. Deciduous Trees and Deciduous Shrubs

1 part peat borrow

3 parts loam borrow

10 pounds bone meal per cubic yard of mixture

C. Roses, Vines and Ground Cover

1 pan peat borrow

2 parts loam borrow

20 pounds bone meal per cubic yard of mixture.

The Contractor shall notify the Engineer in writing at least 15 days in advance when he intends to use the backfill mixture, the source and amount of material available and reserved for backfilling. Samples for testing will be taken in the field at the source. The Contractor shall furnish facilities and

assistance to the Engineer for collecting and forwarding these samples.

771.44 Container Grown Plants.

All container grown plants shall be healthy, vigorous, well-rooted and established in the container in which they are sold. They shall have tops which are of good quality and are in healthy growing condition. An established container grown plant shall have roots penetrating the plantable container, or, on removal of the container, shall reveal roots that thoroughly penetrate the soil mass to the extent that the soil mass does not crumble apart on handlings.

The container shall be sufficiently rigid to protect the root mass during shipment.

The container sizes shall be provided in accordance to the "USA STANDARD FOR NURSERY STOCK" specifications by the American Association of Nurserymen, Inc.

Container grown crownvetch shall conform to the provisions of Subsection M6.06.2.

The potting mixture in containers shall be 1 part peat, 1 part loam and 1 part coarse sand. If necessary, ground limestone shall be added to raise the pH value to 6.0. Super phosphate shall be added at the rate of6 pounds per cubic yard.

The potting mixture for sweet fern shall be equal parts of peat and sand, with no additives required.

Plants of Liner size and Sweet Fern root cuttings shall have been grown in the container for a minimum of twelve (12) weeks.

The certificate of compliance for container grown plants shall contain, in addition to the requirements listed in Subsection771.40, the guaranteed composition of the potting mixture and the date of planting in the container. A random sample may be required from each delivery for soil and root inspection upon request of the Engineer.

CONSTRUCTION METHODS

771.60 General.

Balled and burlapped plants may be planted in the spring until June 15 and in the fall from August 15 to November 1. Container grown plants may be planted at any time the ground is not frozen (provided specified minimum time of growth and root development have been met).

Bare rooted plants shall be planted only from the time ground thaws in spring until May 15.

The seeding season for crownveteh shall be from April 15 to August 15.

771.61 Turf Removal.

In areas of mass shrub planting where there is an established turf the Contractor will be required to excavate the sod, as indicated on the plans or as directed by the Engineer, to a depth sufficient to remove the root system (approximately 4").

The shape and dimensions of the areas to be so treated shall be determined in the field by the Engineer.

It shall be the Contractor's responsibility to dispose of all material removed in a manner satisfactory to the Engineer.

771.62 Excavation of Planting Pits.

The dimensions of the planting pits for bare rooted or balled and burlapped plants shall be as follows:

A. Trees more than 4 feet high

Diameter at least 2 feet larger than the diameter of the ball or root spread; depth at least 12 "greater than the depth of the ball or root system.

B. Trees 4 feet high or less

Least dimension 2 feet.

C. Shrubs

Least dimension 2 feet.

D. Roses, Vines and Ground Cover

Least dimension I foot. The shape of the pits may vary from square to round with the approval of the Engineer. In all cases the

least dimension of the pit shall be sufficient to easily accommodate the root system without crowding. The excavated material shall be disposed of as directed.

771.63 Planting Bare Rooted Plants (Except seedlings).

The backfill mixture of soil placed beneath the plant shall be firmed prior to setting the plant.

The plant shall be set in the planting pit at a depth within one inch below the depth at which it was previ-ously growing. The root system shall be carefully spread and the pit partially backfilled, making sure that the soil filters in among the roots. The backfill shall be formed with care taken not to injure or bruise the roots.

When the pit is between 2/3 and 3/4 full it shall be puddled to eliminate air pockets and settle the soil. After the water has percolated into the soil, the rest of the pit shall be filled in. A mound shall be formed around the edge of the pit to for marshmallow saucer to aid watering. The pit area shall then be puddled again and any depressions occurring as a result filled in with the backfill mixture. The plant shall be woodchip mulched, after watering, to a depth of4 inches as provided in Subsection 771.71.

771.64 Planting Balled and Burlapped Plants.

The plant shall be set in the planting pit at a depth within one inch below the depth at which it was previ-ously growing. The burlap shall then be untied, loosened and spread away from the ball. Any excess burlap shall be cut away and disposed of as directed. Roots that have been wrapped around the ball shall be made to lay in as natural a manner as possible. Backfill shall then be placed around the ball and firmed.

The planting procedure shall also include that as specified in the first and third paragraphs of Subsection 771.63, entitled "Planting Bare Rooted Plants (except Seedlings)".

771.65 Planting Container Grown Plants.

The plant shall be placed in a hole that is six (6) inches larger than the diameter of the container and the surface of the soil of the container shall be level with the surrounding ground. Any part of a plantable con-tainer projecting above the level of the soil shall be removed. All metal, plastic or other non root-thru type container shall be completely removed during the process of planting. The part of the hole outside the con-tainer shall be backfilled with the excavated soil and thoroughly finned and puddled with water to eliminate air pockets. A mound of soil shall be formed on the ground around the container to form a shallow saucer to aid watering. On steep slopes, the mound around the saucer may be omitted on the uphill side. The plant shall be woodchip mulched, after watering, to a depth of4 inches as provided in Subsection 771.71.

771.66 Planting Bare Root seedlings.

Bare root seedlings of the variety indicated on the plan shall be planted by opening a wedge-shaped hole in the slope of a sufficient size to take the seedling's roots that are to be directed downward and

without kinks. The seedling shall be placed at a depth in the hole approximately one (1) inch below its previously planted depth. The planting hole shall be closed by making a second wedge-shaped hole about 2 inches from the first in order to force the first closed, which then shall be closed and compressed with the heel.

Bare root seedlings shall be given a liquid mud bath prior to planting. For seedlings to be planted on grass covered slopes, it will require removal of the sod on a one (1) foot square area for a maximum depth of two (2) inches at each seedling location prior to planting. Seedlings must be delivered to the project in a dormant condition. If there is any evidence that growth has started, the entire load or lot will be rejected. Evergreens will be rejected if the fine roots were lost in digging.

771.67 Planting Crownvetch.

Crownvetch shall be planted on areas that are bare, eroded or where grass growth is sparse and in areas of separated turf as indicated on the plan or directed by the Engineer. When crownvetch in peat pots is to be planted the slopes shall be prepared by spreading limestone at the rate of 1.5 tons per acre or 75 pounds per 1000 square feet and fertilizer, granular 0-20-20 at the rate of 600 pounds per acre or 15 pounds per1000 square feet. Crownvetch will not grow satisfactorily in soil with a pH factor of less than 6.0 to 6.5.

Perennial Rye Grass seed shall be sown only on large bare areas are the rate of 15 pounds per acre or 51h ounces per 1000 square feet and then raked into the previously prepared slope. This rate of seeding must not be exceeded at any time, because of the competition between the crownveteh and rye grass. Deteriorating slopes, where grass is sparse, require no rye grass.

Under no condition shall any grass seed mixture, either plot or slope, be sown in the areas of crownvetch planting. The slope shall then be covered with hay at the rate of two (2) tons per acre.

The mulch material shall be parted for each planting. Holes, six (6) inches square or round and six (6) inches deep shall be spaced five (5) feet on centers in staggered rows. The hole shall then be backfilled with

Loam Borrow. (M1.05.0).

The outer shell or peat pot must be removed before planting.

Plants shall be placed at a depth in their hole approximately one (1) inch below their previously planted depth. After planting, the loam around the plant shall be satisfactorily compressed and a slight depression left to catch rain water, and the previously parted mulch shall be drawn back around the plant.

Limestone at the rate of one-half ton per acre or 25pounds per 1000 square feet, and Fertilizer, granular 0-20-20 at the rate of200 pounds per acre or five (5) pounds per 1000 Square Feet shall be spread over the mulch, between the rows, near the plants.

The total amount of Limestone to be used in this planting shall be two (2) tons per acre and the Fertilizer shall be 800 pounds per acre.

771.68 Staking and Guying.

Type I(a) Evergreen Trees 3 to 4 feet high

Deciduous trees 5 to 6 feet high

These trees shall be supported by one stake driven firmly two (2) to three (3) feet into the ground. The stake shall be located. far enough from the tree to avoid damaging the roots and so that the top of the stake shall be about 2/3 the height of the tree. The point of attachment to the stake shall not be more than six (6) inches from the trunk. If the stake must angle toward the tree, it shall be driven at

such an angle to cross the trunk and shall extend about four (4) inches past the trunk.

Secure the tree to the stake with 12 gauge hose-covered wire twisted to provide tension The length of the hose shall be 8 inches.

Type I(b) Trees higher than type l(a) and less than 3 inches caliper

These trees shall be supported with two (2) stakes on opposite sides and driven into the ground at least two (2) feet. The stakes shall be cutoff at a height in aesthetic proportion to the height of the tree. The stake shall not be higher than three-fourths (3/4) the height of the tree. Secure the tree to stakes with12-gauge wire with hose and twist the wire to provide tension. The length of the hose shall be8 inches.

Type II Trees 3 to 4 inch caliper

These trees shall be securely guyed by wire, protective material and anchors. Three guys shall be equally spaced around the tree. Each guy shall be fastened around the tree trunk immediately above a substantial limb located 1/2 to 2/3 of the tree height above the ground and anchored at a distance from the trunk equal to 2/3 of the height of attachment to the tree. The anchor shall be a hardwood stake. The anchor stake shall be firmly driven at an angle and to a depth of at least 15 inches and the excess length of stake shall be cut off 3 inches above the ground.

The guy wire with protective hose shall be placed around the tree trunk, secured at the hose by a single twist, extended with both wires to the anchor stake and securely fastened with enough slack in the guy to per-mit ten to twenty twists for tensioning. After installation of all guys, the wires shall be twisted by a lever in the same direction as previous twists to provide tension, as directed by the Engineer.

771.69 Wrapping.

Only deciduous trees will require wrapping. Trunks of trees one (1) inch caliper and over shall be completely wrapped with burlap or other approved material beginning at the base of the tree and extending to the first branch. Wrapping shall betiedatthetopandbottomandat2-footintervals. Wrapping of tree trunks shall not be completed until after inspection and approval by the Engineer. Wrapping of tree trunks shall be com-pleted within five (5) calendar days after planting.

771.70 Protective Screen.

All Euonymus, Flowering Cherries and Flowering Crabs shall be protected to a height of 12" to 18" above the ground from animals and rodents by a protective cage. The cage shall be of wire or plastic mesh or other approved material and shall not make any direct contact with the tree. Standard practice shall apply.

771.71 Mulching.

No mulch shall be applied prior to the first watering of the plant. Trees and shrubs shall be mulched not later than one week after planting. Mulch material shall be furnished and placed over all pit or saucer areas of individual trees and shrubs and over the entire area of shrub beds to the depth indicated on the plans.

In areas to be planted with roses, vines, or ground cover, the entire area shall be mulched before planting. The mulch shall be parted at the location of each hole and carefully replaced around the plant immediately after planting.

Preparation for mulch areas of mass planting shall conform to the provisions of Subsection 767.60.

Mulch material may be wood chips, aged pine bark or other material as indicated on the plans or approved by the Engineer.

771.72 Pruning.

Pruning of all plants shall be done only by persons skilled in this work, as follows: Initially, all broken or dead or injured branches shall be cut flush with the trunk or limb, and broken roots shall be pruned on the plant side of the break. Additional pruning shall be done in accordance with accepted nursery practice for the variety of plant involved. The foregoing shall be done at the time of planting. Dieback shall be pruned before final acceptance. Pruning shall not deform or otherwise destroy the typical shape or symmetry of tree and shall not reduce the height by more than 1/3. The leader of the tree shall not be cut back unless otherwise directed. Cuts larger than one inch in diameter shall be painted with approved tree paint.

771.73 Care and Maintenance.

The Contractor will beheld responsible for all planted material until the project is completed and accepted, at which time all plants shall be in a healthy, growing condition and free from weeds or other obnoxious materials or conditions. All plants shall be care for during the course of the project by weeding, cultivating, pruning, trimming, tightening of guys, resetting or replacement of plants where necessary, and by performing other operations to keep-the plants healthy and growing.

771.74 Weeding.

The Contractor will be responsible for weeding around planted materials mulched with wood chips. All weeding shall be completed before the acceptance of the project. At no time shall weeds attain the height of 6 inches during the period of contract prior to acceptance.

771.75 Watering.

All plants shall be watered during planting and all plants, except seedlings, shall be watered at least twice each week for a minimum of twelve(12) waterings. At each watering the soil around each tree or shrub shall be thoroughly saturated. If sufficient moisture is retained in the soil, as determined by the Engineer, the required watering may be reduced.

Trees will require a minimum of 10- gallons of water, each; shrubs-a minimum of 5 gallons, each; and a minimum of 1500 gallons per acre on areas planted or seeded with crownvetch. Trees or shrubs planted afterOctober15shallbethoroughlywateredatthe time of planting, after which subsequent watering will not be required.

771.76 Period of Establishment.

The Contractor shall employ all possible means to preserve the plants in a healthy growing condition. The plant establishment period shall be for at least one year following the satisfactory completion of all planting on the contract or for the duration of contract, whichever is later. Care during the establishment period includes watering, cultivating, pruning, repair and adjustment of guys and stakes, and such other work as specified or ordered by the Engineer.

771.77 Replacement of Defective Plant Material.

The Contractor shall replace all plant material that has not shown satisfactory evidence of growth. A semi-formal inspection by the Engineer and the Contractor will be made to determine the acceptability of the plant material at a date no later than September 20 prior to a November project completion date. Each tree shall show at least 75 % healthy growth and any other plants, except seedlings and crownvetch, shall show at least 50% healthy growth. All dead and unsatisfactory plants shall be replaced in kind and size with plants as originally specified, or on approval by the Engineer in writing, by alternate or substitute varieties of plant material of equal value. Replacement plantings of evergreens shall be in place by October15and of deciduous by November 1st. Replacement plantings shall conform to the provisions of this section, excepts the requirements for establishment.

Seedling and crownvetch plantings shall be allowed a tolerance of 25%for dead or defective plants, provided there are no prominent bare spots. If the number of seedlings or crownveteh plants in any planting area are less than the allowable tolerance, sufficient replacement plantings shall be made to eliminate the bare spots and also meet the specified tolerance.

All dead and unsatisfactory plants, except seedlings and crownvetch shall be promptly removed from the project. A formal inspection of all plant material for acceptance will be held after the replacement planting has been completed. in hisjudgment, traffic is being unduly hampered ordelayed by the work, under this item.

COMPENSATION

860.80 Method of Measurement.

Markings are to be paid for on the actual length of lines applied under the various items of the Contract. The lengths of solid lines will be obtained by:

1. Calculation from established base line stations or
2. Use of a measuring wheel or
3. Vehicle odometer readings.

The length of broken lines (except for broken lines less than 10 feet, the actua11ength shall be used) will be obtained by using 114 of the results obtained above for solid lines. Patterns, other than lines, are to be paid for by the square foot area under the item in the Contract.

860.81 Basis of Payment.

The work under these items will be paid for at the contract unit price under each item of the Contract based on the measurements as determined by the Engineer.

The contract prices shall include all material, labor, and equipment required or incidental to the satisfactory completion of the work.

860.82 Payment Items.

860.04-860.12 *-inch reflectorized white line (painted)	Linear Foot
861.04-861.12 *-inch reflectorized yellow line (painted)	Linear Foot
* (4 In.-12 In.)	
864.00 Pavement arrow refleetorized white (painted)	Square Foot
864.01 Pavement arrow and legends reflectorized white tape (inlay)	Square Foot
864.02 Pavement arrow and legends (surface applied tape)	Square Foot
864.00 Pavement arrow refleetorized white (painted)	Square Foot
864.01 Pavement arrow and legends reflectorized white tape (inlay)	Square Foot
864.02 Pavement arrow and legends (surface applied tape)	Square Foot
866.04-866.12 *-inch reflectorized white line (thermoplastic)	Linear Foot
867.04-867.12 *-inch reflectorized yellow line (thermoplastic)	Linear Foot
* (4 In.-12 In.)	
870.04 4 In. white reflective tape (inlay)	Linear Foot
871.04 4 In. yellow reflective tape (inlay)	Linear Foot
872.04 4 In. white reflective tape (surface applied)	Linear Foot
873.04 4 In. yellow reflective tape (surface applied)	Linear Foot