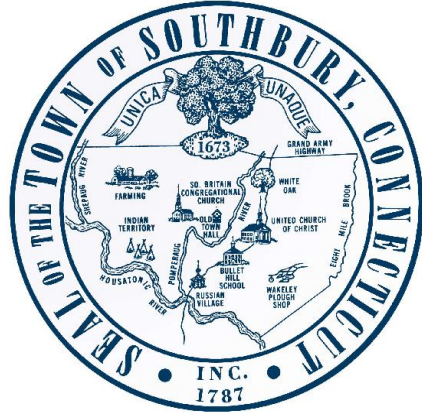


TOWN OF SOUTHBURY



SPECIFICATIONS FOR PUBLIC IMPROVEMENTS

DEPARTMENT OF PUBLIC WORKS

501 MAIN STREET SOUTH

SOUTHBURY, CONNECTICUT

Revised January 28, 2025

INDEX TO CONSTRUCTION SPECIFICATIONS

1. SITE PREPARATION
2. TREE, STUMP AND BRUSH REMOVAL
3. MAINTENANCE AND PROTECTION OF TRAFFIC
4. TRAFFIC DRUMS
5. UNIFORMED OFFICERS
6. DUST CONTROL
7. SEDIMENT & SOIL EROSION CONTROL
8. HIGH DENSITY POLYETHYLENE PIPE
9. REINFORCED CONCRETE PIPE
10. UNDERDRAINS AND OUTLETS
11. TRENCH EXCAVATION
12. CRUSHED STONE BEDDING
13. FLARED HDPE CULVERT ENDS
14. FLARED REINFORCED CONCRETE CULVERT ENDS
15. CONCRETE CATCH BASIN
16. CONCRETE MANHOLES
17. RIPRAP
18. GABIONS
19. STRUCTURAL EXCAVATION
20. PRECAST CONCRETE BOX CULVERT
21. CONCRETE WORK
22. COMMON EXCAVATION
23. EARTH FILL
24. BORROW
25. COMPACTED GRAVEL FILL
26. PREPARATION OF SUBGRADE
27. GRAVEL SUBBASE
28. PROCESSED AGGREGATE BASE
29. MILLING OF BITUMINOUS CONCRETE PAVEMENT (0-4")
30. TACK COAT
31. PULVERIZE, RECLAIM, AND COMPACT BITUMINOUS CONCRETE PAVEMENT
32. BITUMINOUS CONCRETE PAVEMENT
33. CONCRETE CURBING
34. BITUMINOUS CONCRETE LIP CURBING
35. CONCRETE SIDEWALKS, DRIVEWAYS, AND RAMPS
36. METAL BEAM RAIL
37. TOPSOIL
38. LIMING, FERTILIZING, SEEDING & MULCHING
39. PAVEMENT REPAIR
40. RESTORATION

SITE PREPARATION

A. DESCRIPTION

The Contractor shall do all work necessary for the movement of personnel, materials and equipment to and from the project site, and for the establishment and removal of all Contractor's facilities necessary to the performance of the work and shall do clearing and grubbing as required for the Work, as shown on the Contract Drawings or as specified in the Special Provisions. This Work shall include all types of work usually included in the clearing and grubbing item except that Restoration will be done under "Restoration." It is the intent of these specifications that Work done shall minimize the disturbing effect of construction. Therefore, only such clearing and grubbing (cutting and removing shrubbery, bushes, trees, roots, stumps, organic matter, fences, other surface structures and objectionable materials) as is absolutely necessary to perform the Work shall be done.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

The Contractor shall remove trees, stumps, brush, rubbish and all objectionable material only as required to perform the Work. The Contractor shall control his operations so as to minimize the disturbance to all areas, minimizing cutting and damage to trees and shrubs which are to be preserved. Excavating machinery shall be handled with care to prevent damage to trees, particularly to overhanging branches and limbs, and to other property. Protection may include fences and/or boards lashed to trees to prevent damage. Any damage caused by the Contractor's operations shall be repaired as directed by the Director of Public Works. The Contractor shall carefully cut off all branches of trees to be saved that interfere with construction operations or which have been broken or injured during construction. Prior to commencing clearing and grubbing operations, the Contractor shall walk the job with the Director of Public Works in order to determine and mark the extent of clearing and grubbing.

Where the root structure of existing trees interferes with the Work, the Contractor will be required to cut and trim the roots in an acceptable manner. Where soil over the roots of trees to be preserved has become compacted, it shall be restored by proper cultivation to a condition, which will permit adequate aeration of the soil.

All new and existing ditches, waterways, drainage structures and culverts shall be cleaned of obstructions resulting from construction operations including any existing downstream channels, culverts, etc. which have become sedimented or obstructed.

All wood, timber, trees and brush shall be disposed of within 15 days after cutting or felling unless otherwise ordered.

Due to the air pollution potential, open burning is discouraged and will only be permitted after receiving the approval in writing from the Local Regulatory Agencies. The Contractor shall obtain all permits required. The Contractor is further warned that any such permits obtained may be

revoked at any time for reasons including Air Pollution Alerts issued by the Commissioner of Health or Local Regulatory Agencies. The revocation of such permits shall in no way relieve the Contractor of his responsibility to dispose of the materials as herein specified. No claims for extra compensation for such other means of disposal as may be required shall be considered.

It is suggested that such means as chipping or mulching of brush and trees, or logging, burying of larger trees and stumps in designated or approved sites, or such other means as the Contractor may determine, be used for the disposal of the materials subject to the approval of the Local Regulatory Agency, State Health Department and the Director of Public Works. Unless disposal sites are provided by the Town as designated elsewhere in the Contract Documents, it shall be the responsibility of the Contractor to locate suitable places for the disposal. Such sites shall be approved by the Local Regulatory Agencies in writing and acquired by the Contractor at his own expense unless otherwise stated elsewhere in the Contract Documents.

The Contractor shall prevent all damage to installations such as pipes, conduits, wires, cables or structures above or below ground; he shall ascertain from the Town of said utilities or installations any special construction methods or precautions which should be employed while working in proximity to same.

No land monuments, property markers, or official datum points shall be damaged or removed until an authorized agent approved by the Director of Public Works has witnessed or otherwise referenced their location and approved their removal.

All fences, railings, road signs, mailboxes, utilities, stone wall fences and ornamental and utilitarian domestic accessories, such as but not limited to garden pools, arbors, fireplaces, sheds and incinerators interfering with the Work shall be removed and reset as directed. Items required to be temporarily reset during construction such as road signs, mailboxes, etc. shall be completed under this item without additional compensation.

D. MEASUREMENT AND PAYMENT

Payments will be made in proportion to the amount of work done. The Unit Price (Lump Sum) for "Site Preparation" shall include the cost of furnishing all materials, labor, equipment, tools, and incidentals required for the completion of this Work.

The item "Site Preparation" does not include restoration. Restoration will be paid for as specified under "Restoration."

If no item "Site Preparation" appears in the Bid Schedule, then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the prices bid for other items as listed in the Bid Schedule.

TREE, STUMP, AND BRUSH REMOVAL

A. DESCRIPTION

The Contractor shall do all work necessary and furnish all labor, equipment, tools and materials to safely and properly remove and dispose of trees, stumps and brush as directed by the Director of Public Works.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

All work shall be done in accordance with the specification "Site Preparation".

D. MEASUREMENT AND PAYMENT

Tree removal shall be measured for payment by the actual number of trees of the various size classifications removed and disposed of as directed by the Director of Public Works.

Stump removal shall be measured for payment by the actual number of trees of the various size classifications removed and disposed of as directed by the Director of Public Works.

Stumps from trees less than 12 inches in diameter at the base shall not be measured for payment.

Brush removal shall be measured for payment by the actual number of square yards of brush cut and chipped as directed by the Director of Public Works.

Tree removal, stump removal and brush removal shall only be paid for when specifically authorized by the Director of Public Works. If no specific tree removal, stump removal or brush removal item is authorized by the Director of Public Works, then no separate payment will be made for any incidental clearing performed during the construction of other items of work and the cost of such incidental work is understood to be included in the prices bid for other items as listed in the bid schedule.

MAINTENANCE AND PROTECTION OF TRAFFIC

A. DESCRIPTION

The Contractor shall maintain and protect pedestrian and vehicular traffic in the Project area in accordance with the requirements and regulations of the applicable State and Local Regulatory Agencies and these Specifications. Unless otherwise specified, the Contractor must maintain pedestrian and vehicular traffic to permit access to businesses, factories, residences, and intersecting streets. It shall be the sole responsibility of the Contractor to prewarn the State and Local Regulatory Agencies (including but not limited to the Police and Fire Departments) at least 72 hours in advance of changes in traffic patterns due to reduction of pavement widths or closing of streets. The Contractor shall furnish, install, maintain, adjust, and store all signs, suitable barricades and traffic cones, as necessary to carry out the traffic routing plan and maintain vehicular and pedestrian traffic. All of this work shall meet with the approval of the State and Local Regulatory Agencies.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

1. **ACCESS:** The Contractor shall arrange his operations to provide access to properties along the street including temporary bridges to driveways, and provide access to fire hydrants, manholes, gate boxes, or other utilities. Whenever any work obstructs traffic in or to any public way, private driveway, or property entrance, the Contractor shall take such steps as required to maintain necessary traffic and access including temporary bridging if required. The Contractor shall confine his occupancy of public or traveled ways to the smallest space compatible with the efficient and safe performance of the work.

The Contractor shall observe and obey all local and state laws, ordinances, regulations and permits in relation to the obstruction of streets and highways, keeping passageways open and protecting traffic where there may be danger from blasting or other construction activities.

If the Contractor's operations shall interfere with the removal or sanding of snow or ice by the public authorities or adjoining land owners, in an ordinary manner with regular highway equipment, the Contractor shall be required to perform such services for the public authorities or adjoining owners without charge. If the Contractor fails to do so,

he shall reimburse the said authorities or adjoining owners or the Town for any additional cost to them for doing such work occasioned by conditions arising from the Contractor's operations, occupancy, or trench surfaces, together with any damage to the equipment of said parties by those conditions, or claims of any parties for damage or injury or loss by reason of failure to remove snow or ice or to sand icy spots under these conditions.

2. **SIGNS:** Properly lighted, adequately sized, clear, concise, legible signs shall be furnished as necessary for the safe regulation of traffic.

3. **BARRICADES:** Suitable barriers or barricades shall be furnished by the Contractor and put up and maintained at all times during the night or daytime, around all open ditches, trenches, excavations, or other work potentially dangerous to pedestrians and traffic. Barricades shall be placed on all sides and throughout the entire length of all open ditches, trenches, excavations, or other work which must be barred to the general public. Barricades shall be properly painted in order to retain a high degree of visibility to vehicular and pedestrian traffic.

4. **FLASHERS:** The Contractor shall furnish and securely fasten flashing units to signs, barricades, and other objects in such numbers and for such lengths of time as are required for the maintenance and protection of traffic. The flasher shall be in operation during all hours between sunset and sunrise, and during periods of low visibility. The Contractor shall maintain, relocate and operate barricades and flashers throughout the life of the contract. No special payment will be made for lights or flashers. Flasher units shall conform to the requirements for flashers in the item "Traffic Drums".

5. **DETOURS:** If a detour is shown on the plans or deemed necessary a proposed detour plan will be submitted to the Director of Public Works and the applicable Regulatory Agencies in sufficient time for proper review and approval.

6. **NONPERFORMANCE:** Should the Contractor or his employees neglect to set out and maintain barricades or signs, as required in these Specifications, the Town immediately, and without notice may furnish, install and maintain barricades or signs. The cost thereof shall be borne by the Contractor and may be deducted from any amount due or to become due to the Contractor under this contract.

The Contractor will be held responsible for any damages that the Town, Director of Public Works, Governmental units, or their heirs or assigns may have to pay as a consequence of the Contractor's failure to protect the public from injury, and the same may be deducted from any payments that are due or may become due to the Contractor under this contract.

D. MEASUREMENT AND PAYMENT

"Maintenance and Protection of Traffic" shall include all costs for furnishing barricades and traffic protection devices and for labor, equipment and services involved in the erecting, maintaining, adjusting, and storing of signs, flashers, lights, barricades, traffic cones, and other devices except

lighted traffic drums furnished by the Contractor, as well as the cost of all labor and equipment involved in the maintenance of traffic lanes and detours ordered or included in the approved scheme for maintenance of traffic.

The Contractor will be required under the Item "Maintenance and Protection of Traffic" to maintain and protect the traffic throughout the entire duration of the Contract. No claim for additional payment due to unusual construction conditions encountered or delay caused by the Contractor or other outside agencies shall be considered.

The Contractor will not be paid separately for repair and maintenance "such as patching, grading, snow removal, etc." or detours; said cost to be included in the Item for "Maintenance and Protection of Traffic."

If no item "Maintenance and Protection of Traffic" appears in the Bid Schedule, no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the prices bid for other items as listed in the Bid Schedule.

"Maintenance and Protection of Traffic" shall not include the cost of lighted traffic drums which items will be paid for at the contract unit price.

TRAFFIC DRUMS

A. DESCRIPTION

Under this Item, the Contractor shall furnish all lighted traffic drums required on the project to control traffic patterns, as indicated in "Maintenance and Protection of Traffic", or as directed by the Director of Public Works.

B. MATERIALS

Traffic drums shall be 55-gallon metal containers or an approved equal. Metal lids shall be removed from the drum prior to actual usage on the project.

Reflective sheeting shall conform to the requirements of Article M.18.09 of the Standard Specifications for Roads, Bridges, and Incidental Construction, Form 819. For this material, a Certificate of Compliance shall be required.

Traffic drums shall be lit by flashers in accordance with this paragraph or other lighting methods approved by the Director of Public Works in lieu thereof. Flashers shall be power operated, lens directed, enclosed light unit which shall provide intermittent light from 70 to 120 flashes per minute, with the period of light militancy occurring not less than 25 per cent of each on-off cycle, regardless of temperature. The emitted light shall be yellow in color and the area of light on at least one face of the unit shall be not less than 12 square inches. The discernible light shall be bright enough to be conspicuously visible during the hours of darkness at a minimum of 800 feet from the unit under normal atmospheric conditions. For units which beam light in one or more directions, the foregoing specifications shall apply 10 degrees or more to the side and 5 degrees or more above and below the photometric axis.

C. CONSTRUCTION METHODS

Suitable lighted traffic drums shall be furnished by the Contractor and put up and maintained at all times during the night or daytime, around all open ditches, trenches, excavations, or other work potentially dangerous to pedestrians and traffic. Traffic drums shall be placed throughout the entire length of all open ditches, trenches, excavations, or other work.

The Contractor shall have, available on the project, a sufficient number of traffic drums to fulfill all the requirements, as specified in the contract, to provide adequate traffic control on roadways during periods of unforeseen circumstances or emergencies.

Traffic drums shall be designed and installed to adequately and safely control traffic and in accordance with the "Manual on Uniform Traffic Control Devices", latest edition, and as directed by the Director of Public Works.

The Contractor shall furnish and securely fasten flashing units to traffic drums and other objects in such numbers and for such lengths of time as are required for the maintenance and protection of traffic. The flasher shall be in operation during all hours between sunset and sunrise, and during periods of low visibility. The Contractor shall maintain, relocate and operate traffic drums and flashers throughout the life of the contract.

Drums shall be suitably weighted with free-draining ballast (2"-4") at the base so as to minimize accidental movement of the drum.

Traffic drums, which have become damaged, defaced or are missing, shall be promptly replaced by the Contractor. When the traffic drums are no longer required on the project, they shall be removed from the highway property and shall remain the property of the Contractor.

D. MEASUREMENT AND PAYMENT

This work will be measured for payment by the number of calendar days that each individual unit is in place and in operation as herein before described.

Traffic drums will be paid for at the contract unit price per day, which price shall include all materials, equipment, tools, labor and work incidental to furnishing and disposing of the units.

UNIFORMED OFFICERS

A. DESCRIPTION

Under this item the Contractor shall provide the services of uniformed traffic men at such locations and for such periods as the Director of Public Works may order for the control and direction of vehicular traffic and pedestrians. Traffic men shall consist of uniformed police officers from the Town of Southbury Police Department. The Contractor shall be solely responsible for all arrangements in advance to schedule such officers.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

Not applicable.

D. MEASUREMENT AND PAYMENT

Services of traffic men will be measured for payment by the number of hours for each person rendering services in accordance with the orders of the Director of Public Works; this to include, however, only such traffic men as are employed within the limits of the construction, within the right of way for the project, upon detours stipulated in the contract, or upon detours ordered by the Director of Public Works. Traffic men furnished by the Contractor for continued use of a detour or bypass beyond the period for which the Director of Public Works deems such traffic men necessary to the proper completion of the project, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

The minimum hours of payment for any one traffic man in any one day shall be four hours. No traffic man shall work more than twelve hours in any one day. In case such services are required for more than twelve hours, the Contractor shall furnish additional traffic man personnel.

Travel time will not be measured for payment.

Traffic men will be paid for at the prevailing Southbury Police Department, per hour, fee schedule, which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the traffic men ordered. The Contractor shall pay the Southbury Police Department for each traffic man for hours worked and the Town of Southbury will reimburse the Contractor, "Dollar for Dollar", on the monthly estimates. The Town of Southbury reserves the right to pay the costs for approved uniformed officers provided by the Southbury Police Department directly and the Contractor shall receive no reimbursement in such case.

DUST CONTROL

A. DESCRIPTION

The Contractor shall provide water and/or calcium chloride and all equipment, labor, materials and related work necessary for the prevention and control of dust resulting from his operations in the performance of the Work.

B. MATERIALS

Water used shall be non-polluted. Calcium chloride shall conform to the requirements of AASHTO M 144 (ASTM D-98) except that the pellet form and the flake form shall be equally acceptable.

C. CONSTRUCTION METHODS

The Contractor shall exercise every precaution and means to prevent and control dust arising out of all construction operations from becoming a nuisance to abutting property Towns or surrounding neighborhoods. Pavements adjoining the pipe trenches shall be kept broomed off and washed clean of excess trench material wherever and whenever directed. Water and/or calcium chloride shall be applied to the surface of all disturbed areas at such rates and at such times as may be directed by the Director of Public Works to allay dust conditions.

Should the Contractor or his employees neglect to provide proper dust control, as required in these Specifications, the Town immediately, and without notice may furnish such dust control measures as are deemed necessary. The cost thereof shall be borne by the Contractor and may be deducted from any amount due or to become due to the Contract under this contract.

D. MEASUREMENT AND PAYMENT

Calcium chloride will be measured by weights as marked on the shipping containers; or if directed by the Director of Public Works, scales shall be furnished by and at the expense of the Contractor and the calcium chloride weighed in a manner satisfactory to the Director of Public Works. Water for dust control will be measured in tanks or tank trucks of predetermined capacity or by means of satisfactorily installed meters. Any and all measuring devices shall be furnished by the Contractor.

Payment for "Dust Control - Calcium Chloride" will be paid for at the contract unit price per pound which price shall include spreading and all materials, equipment, tools, labor, and work incidental to or necessary for the completion of the item.

Payment for "Dust Control-Water" will be paid for at the contract unit price per "M" (thousand) gallons, which price shall include all water, labor, equipment and all tools required to measure the water applied to surfaces designated by the Director of Public Works and at the times specified.

If no item, "Dust Control-Calcium Chloride" or "Dust Control-Water" appears in the Bid Schedule, then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the prices bid for other items as listed in the Bid Schedule.

SEDIMENT AND SOIL EROSION CONTROL

A. DESCRIPTION

The work under this section shall consist of any and all temporary and/or permanent measures to control water pollution and soil erosion as may be required, specified herein, or directed by the Director of Public Works, during the construction of the work embraced under this Contract and for such a length of time after the completion of work as determined by the Director of Public Works.

This work applies to, but is not limited to, any construction work in or near any watercourse or water body resulting in water pollution or soil erosion.

The work shall consist of measures to control water pollution and soil erosion through the use of berms, dikes, dams, sediment basins, netting, gravel, mulches, grasses, slope drains, ditches, channels, riprap, grading to control surface runoff and other erosion control devices or methods.

B. MATERIALS

The materials shall be satisfactory to the Director of Public Works and may consist of the following:

1. Mulches may be hay, straw, wood cellulose, wood chips, stone, netting, burlap, plastic sheets or other suitable mulch material acceptable to the Director of Public Works. Mulches shall be reasonably clean and free of noxious weeds and deleterious materials.
2. Slope drains or ditches may be constructed of pipe, rubble, riprap, sod, burlap, jute and excelsior matting, plastic sheets, Portland cement concrete, bituminous concrete or other material satisfactory to the Director of Public Works.
3. Grass shall conform to the specifications for "Fertilizing, Seeding and Mulching" except that the seeding may be altered by the Director of Public Works if requested by the Contract to suit special areas or conditions.

C. CONSTRUCTION METHODS

Construction methods shall, in general, be in accordance with the provisions set forth in the "Erosion and Sediment Control Handbook for Connecticut" published by the U. S. Department of Agriculture, Soil Conservation Service, Storrs, Connecticut. Free copies are available upon request from the Wallingford Agriculture Center, telephone (203) 269-7509.

Prior to the commencement of any work, the Contractor shall submit to the Director of Public Works the proposed methods of water pollution and soil erosion control to be incorporated in the work.

In general, all construction activities shall proceed in such a manner so as not to pollute insofar as possible, any watercourse, water body, conduit carrying water, etc., all in accordance with this specification and to the satisfaction of the Director of Public Works.

The Contractor shall be responsible to: limit, insofar as possible, the surface area of earth materials exposed by construction methods, immediately provide permanent and temporary pollution control measures to prevent contamination of adjacent watercourses and water bodies, and prevent, insofar as possible, erosion on the site and abutting property.

All slopes of stockpiled and excavated materials, all borrow stored on the site, all embankments and/or filling operations sloping into or near watercourses, water bodies, wetlands, etc., and all other disturbed areas shall be protected with mulching, seeding or plastic sheets. A temporary system of anchored bales of hay or straw or silt fence shall be placed at or near the toe of all exposed earth surfaces as ordered by the Director of Public Works, and at other locations as the Director of Public Works may direct, until such areas are reduced in grade or permanently stabilized.

When working in open areas such as fields, the Contractor shall limit his construction activities to as small an area as possible so as to have the least disturbing effect on the land.

All damaged areas shall be repaired as soon as possible. The Director of Public Works shall limit the surface area of earth material exposed if the Contractor fails to sufficiently protect the slopes to prevent pollution.

Temporary channels, ditches and outfalls shall be protected prior to directing water into them to prevent erosion. Netting, asphalt sprays, or other anchoring devices shall be used to secure mulches other than stone when placed within the channels, ditches and watercourses.

The Director of Public Works has the authority to direct the Contractor to divert surface water runoff away from exposed raw earth surfaces through the use of temporary berms, dikes, dams and diversion channels.

The Contractor shall, at all times, have on hand the necessary materials and equipment to provide for early slope treatment and corrective measures to damaged slopes.

The erosion control features shall be installed and maintained by the Contractor, and shall be checked periodically and after each severe rain storm for damage, until such features are no longer needed.

Ditches, sediment traps etc. which are or become filled or partly inoperative shall be cleaned and made operative before the Contractor stops work for any day and shall be maintained in a condition satisfactory to the Director of Public Works throughout the duration of the Contract.

The Contractor shall be responsible for the preservation of all stream banks within and adjacent to the limits of work. No excavation, stockpiling, or construction equipment will be permitted within ten (10) feet of the top of any stream bank or water body, unless required for the work shown on the Contract Drawings. Any stream bank disturbed by the Contractor's operations will be riprapped or otherwise repaired as ordered by the Director of Public Works.

In all cases involving work in a water body, every effort should be made to return the water body to the highest possible standard for aesthetic value, water quality and fish habitat. At stream crossings, the Contractor's work shall meet the following minimum standards:

1. Sufficient flow of water shall be maintained at all times to sustain aquatic life downstream.
2. Any divergence of the stream shall provide a V or dis-shaped channel, to concentrate flow during periods of low water.
3. Disturbance of the streambed shall be kept at an absolute minimum, and the streambed shall be returned as nearly as possible to its original condition or better. (Where possible, in modifying a streambed, the centerline shall be 8 to 12 inches lower than the toe of the channel bank to concentrate the flow of the water).
4. Disturbed banks shall be returned to original slope, and riprapped and/or planted with suitable grasses, trees and shrubs so as to prevent erosion.
5. Any dike or cofferdam required to facilitate construction shall be erected in such a manner that stream flow will not be sufficiently reduced to endanger fish life downstream and such dike or cofferdam shall be erected of materials that will not contribute substantially to the turbidity or siltation of the stream.
6. When it is necessary to use construction pads, haul roads or temporary roads in or across a river or stream, they shall be constructed with gravel or stone consisting of durable particles of rock and contain only negligible quantities of fines. This or other methods of entering a river or stream for construction purposes may be used but must meet with the written approval of the Director of Public Works.

Care shall be taken to prevent or reduce to a minimum any damage to any water body from pollution by debris, sediment or other materials in or near such water bodies. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of

the water in the stream shall not be directly returned to the stream. Such waters will be diverted through a settling basin or filter before being directed into the water body.

If water is taken from a water body for construction purposes and an impounding structure is necessary, such structure shall be erected in a manner causing the least possible disturbance to the water body.

If it becomes necessary, the Director of Public Works will inform the Contractor of unsatisfactory construction procedures and operations insofar as erosion control and water pollution are concerned. If same are not corrected promptly, the Director of Public Works may suspend the performance of any or all other construction until the unsatisfactory conditions have been rectified. In case of repeated failures on the part of the Contractor to properly control erosion, pollution and/or siltation, the Director of Public Works reserves the right to use Town forces or to employ outside assistance to provide the necessary corrective measures. Any direct costs thus incurred, plus associated costs, will be charged to the Contractor and will be deducted from payments otherwise due him.

D. MEASUREMENT AND PAYMENT

Payment for this work will be made at the contract unit price (lump sum) for "Sediment and Soil Erosion Control" and shall include all costs for furnishing erosion and sediment control measures and for all labor, equipment and material involved in constructing, erecting, maintaining and adjusting of berms, dikes, fences, sediment basins, mulching, temporary vegetation, drains, channels and other erosion and sediment control devices and methods approved or ordered unless the Bid Proposal also includes an item "Sediment Control Filter Fence" in which case separate measurement and payment will be made for fabric filter fence. "Sediment Control Filter Fence" if included in the Bid Proposal will be measured for payment by the actual number of lineal feet of "Sediment Control Filter Fence" installed and accepted. Fence, which becomes unserviceable and is replaced, will not be remeasured for payment. Fence, which in the opinion of the Director of Public Works is required due solely to carelessness in the Contractor's operations, will not be measured for payment.

The Contractor will be required under the unit price for "Sediment and Soil Erosion Control" to control erosion and sediment throughout the entire duration of the Contract. No claim for additional payment due to unusual construction conditions encountered or delay caused by the Contractor or other outside agencies shall be considered.

If no item "Sediment and Soil Erosion Control" or "Sediment Control Filter Fence" appears in the Bid Schedule then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the prices bid for other items as listed in the Bid Schedule.

HIGH-DENSITY POLYETHYLENE PIPE

A. DESCRIPTION

Under this Item, the Contractor shall provide all labor, materials, tools, and equipment necessary for furnishing and installing high density polyethylene pipe; and connecting to storm drainage structures.

Trench excavation and backfill, including all sheeting and bracing, and dewatering shall be included under this Item.

B. MATERIALS

High density polyethylene pipe shall conform to the requirements of AASHTO M252 or M294, Type S, and to the requirements of Article M.08.01-18 of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 819 (State of Connecticut Standard Specifications).

C. CONSTRUCTION METHODS

Where the pipe is to be laid below the existing ground line, the trench shall be excavated to the required depth. Unless otherwise ordered by the Director of Public Works, the pipe shall bear continuously on a 4-6 inch layer of crushed stone which has been thoroughly compacted and shaped to conform to the lower part of the pipe exterior to afford it a uniformly firm bed throughout its entire length.

A recess of sufficient depth shall be excavated at each bell to relieve it of any load and to allow ample space for making the joint. When the pipe has been bedded satisfactorily and the joint made, the recess under the bell shall be refilled with gravel or crushed stone and a 4 inch layer of gravel or crushed stone placed and tamped on each side of the pipe to hold it securely in place, care being taken not to disturb the pipe in the process.

Where rock is encountered, the trench, unless otherwise ordered by the Director of Public Works, shall be excavated a minimum of 8 inches below the bottom of the pipe. This area shall be refilled with suitable material, thoroughly compacted and shaped as hereinbefore specified.

Where a pipe is to be placed in a fill section, the fill shall first be constructed to an elevation 3 feet higher than the flow line of the pipe or 1 foot over the top of the pipe, whichever is greater. Then the trench shall be excavated as in a cut section and the pipe placed and backfilled.

If indicated in the plans or directed by the Director of Public Works, poor foundation material below the normal grade of the pipe bed shall be removed and replaced to the required elevation with gravel.

All pipes shall be carefully laid true to the line and grade as shown on the Contract Drawings or as furnished by the Director of Public Works, with hubs up grade and with the spigot ends fully engaged into the adjacent hubs. Pipe shall not be placed in any length less than four (4) feet. When the distance between the end of the pipe and the structure would require that a short piece of pipe will be used, the last two pieces of pipe shall be cut to approximately equal length to insure no pipe section is shorter than four (4) feet in length.

All pipes which are not in true alignment or which show any settlement or distortion after laying, shall be taken up and relaid or corrected to the satisfaction of the Director of Public Works without additional compensation.

Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Proper and suitable tools and equipment shall be used for safe and convenient handling of the pipe.

Joints in high density polyethylene pipe shall be sealed with either cold-applied bituminous sealer, preformed plastic gaskets, flexible watertight rubber-type gaskets or carefully caulked and filled.

Backfill shall be placed in 12 inch layers with approved material free from large stone, sod or other material which would prevent the backfill from being thoroughly compacted and each layer shall then be tamped thoroughly around and over the pipe with special attention being given to thoroughly tamping the material haunching the pipe. Tamping shall be done through the use of mechanical tampers. No heavy equipment shall be moved over the pipe until a fully compacted backfill of at least 3 feet has been placed. No pavement or surfacing materials shall be laid over any pipe until the backfill has been thoroughly compacted and settled and is satisfactory to the Director of Public Works.

The interior of the pipe shall, as the work progresses, be cleaned of all dirt, stone, sealant and superfluous material of every description. The exposed ends of all pipe shall be provided with approved temporary covers fitted to the pipe so as to exclude earth and other materials.

The completed drainage line shall be substantially watertight and any visible leakage shall be corrected. No additional payment will be made for this work.

D. MEASUREMENT AND PAYMENT

The quantity to be paid for under this Item shall be the number of lineal feet of High Density Polyethylene Pipe, of the size and depth specified, complete in place, in the accepted work.

Measurement shall be made from face of structure to face of structure. No payment shall be made for "cut off" or waste sections of pipe.

The item shall be paid for at the contract unit price measured as provided above which price shall be full compensation for furnishing, transporting, handling, placing and jointing the pipe, excavating and backfilling, all dewatering, bracing and shoring, and the furnishing of all labor, tools, equipment and incidentals necessary to complete the work.

Crushed stone bedding where required shall be measured and paid for under the bid item "Crushed Stone Bedding".

REINFORCED CONCRETE PIPE

A. DESCRIPTION

Under this Item, the Contractor shall provide all labor, materials, tools, and equipment necessary for furnishing and installing reinforced concrete pipe; and connecting to storm drainage structures.

Trench excavation and backfill, including all sheeting and bracing, and dewatering shall be included under this Item.

B. MATERIALS

Reinforced concrete pipe shall conform to the requirements of AASHTO M170, Class IV, and to the requirements of Article M.08.01-7 of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 819 (State of Connecticut Standard Specifications).

C. CONSTRUCTION METHODS

Where the pipe is to be laid below the existing ground line, the trench shall be excavated to the required depth. Unless otherwise ordered by the Director of Public Works, the pipe shall bear continuously on a 4-6 inch layer of crushed stone which has been thoroughly compacted and shaped to conform to the lower part of the pipe exterior to afford it a uniformly firm bed throughout its entire length.

A recess of sufficient depth shall be excavated at each bell to relieve it of any load and to allow ample space for making the joint. When the pipe has been bedded satisfactorily and the joint made, the recess under the bell shall be refilled with gravel or crushed stone and a 4 inch layer of gravel or crushed stone placed and tamped on each side of the pipe to hold it securely in place, care being taken not to disturb the pipe in the process.

Where rock is encountered, the trench, unless otherwise ordered by the Director of Public Works, shall be excavated a minimum of 8 inches below the bottom of the pipe. This area shall be refilled with suitable material, thoroughly compacted and shaped as hereinbefore specified.

Where a pipe is to be placed in a fill section, the fill shall first be constructed to an elevation 3 feet higher than the flow line of the pipe or 1 foot over the top of the pipe, whichever is greater. Then the trench shall be excavated as in a cut section and the pipe laid and backfilled.

If indicated in the plans or directed by the Director of Public Works, poor foundation material below the normal grade of the pipe bed shall be removed and replaced to the required elevation with gravel.

All pipes shall be carefully laid true to the line and grade as shown on the Contract Drawings or as furnished by the Director of Public Works, with hubs up and with the spigot ends fully entered into the adjacent hubs. Pipe shall not be placed in any length less than four (4) feet. When the distance between the end of the pipe and the structure would require that a short piece of pipe will be used, the last two pieces of pipe shall be cut to approximately equal length to insure no pipe section is shorter than four (4) feet in length.

All pipes which are not in true alignment or which show any settlement or distortion after laying, shall be taken up and relaid or corrected to the satisfaction of the Director of Public Works without additional compensation.

Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Proper and suitable tools and equipment shall be used for safe and convenient handling of the pipe.

Joints in concrete pipe shall be sealed with either cold-applied bituminous sealer, preformed plastic gaskets, flexible watertight rubber-type gaskets or carefully caulked and filled with mortar.

Backfill shall be placed in 12 inch layers with approved material free from large stone, sod or other material which would prevent the backfill from being thoroughly compacted and each layer shall then be tamped thoroughly around and over the pipe with special attention being given to thoroughly tamping the material around the pipe. Tamping shall be done through the use of mechanical tampers. No heavy equipment shall be moved over the pipe until a fully compacted backfill of at least 3 feet has been placed. No pavement or surfacing materials shall be laid over any pipe until the backfill has been thoroughly compacted and settled and is satisfactory to the Director of Public Works.

The interior of the pipe shall, as the work progresses, be cleaned of all dirt: cement and superfluous material of every description. The exposed ends of all pipe shall be provided with approved temporary covers fitted to the pipe so as to exclude earth and other materials.

The completed drainage line shall be substantially watertight and any visible leakage shall be corrected. No additional payment will be made for this work.

D. MEASUREMENT AND PAYMENT

The quantity to be paid for under this Item shall be the number of lineal feet of Reinforced Concrete Pipe, of the size and depth specified, complete in place, in the accepted work. Measurement shall be made from face of structure to face of structure. No payment shall be made for "cut off" or waste sections of pipe.

The item shall be paid for at the contract unit price measured as provided above which price shall be full compensation for furnishing, transporting, handling, placing and jointing the pipe, excavating and backfilling, all dewatering, bracing and shoring, and the furnishing of all labor, tools, equipment and incidentals necessary to complete the work.

Crushed stone bedding where required shall be measured and paid for under the bid item "Crushed Stone Bedding".

UNDERDRAINS AND OUTLETS

A. DESCRIPTION

Underdrains shall consist of pipe pervious to water, laid in a trench refilled with pervious material. They shall be six (6) inches in diameter unless directed otherwise by the Director of Public Works.

Outlets for underdrains shall consist of pipe laid in a trench and refilled with earth. The size and type of outlet pipe shall be the same as that of the underdrain to which it is connected, except that it shall not be pervious to water.

B. MATERIALS

1. PIPE: The pipe of underdrains and outlets shall conform to the requirements of ASTM F758, D-2751, and D-2665. Couplings and elbows shall conform to the requirements of ASTM D-2466 or D-2467.

2. AGGREGATE: The aggregates specified for filling the trench shall meet the requirements of Article M-08.03.

3. FILTER FABRIC: The fabric shall be nonrotting, acid and alkali resistant and have sufficient strength and permeability for the purpose intended, including handling and backfilling operations. Fibers shall be low water absorbent. The fiber network must be dimensionally stable and resistant to domination. The fabric shall be free of any chemical treatment or coating that will reduce its permeability. The fabric shall also be free of any flaws or defects which will alter its physical properties. Torn or punctured fabrics shall not be used. For each specific use, only commercially available fabric which is certified in writing by the manufacturer for the purpose intended shall be used. The Director of Public Works reserves the right to reject any fabric which he deems unsatisfactory for a specific use. The brand name shall be labeled on the fabric or the fabric container. Fabrics which are susceptible to damage from sunlight or heat shall be so identified by suitable warning information on the packaging material.

Fabrics susceptible to sunlight damage shall not be used in any installations where exposure to light will exceed 30 days, unless specifically authorized in writing by the Director of Public Works.

C. CONSTRUCTION METHODS

The trench for the underdrain shall be excavated in conformity with the requirements for pipe culverts. The dimensions of the trench shall be as indicated on the plans or as ordered. Where the bottom of the trench is unstable or in rock, the trench shall be excavated six (6) inches deeper and an additional six (6) inch layer of gravel fill or aggregate similar to that used to fill the trench shall be placed and compacted in the trench.

Where the perforations are to be at the bottom of the pipe, the aggregate for filling the trench shall then be placed to a depth of three (3) inches and tamped true to grade. The pipe shall be placed and firmly bedded on the aggregate. This aggregate shall be placed whether the pipe is encased with Filter Fabric or not.

When the pipe used has a bell, the pipe shall be installed with the bell end upgrade with the spigot end entered fully into the adjacent bell.

The pipe shall be carefully butted together and held by approved means so as to prevent any displacement of the joint.

After the pipe has been installed as described above, the aggregate shall be placed carefully around and over the pipe to a height of twelve (12) inches above the top of the pipe. The remainder of the trench shall be filled with aggregate and tamped in layers. When the underdrain pipe is used with the holes in an upward position, and in all cases where sand is used instead of the aggregate described hereinbefore, a protective three (3) inch minimum layer of three-eighths (3/8) inch aggregate shall be placed over the pipe and around all of the holes. Filter fabric may be substituted for the three (3) inch layer of aggregate. When filter fabric is used, the entire length of each drain pipe shall be wrapped with the fabric and the seams lapped and welded or bonded. Where the seams of the filter fabric are not welded or bonded, they shall be lapped to a minimum width equal to the diameter of the pipe for six (6) inch pipe and larger and a minimum of six (6) inch for smaller pipe.

In all cases where subbase material or gravel is to be placed over the underdrains, a layer of at least six (6) inches of subbase material or gravel shall be placed over the underdrain immediately after its completion.

Where shown on the plans or directed by the Director of Public Works, the Contractor shall connect underdrains or outlets to existing or proposed drainage systems or structures.

This work shall be performed in a workmanlike manner satisfactory to the Director of Public Works by installation of tees or wyes branches or by providing an acceptable hole in the main line underdrain.

Where the upgrade end of the underdrain does not enter a structure, it shall be capped or plugged as directed.

D. MEASUREMENT AND PAYMENT

This work will be measured for payment by the actual number of linear feet of Underdrains, and Outlets for underdrains, completed, accepted and measured in place. Trench excavation will not be measured for payment.

This work will be paid for at the contract unit price per linear foot for "Underdrain", complete in place, which price shall include pipe of the size specified, elbows, tees, wyes, couplings, fitting, trench excavation, filter fabric, aggregate, sand, tools, material and labor incidental thereto.

There will be no direct payment made for capping, plugging or connecting underdrains or outlets to existing or proposed drainage systems or structures, but the cost thereof shall be included in the cost of the underdrain items involved.

Rock-in-trench will be measured and paid for in accordance with and at the contract unit price per cubic yard for "Trench Excavation-Rock" of the applicable depth.

TRENCH EXCAVATION

A. DESCRIPTION

Trench excavation shall consist of the removal of all materials which are necessary for the proper construction of storm sewers, drains, pipe culverts, catch basins, manholes, utilities and related work; the removal of underground storm sewers, drains, pipe culverts, catch basins, manholes, utilities and appurtenances; proper disposal of all surplus or unsuitable material, all dewatering, all sheeting and shoring, and backfilling and compaction necessary for the construction of the work in the location and to the dimensions as shown on the plans or as directed by the Director of Public Works, all in accordance with these specifications.

The classification of trench excavation will only be in accordance with the following classes:

1. Trench Excavation-Normal: Trench Excavation-Normal shall include the removal as indicated on the plans or directed by the Director of Public Works of all earth, muck, mud, hardpan and loose disintegrated or decomposed ledge rock, topsoil, sod and similar materials which are sufficiently soft to permit removal by normal earth excavation machinery and methods.

2. Trench Excavation-Below Normal Grade: Trench Excavation-Below Normal Grade shall include the removal and proper disposal of the natural foundation material at or below the normal grade for the bottom of the trench which the Director of Public Works has determined is insufficient to safely support the pipe.

3. Trench Excavation-Rock: Trench Excavation-Rock shall include the removal of rock in definite ledge formation and severed or fragmented rock that cannot be removed by means of a suitable shovel or backhoe, suitably powered, in good condition and properly operated, without continuous drilling, blasting, barring and/or wedging. A suitable shovel or backhoe is defined as equipment of the proper type, size, and power to perform the excavation required. It shall also include boulders, portions thereof, concrete structures (not specified to be removed under other items of work), of 1/2 cubic yard or more in volume which fall within the limits of the trench or which are removed as directed by the Director of Public Works. Material which can be removed by normal earth excavation methods will not be paid for as trench excavation rock. Trench excavation rock shall not include excavation or removal of catch basins, manholes, drop inlets, pavement/bases and pipes of whatever dimension or type.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

Trench excavation shall be completed in conformity with the requirements of the plans or as directed by the Director of Public Works. The Contractor shall furnish and employ all bracing, sheeting, shoring, pumps, etc. as may be necessary for the proper completion of the work, the

protection of property and the safety of the public, employees of the Contractor, the Town and the Director of Public Works all in accordance with the applicable sections of the Occupational Safety and Health Act of 1970 (William-Steiger Act) as amended to date and all laws, rules, regulations, codes and published guidelines of any or all regulatory agencies having jurisdiction over such work. All bracing, sheeting, etc. shall be removed when no longer required for the construction or safety of the work.

After the excavation is completed, the Contractor shall notify the Director of Public Works and no masonry pipe or other material shall be placed in the excavated trench until the Director of Public Works has approved the depth of excavation and the character of the foundation material.

Whenever the natural foundation material is insufficient to safely support the pipe, poor foundation material below the normal grade of the culvert bed shall be removed and replaced to the required elevation with gravel meeting the material requirements of "Compacted Gravel Fill". The excavation shall be paid for at the contract unit price for "Trench Excavation Below Normal Grade" and the gravel shall be paid for at the contract unit price for "Compacted Gravel Fill".

If rock is encountered, the Contractor shall strip it of sufficient overlying material to allow for proper measurement and shall then notify the Director of Public Works that the rock surface is ready for measurement. Rock shall not be excavated until measurements have been made by the Director of Public Works unless, in the opinion of the Director of Public Works, satisfactory measurements can be made in some other manner. If the Contractor excavates rock prior to measurement by the Director of Public Works, the Director of Public Works shall estimate the quantity of rock excavated and it shall be presumed that the Director of Public Works' estimate will give the true quantity of excavation. If rock is excavated beyond the limits of payments specified or authorized in writing by the Director of Public Works, the excess excavation, whether resulting from over breakage or other causes, shall be by and at the expense of the Contractor.

In pipe trenches, excess excavation below the elevation of the bottom of the bedding shall be filled with material of the same type, placed and compacted in the same manner as specified for the bedding.

Excess excavation above said elevation shall be filled with the same material as specified for trench backfill. If rock below normal depth is shattered due to drilling or blasting operations of the Contractor, and the Director of Public Works considers such shattered rock to be an unfit foundation, the shattered rock shall be removed and the excavation shall be backfilled with the same material as specified as bedding, all such removal and backfilling shall be done by and at the expenses of the Contractor.

Excavated rock shall not be used in backfilling trenches unless authorized by the Director of Public Works and then subject to the following limitations:

1. Pieces of rock larger than those permitted as trench backfill under the Item "Earth Fill" shall not be used for this purpose.

2. Rock shall be mixed with earth fill in a sufficient quantity to insure a uniform well compacted backfill free of voids.

3. Rock backfill shall not be placed within twelve (12) inches of the pipe or twelve (12) inches of the finished subgrade.

Surplus excavated rock shall be disposed of as specified or as surplus excavated material under "Earth Fill". All blasting shall be completed within a minimum distance of twenty-five (25) feet before any portion of a masonry structure is placed or any pipe is laid.

The Contractor shall, at all times, keep the excavation free from water. Water shall be disposed of by the Contractor to the satisfaction of the Director of Public Works and in accordance with all applicable laws and regulations. The Contractor shall provide all necessary pumps, drains, sumps, pipes, ditches and other means for excluding and removing water from trenches and other parts of the work and for preventing the sides of the trench from sliding or caving. He shall satisfactorily remove all water which interfere with the work.

The Contractor shall sufficiently dewater all trenches to dry and solidify the foundation below the bottom of the pipe or structure and to provide a firm, solid foundation on which to lay the pipe or construct the structure.

It shall be the responsibility of the Contractor to maintain and protect the pipe at all times during construction. Any displacement of the pipe or appurtenant structures as a result of inadequate drainage protection during construction shall be the sole responsibility of the Contractor and he will be required to restore any pipe or appurtenant structure so displaced without additional compensation therefore.

No direct payment shall be made for the work of dewatering as specified above, but compensation for such work and all expenses incidental thereto shall be considered as having been included for the various pipe items.

D. MEASUREMENT AND PAYMENT

No measurement or separate payment will be made for work completed under the category "Trench Excavation-Normal". Its cost, including all dewatering, all sheeting and shoring, placement and compaction of all surplus suitable material with embankments and all backfilling, shall be included under the various "Reinforced Concrete Pipe" items.

"Trench Excavation-Below Normal Grade" shall be measured for payment by the actual volume of unsuitable material excavated to the width and depth ordered by the Director of Public Works. This work will be paid for at the contract unit price per cubic yard for "Trench Excavation-Below Normal Grade" complete, which price shall include and be full compensation for excavating and disposing of all unsuitable materials and for placing and compacting all backfill and for all labor, equipment, tools, and work incidental to or necessary to complete the item. "Compacted Gravel

Fill" or "Crushed Stone Bedding" used to bring the trench to normal grade shall be paid for at their respective contract unit prices.

"Trench Excavation-Rock" shall be measured for payment by the actual number of cubic yards of rock excavated in accordance with the following payment limits as indicated on the plans or as directed by the Director of Public Works. Trench Rock horizontal payment lines shall be vertical and shall be the width to which the material is actually removed except that in no case shall the width between payment lines be more than three (3) feet greater than the nominal inside diameter of circular pipe or nominal inside span of elliptical pipe or two (2) feet (measured horizontally) outside of the neat lines of the foundations of catch basins, manholes and other structures in each direction.

Trench Rock payment lines shall extend vertically from an elevation six (6) inches below normal grade to the upper surface of the rock formation or the bottom of the general excavation whichever is lower. This work will be paid for at the contract unit price per cubic yard for "Trench Excavation-Rock" which price shall include and be full compensation for excavation and disposal of all rock, all dewatering, and for backfilling and compaction and for all labor, equipment, tools, and work incidental to or necessary to complete the work. If "Compacted Gravel Fill" or "Borrow" are used for trench backfill, payment will be made at their respective contract unit price.

When trench excavation is completed in fill, no such excavation will be classified as "Trench Excavation-Rock".

CRUSHED STONE BEDDING

A. DESCRIPTION

This Item shall consist of furnishing, placing, shaping and compacting crushed stone or screened gravel as a foundation for structures, culverts and storm drains and elsewhere as indicated on the plans, required by the specifications or as ordered by the Director of Public Works.

B. MATERIALS

Crushed Stone Bedding shall conform to the requirements of Article M.02.01 of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 819 (State of Connecticut Standard Specifications) except that it shall conform to the gradation requirements of Article M.01.01 for 3/4-inch aggregate.

C. CONSTRUCTION METHODS

Foundation surfaces and trenches shall be clean and free of organic matter, loose soil, foreign substance, and standing water when the bedding is placed. Earth surfaces upon or against which bedding will be placed shall not be scarified.

Bedding shall not be placed until the subgrade has been inspected and approved by the Director of Public Works. Bedding shall not be placed over or around pipe or drain tile until the installation of the pipe or tile has been inspected and approved.

Bedding shall be placed uniformly in layers not more than 12 inches deep before compaction. When compaction is accomplished by manually controlled equipment, the layers shall not be more than 8 inches deep. Materials shall be placed in a manner to insure that no foreign materials are allowed to become intermixed with or otherwise contaminate the bedding.

Bedding over or around pipe or culvert shall be placed in a manner to avoid any displacement in line on grade of the pipe or tile.

D. MEASUREMENT AND PAYMENT

Crushed stone or screened gravel shall be weighed on scales furnished by the Contractor or provided by the supplier. The scales shall be of a type satisfactory to the Director of Public Works and shall be inspected and sealed, at the expense of the Contractor, as often as the Director of Public Works may require. If stone is weighed by the supplier, machine printed tickets clearly indicating the weight of the material, shall be furnished to the Director of Public Works with each delivery.

This work will be paid for at the contract unit price per ton for "Crushed Stone Bedding", complete in place which price shall include all materials, tools, equipment and labor incidental thereto. No payment shall be made for stone not shown in the drawing, required by the specification or ordered

in place by the Director of Public Works and which is utilized by the Contractor primarily to facilitate his operations or to replace material carelessly over-excavated by the Contractor.

FLARED HIGH DENSITY POLYETHYLENE CULVERT ENDS

A. DESCRIPTION

This Item shall consist of furnishing and installing high density polyethylene culvert ends conforming to the details shown on the plans or to commercial details providing equal lengths and a similar shape, and having generally comparable hydraulic characteristics. These high density polyethylene culvert ends shall be placed where and as shown on the plans, or as directed by the Director of Public Works. Excavation and backfill shall be included under this Item.

B. MATERIALS

The materials for this work shall conform to the requirements of ASTM D-3350, with minimum cell classification of 213320C.

C. CONSTRUCTION METHODS

High density polyethylene culvert ends shall be placed on a prepared bed of the existing ground, or if so directed by the Director of Public Works, on gravel fill and accurately aligned as shown on the plans. The joints shall be sealed as specified in the item "High Density Polyethylene Pipe".

D. MEASUREMENT AND PAYMENT

High Density Polyethylene Culvert Ends will be paid for at the contract unit price for each culvert end of the type and size specified, complete in place, including all materials, equipment, tools and labor incidental thereto.

FLARED CONCRETE CULVERT ENDS

A. DESCRIPTION

This Item shall consist of furnishing and installing reinforced concrete culvert ends conforming to the details shown on the plans or to commercial details providing equal lengths and a similar shape, and having generally comparable hydraulic characteristics. These reinforced concrete culvert ends shall be placed where and as shown on the plans, or as directed by the Director of Public Works. Excavation and backfill shall be included under this Item.

B. MATERIALS

The materials for this work shall conform to subarticle M.08.01-11 for Reinforced Concrete Culvert End of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 819 (State of Connecticut Standard Specifications).

C. CONSTRUCTION METHODS

Reinforced concrete culvert ends shall be placed on a prepared bed of the existing ground, or if so directed by the Director of Public Works, on gravel fill and accurately aligned as shown on the plans. The joints shall be sealed as specified in the item "Reinforced Concrete Pipe".

D. MEASUREMENT AND PAYMENT

Reinforced Concrete Culvert Ends will be paid for at the contract unit price for each culvert end of the type and size specified, complete in place, including all materials, equipment, tools and labor incidental thereto.

CONCRETE CATCH BASINS

A. DESCRIPTION

This Item shall consist of the construction of catch basins using solid concrete blocks or precast units, including precast concrete base, precast top with metal frame and grate, steps if required and in full conformance to the specifications at locations indicated on the plans or as ordered by the Director of Public Works.

B. MATERIALS

The materials to be used in the construction shall be those indicated on the plans or ordered by the Director of Public Works and shall conform to Article M.08.02 of the Standard Specifications for Roads, Bridges and Incidental Construction, Form 819.

Catch basins shall be constructed of solid concrete block or precast concrete. Bases shall be precast concrete.

Catch basin tops shall be Type "C" or Type "CL" precast concrete tops with steel frame and grate. Catch basin grates shall meet Federal Bicycle Safety Standard (Conn DOT. 507K)

Tops shall have a cross slope equal to the cross slope of the finished roadway surface and shall be specifically intended for use with the type of curbing used.

All mortar used in the work shall be composed of one volume of cement to two volumes of sand. The use of lime in the mortar shall not be permitted.

C. CONSTRUCTION METHODS

Excavation shall be to the established bottom of the foundation and the finished surface shall be firm and smooth. If soft or yielding spots are encountered at this elevation, they shall be removed, backfilled with suitable material and thoroughly tamped into place. Should rock be encountered at the bottom elevation, the excavation shall be carried down 6 inches further and backfilled with approved material, thoroughly tamped to the required elevation.

Mortar shall be mixed in a suitable box or on a tight platform. The cement and sand shall be thoroughly mixed dry until the mixture has a uniform color. Water shall then be added and the mass worked until the mortar is uniform and of the required consistency. Mortar shall be mixed in no greater capacity than is required for the work in progress and any that sets sufficiently to require retempering shall not be used. Only competent masons shall be employed in constructing catch basins.

Brick or block masonry units shall be laid in horizontal courses with full and close joints of mortar and finished properly as the work progresses. Masonry units shall be satisfactorily wet when laid and each unit shall be laid in mortar so as to form full bed and side joints in one operation. The

joint shall be not wider than 3/8" except when the units are laid radially, in which case the narrowest part of the joint shall not exceed 1/4".

Bricks and blocks shall be laid in workmanlike manner, true to line and the joints shall be carefully struck and pointed on the inside. The outside of the masonry shall be neatly plastered with 1/2" cement mortar as the work progresses. Vertical joints shall be broken and as nearly as practical, adjoining courses shall be offset 1/2 unit.

The concrete block wall vertical sections shall be set plumb except as noted on the plans.

Catch basins over ten (10) feet deep shall be constructed with precast units designed for the proposed depth or shall be constructed of a double thickness of concrete blocks placed in an interlocking pattern to provide additional strength.

Standard double catch basins shall be constructed with a precast concrete top with steel frame and grate designed, constructed and intended for use in building double grate catch basins. Top shall be cast as a single integral unit. Catch basin shall be constructed to proper dimensions to coincide with the top.

Inlet and outlet pipes shall extend thorough the walls a sufficient distance to allow for satisfactory connections and the concrete or masonry shall be constructed around it neatly to prevent leakage along their outer surface. Unless otherwise shown, the inside ends shall be saw cut flush with the inside walls and all reinforcing steel shall be neatly trimmed flush with the pipe end. The pipe shall be of the same size and type as that with which it connects on the outside. Partial lengths of pipe connected to structures shall not be less than four (4) feet in length and the Contractor shall measure and plan his work to insure that short lengths of pipe are not required.

All fresh masonry shall be carefully protected from freezing and from the drying effects of the sun and wind and if required, it shall be sprinkled with water at such intervals and/or such a time as may be directed. Masonry shall be protected from injuries of all sorts and all portions which may become damaged shall be removed and rebuilt.

Masonry shall not be constructed in freezing weather unless all blocks have been heated sufficiently to remove all ice and frost.

All catch basins shall have at least two courses of concrete brick immediately below the precast top to facilitate future grade changes and basins constructed of precast units shall also have at least one course of concrete block in addition to the two courses of brick.

Precast tops shall be set accurately to the finish pavement elevation so that subsequent adjustments will not be necessary. Where precast tops are adjacent to, or surrounded by, cement concrete construction, each top unit shall be entirely separated from the concrete by a preformed bituminous expansion joint not less than 3/8" thick. The cost of each joint, including the materials, shall be included in the price for the structure.

If the completed structure is in the immediate vicinity of pavement, sidewalks, curbs, gutters or similar miscellaneous structures, they shall be backfilled with granular material. Backfill shall be thoroughly and completely compacted in six inch layers. Care shall be taken to avoid any damage or displacement of the masonry units during backfill.

Upon final completion, all catch basins shall be cleaned and all structures shall be freed from any accumulation of silt, debris and other foreign matter of any kind.

D. MEASUREMENT AND PAYMENT

Construction of catch basins, single units or double units, will be measured and paid for at the contract unit price per each as specified in the bid proposal, completed and accepted in place. No payment will be made for frames and grates and their cost shall be included in the price for the catch basin. No measurement or payment will be made for alterations to existing catch basins required to make pipe connections and this cost will be included in the prices bid for other items of work.

When an Item appears in the bid proposal for construction of additional depth of catch basin over a specified depth, such work shall be measured and paid for at the contract unit price per vertical foot.

When an Item appears in the bid proposal for "adjustment of structure frame and cover" such work shall be measured and paid for at the contract unit price per each. Adjustment of structure frame and cover shall include the removal of the required number of courses of masonry block or brick and/or the addition of up to two courses of masonry block and two courses of brick. No measurement or payment for adjustment of structure frame and cover shall be made on any structure constructed by the Contractor unless the design grade is modified by the Director of Public Works after the frame and grate has been set to finish grade.

The unit price shall include the price of all excavation, backfill, support systems, frame and grates, concrete masonry, pipe to catch basin connections, damp proofing and all other material and equipment, tools and labor necessary for or incidental to the completion of the work.

CONCRETE MANHOLES

A. DESCRIPTION

This item shall consist of the construction of manholes using solid concrete blocks or precast units, including precast concrete base, cast iron frame and cover, steps if required, and in full conformance to the specifications at locations indicated on the plans or as ordered by the Director of Public Works.

B. MATERIALS

The materials to be used in the construction shall be those indicated on the plans or ordered by the Director of Public Works and shall conform to Article M.08.02 of the Standard Specifications for Roads, Bridges and Incidental Construction, Form 819.

Manholes shall be constructed of solid curved concrete block or precast concrete. Precast concrete manholes shall be used unless manholes constructed of concrete block are specifically authorized by the Director of Public Works.

Bases shall be precast concrete.

Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast.

Frames and covers shall be Campbell Foundry Company #1032 or approved equal. Manhole sections shall be manufactured with properly sized opening at the necessary locations and elevations to accommodate pipe connection. Holes shall not be broken through manhole walls to allow such connections.

All mortar used in the work shall be composed of one volume of cement to two volumes of sand. The use of lime in the mortar shall not be permitted.

C. CONSTRUCTION METHODS

Excavation shall be to the established bottom of the foundation and the finished surface shall be firm and smooth. If soft or yielding spots are encountered at this elevation, they shall be removed, backfilled with suitable material and thoroughly tamped into place. Should rock be encountered at the bottom elevation, the excavation shall be carried down 6 inches further and backfilled with approved material, thoroughly tamped to the required elevation.

Mortar shall be mixed in a suitable box or on a tight platform. The cement and sand shall be thoroughly mixed dry until mixture has a uniform color. Water shall then be added and the mass worked until the mortar is uniform and of the required consistency.

Mortar shall be mixed in no greater capacity than is required for the work in progress and any that sets sufficiently to require retempering shall not be used.

Only competent masons shall be employed in constructing manholes.

Brick or block masonry units shall be laid in horizontal courses with full and close joints of mortar and finished properly as the work progresses. Masonry units shall be satisfactorily wet and each unit shall be laid in mortar so as to form full bed and side joints in one operation. The joint shall be not wider than 3/8" except when the units are laid radially, in which case the narrowest part of the joint shall not exceed 1/4".

Bricks and blocks shall be laid in a workmanlike manner, true to line and the joints shall be carefully struck and pointed on the inside. The outside of the masonry shall be neatly plastered with 1/2" cement mortar as the work progresses. Vertical joints shall be broken and as nearly as practical, adjoining courses shall be offset 1/2 unit.

The concrete block wall vertical sections shall be set plumb except as noted on the plans.

Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.

All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

Inlet and outlet pipes shall extend through the walls a sufficient distance to allow for satisfactory connections and the concrete or masonry shall be constructed around it neatly to prevent leakage along their outer surface. Unless otherwise shown, the inside ends shall be saw cut flush with the inside walls and all reinforcing steel shall be neatly trimmed flush with the pipe end. The pipe shall be of the same size and type as that with which it connects on the outside. Partial lengths of pipe connected to structures shall not be less than four (4) feet in length and the Contractor shall measure and plan his work to insure that short lengths of pipe are not required.

All fresh masonry shall be carefully protected from freezing and from the drying effects of the sun and wind and if required, it shall be sprinkled with water at such intervals and/or such time as may be directed. Masonry shall be protected from injuries of all sorts and all portions which may become damaged shall be removed and rebuilt. Masonry shall not be constructed in freezing weather unless all blocks have been heated sufficiently to remove all ice and frost.

All manholes shall be at least two courses of concrete brick immediately below the cast iron frame to facilitate future grade changes and manholes constructed of precast units shall also have at least one course of concrete block.

Castings shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.

All castings shall be thoroughly cleaned and subject to a careful hammer inspection.

Castings shall be at least Class 25 conforming to the ASTM Standard Specifications for Gray Iron Castings, Designation A48-76.

Before being shipped from the foundry, castings shall be given one coat of coal-tar-pitch varnish, applied in a satisfactory manner so as to make a smooth coating, tough, tenacious, and not brittle or with any tendency to scale off.

Manhole covers shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings or directed. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

Manhole covers shall be left in place in the frames on completion of other work at the manholes.

Unless otherwise indicated, manhole steps shall be of aluminum. Aluminum manhole steps shall be similar in shape to Stock No. 12653B made by Aluminum Company of America, Pittsburgh, Pa., and Allegheny Foundry Co., Pittsburgh, Pa., or Stock No. F-14-2-B made by New Jersey Aluminum Co., New Brunswick, N.J., or an acceptable equivalent product. Before the steps are built into the masonry and after thorough cleaning, those parts of aluminum steps which will be embedded shall be given a protective coating of an acceptable, heavy-bodied, bituminous material. The cleaning shall be done by suitable means and with suitable cleaning agents to ensure that the surfaces to be coated are free from all foreign matter such as dirt, oil, and grease. The steps shall be thoroughly rinsed and dried before the coating is applied and the coating shall have become thoroughly dry before the steps are built into the masonry. The steps shall be embedded in the walls of precast sections during manufacture or shall be securely embedded in masonry block walls during construction and shall be capable of supporting any person using them. Steps shall be set in a continuous vertical alignment to form a ladder with rungs uniformly spaced 12 to 16 inches apart vertically.

Invert channels shall be formed in the concrete base or shall be constructed of brickwork upon the base unless deleted by the Director of Public Works.

The inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerlines of adjoining pipelines. All surfaces of the manhole invert and table shall be finished to provide gradual transitions and a

smooth even surface free from offsets, ridges, dislocations or other defects or irregularities which could impede flow or snag debris.

If the completed structure is in the immediate vicinity of pavement, sidewalks, curbs, gutters or similar miscellaneous structures, they shall be backfilled with granular material. Backfill shall be thoroughly and completely compacted in six inch layers. Care shall be taken to avoid any damage or displacement of the masonry units during backfill.

Upon final completion, all manholes shall be cleaned and all structures shall be freed from any accumulation of silt, debris and other foreign matter of any kind.

D. MEASUREMENT AND PAYMENT

Construction of manholes will be measured and paid for at the contract unit price per each as specified in the bid proposal, completed and accepted in place. No payment will be made for frames and covers and their cost shall be included in the price for the manhole. No measurement or payment will be made for alterations to existing manholes required to make pipe connections and the cost will be included in the prices bid for other items of work.

When an Item appears in the bid proposal for construction of additional depth of concrete manhole over a specified depth, such work shall be measured and paid for at the contract unit price per vertical foot.

When an Item appears in the bid proposal for "adjustment of structure frame and cover" such work shall be measured and paid for at the contract unit price per each. Adjustment of structure frame and cover shall include the removal of the required number of courses of masonry block or brick and/or the addition of up to two courses of masonry block and two courses of brick. No measurement or payment for adjustment of structure frame and cover shall be made on any structure constructed by the Contractor unless the design grade is modified by the Director of Public Works after the frame and grate has been set to finish grade.

The unit price shall include the price of all excavation, backfill, support systems, frames and covers, concrete masonry, pipe to manhole connections, damp proofing and all other material and equipment, tools and labor necessary for or incidental to the completion of the work.

RIPRAP

A. DESCRIPTION

Under this Item the Contractor shall supply all labor, tools, materials, and equipment required to furnish and place riprap at the various locations shown on the Plans or as directed by the Director of Public Works. The riprap shall be placed to the thickness as shown, or as ordered by the Director of Public Works and shall be of well-graded stone which may be dumped in place. The surface shall be brought up evenly to the required grade with surface voids filled by hand placing. This Item is subdivided into the following Items:

1. Standard Riprap
2. Modified Riprap

B. MATERIAL

The stone used for riprap shall be hard, durable, angular in shape; resistant to weathering and to water action; free from overburden, spoil, shale and organic material; and shall meet the gradation requirements for the class specified. Neither breadth nor width of a single stone should be less than one-third its length. Broken concrete or rounded stones (such as those occurring naturally in stream beds or outwash deposits) will not be acceptable.

1. Riprap: Riprap shall form a compact, solid blanket to protect the slope and prevent erosion.
2. Standard Riprap: shall meet the following requirements:

Not more than 15% of the riprap shall be scattered spalls and stones less than 6" in size.

No stone shall be larger than 30" in size and at least 75% of the mass shall be stones at least 15" in size.

3. Modified Riprap: shall meet the following gradation:

Stone Size	Percentage of the Mass
10" or over	0
6"-10"	20-50
4"-6"	30-60
2"-4"	30-40

1"-2" 0-10

Less than 1" 0

4. Filter Fabric: (when specified or shown on the Contract Drawings)

a. The fabric shall be non-rotting, acid and alkali resistant and have sufficient strength and permeability for the purpose intended, including handling and backfilling operations. Fibers shall be low water absorbent. The fiber network must be dimensionally stable and resistant to gemination. The fabric shall be free of any chemical treatment or coating that will reduce its permeability. The fabric shall also be free of any flaws or defects which will alter its physical properties. Torn or punctured fabrics shall not be used. For each specific use, only commercially available fabric which is certified in writing by the manufacturer for the purpose intended shall be used. The Contractor shall submit a two-foot square sample of each type of fabric to be used along with technical data sheet, certified test reports, materials' certificates, and certificates of compliance. The Director of Public Works reserves the right to reject any fabric which he deems unsatisfactory for a specific use. The brand name shall be labeled on the fabric or the fabric container. Fabrics which are susceptible to damage from sunlight or heat shall be so identified by suitable warning information on the packaging material.

b. Fabrics susceptible to sunlight damage shall not be used in any installations where exposure to light will exceed 30 days.

5. Bedding Material: (when specified or shown on the Contract Drawings)

Bedding Material shall consist of material in accordance with Form 819 Article M01.02 for 3/4" coarse aggregate unless noted otherwise in the contract documents or directed by the Director of Public Works.

C. CONSTRUCTION METHODS

The area shall be accurately shaped prior to placing of any filter fabric, bedding material, or riprap. Bedding material shall be placed on the prepared area and compacted to the depth, lines and grades indicated on the plans.

The filter fabric shall be installed at the locations and to the dimensions shown on the plans or as directed by the Director of Public Works. Filter fabric shall be installed as recommended by the manufacturer for the specific use or purpose intended, or as otherwise approved by the Director of Public Works.

The riprap shall be placed to its full course thickness in one operation in such a manner as to produce a reasonably well-graded mass of rock without causing displacement of the underlying material. The finished surface shall be free from pockets of small stones and clusters of larger stones. Placing this material by methods likely to cause segregation of the various sizes of stone will not be permitted. Rearranging of individual stones by mechanical or hand methods will be

required to the extent necessary to obtain a reasonably well-graded distribution of the specified stone sizes. The completed course shall be of the specified thickness and to the lines and grades as shown on the plans or as ordered by the Director of Public Works.

Excavation shall consist of the removal and satisfactory disposal of all material which is necessary for the proper completion of the Riprap Channel and Slope Protection.

D. MEASUREMENT AND PAYMENT

The quantity to be paid for under the subdivisions of this Item shall be the number of tons placed along the slope within the limits shown on the Plans or ordered by the Director of Public Works.

The unit price bid under the subdivisions of this Item shall be full payment for all labor, tools, materials, and equipment required to furnish and place riprap complete as shown on the Plans and specified herein.

GABIONS

A. DESCRIPTION

The work under this item shall consist of furnishing, assembling, placing, tying and filling with approved aggregate open wire mesh baskets in conformity with the line, grade and dimensions shown on the plans, or as directed by the Director of Public Works.

B. MATERIALS

Gabion baskets shall be supplied in various widths, lengths and heights as indicated on the plans. The horizontal width of any basket shall not be less than 18". The height of the gabion shall not exceed its width. All basket units shall be divided into equal compartments and separated by diaphragms of the same mesh and gauge as the basket body. Each compartment's length shall not exceed the compartment's width.

1. Dimensions for heights, lengths, and widths shall be subject to a tolerance limit of $\pm 3\%$ of manufacturer's stated sizes.

2. FABRICATION: The gabion baskets shall be fabricated in such a manner that the sides, ends, lids and diaphragms can be assembled at the construction site into rectangular baskets of the specified sizes. The baskets shall be of single unit construction. The front, base, back, and lid shall be woven into a single unit. The ends shall be factory connected to the base section of the baskets in such a manner that the strength and flexibility at the point of connection is at least equal to that of the mesh. Where the length of the gabion exceeds its horizontal width, the gabion shall be equally divided by diaphragms into cells whose length does not exceed the horizontal width. The gabion shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that no additional tying at this junction will be necessary. All perimeter edges of the mesh forming the gabion basket shall be securely selvedged so that the joints formed have at least the same strength as the body of the mesh. Tie wire or lacing wiring shall be supplied in sufficient quantity for securely fastening all edges of the gabion and diaphragms and to provide for four internal connecting wires in each cell 1/2 unit high and eight internal wires in each cell 1 unit high. The tie wires to meet the same specifications as the wire used in the mesh.

3. WIRE: The wire mesh shall be made of galvanized steel wire having a minimum size of no less than 0.120 inches (3.05mm) (U.S. Gauge No. 11). A selvedge wire, running through the edges of the basket shall be made of galvanized steel wire having a minimum size of 0.148 inches (3.76mm) (approximately U.S. Gauge No. 9). The lacing wire necessary for assembling and lacing the basket units and the connecting wires shall be made of galvanized steel wire having a minimum size of 0.092 inches (2.34mm) (US Gauge No. 13).

All wire shall be zinc coated with not less than 0.80 ounces per square foot of uncoated wire, and complying with Federal Specification QQ-W-461g, Class 3. The maximum dimension of the mesh opening shall not exceed 4.5 inches (115mm) and the area of the mesh opening shall not exceed 8

square inches (51.6cm²). The wire mesh shall be fabricated in such a manner as to be non-raveling and have the ability to resist pulling apart at any of the twists or connections forming the mesh when a single wire in a section of mesh is cut and the section of mesh then subjected to loading.

Tensile strength of all wire used for manufacturing the baskets and lacing wire shall range from 60,000 to 85,000 psi in accordance with Federal Specification QQ-W-461g, Class 3.

Wire for polyvinyl chloride coated gabions shall meet the following:

The wire mesh shall have a galvanized steel wire core having a minimum size of no less than 0.104 inches (2.6mm). The selvedge wire shall have a steel wire core having a minimum size of no less than 0.131 inches (3.2mm). The lacing wire shall have a galvanized wire core having a minimum size of no less than 0.085 inches (2.1 mm). The weight of the zinc coating for galvanized wire with extruded PVC coating shall be 0.80 ounces per square foot and shall comply with Federal Specification QQ-W-461g. The minimum PVC coating thickness shall be 0.015 inches (0.40mm). The color of the polyvinyl chloride shall be black unless noted otherwise on the plans.

4. The gabion baskets shall be filled with approved stone meeting the following size limits.

Basket Depth or Height	Minimum Stone Size	Maximum Stone Size
12 inches	4 inches	8 inches
Greater than 12 inches	4 inches	12 inches

All required sizes shall be the stone's greatest dimension. Aggregate shall be reasonable graded between the limiting sizes. The stone shall be as approved by the Director of Public Works on the basis of a geologic analysis. The Town reserves the right to reject any source failing either of the following tests:

- a. Freeze-Thaw Test: A maximum 10% loss, by weight, after 25 cycles of freezing and thawing.
- b. Magnesium Sulfate Soundness Test: A maximum 10% loss, by weight, after 10 cycles of the magnesium sulfate soundness test.

Tests and Certifications: Load elongation, zinc coating and tensile strength tests shall be conducted in accordance with Federal Specifications QQ-W-461g, Class 3. Each shipment of gabion baskets to the job site shall be accompanied by a certification of the manufacturer, which states that the material conforms to the requirements of this specification. A shipment shall consist of all material arriving at the job site at substantially the same time. Certification shall be on company letterhead and shall be signed by an officer having legal authority to bind the company.

C. CONSTRUCTION METHODS

Each basket unit shall be assembled by binding together all vertical edges with lacing wire on 5 inch spacing or by a continuous piece of lacing wire looped around the vertical edges with a coil every 4 inches. Empty baskets shall be set to line and grade as shown on the plans. All adjoining empty basket units must be laced along the perimeter of their contact surfaces in the same manner as described previously for assembling. The empty upper baskets that form the upper tier, shall also be laced to the top of the lower ones. A standard fence stretcher or other approved device shall be used to remove any kinks from the mesh and hold alignment of the units. The aggregate shall be carefully placed by hand or machine to assure alignment and avoid bulges with a minimum of voids. After the aggregate is placed to the level at which the connecting wire are to be installed, two connecting wires shall be placed perpendicular to each other, then looped and tied around 2 meshes of each gabion wall. Filling shall then be resumed until the level of the next connecting wires or the top of the gabion is reached. After a gabion has been filled, the lid shall be stretched tightly over the filling until the lid meets the perimeter edges of the front and end panels. The lid shall then be tightly laced along all edges, ends and diaphragms in the same manner as described for assembling. Shop drawings detailing the layout of the gabions shall be furnished to the Director of Public Works by the contractor at least two weeks prior to their installation.

D. MEASUREMENT AND PAYMENT

If the item "Gabion Structure" appears in the Bid Schedule, then this item shall be measured for payment as the actual number of Gabion Structures constructed as indicated on the plans.

If the item "Gabions" or "PVC Coated Gabions" appears in the Bid Schedule then this work will be measured for payment by the actual number of cubic yards of "Gabions" or "PVC Coated Gabions", measured in place and accepted. Payment for this item will be made at the contract unit price lump sum or per cubic yard for gabions complete in place which price shall include preparation and compaction of the base for the gabions, furnishing, placing, shaping, and tying all gabions, furnishing and placing the aggregate fill and all other materials, equipment, tools, labor and work incidental to or necessary for the completion of the item.

If no item "Common Excavation-Earth" appears in the Bid Schedule then no separate payment will be made for any incidental excavation performed during the installation of the gabions and the cost of such work is understood to be included in the gabion item as listed in the bid schedule.

STRUCTURAL EXCAVATION

A. DESCRIPTION

This Item shall consist of the excavation and satisfactory disposal of all materials of whatever nature necessary for the construction of foundations for bridges, culverts, retaining walls, and similar structures. It shall also include the removal of all material encountered, whether earth or ledge, the necessary backfilling, compacting, the satisfactory disposal of all surplus material and all work incidental to the removal and disposal of said material. Work shall be done in accordance with lines, grades, and cross-sections as indicated on the plans, or as ordered by the Director of Public Works. It shall also include all necessary materials and equipment for, and in the construction of, cribs, coffer dams, and similar items together with their unwatering, all in accordance with these specifications and the plans, or as the Director of Public Works may otherwise direct. The item shall also include the subsequent removal of coffer dams, cribs or similar temporary structures.

Structure excavation shall be classified for the purpose of pavement as "Structural Excavation-Earth" and "Structural Excavation-Rock", in accordance with the following definitions:

1. Structure Excavation-Earth shall include all materials other than water or structure excavation rock.
2. Structure Excavation-Rock shall include rock and definite ledge formations, boulders, or portions of boulders of (1) cubic yard or more in volume and concrete structures of (1) cubic yard or more in volume.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

Unless otherwise indicated in the plans or directed by the Director of Public Works, the Contractor shall confine his excavating operations to within the bounds of the site of the proposed structure and within the limits of coffer dams if such are used. The natural stream bed shall not be disturbed without permission of the Director of Public Works. Material from foundation or other excavation shall not be deposited within the stream area and the stream area shall be kept free from obstructions.

Elevations of the bottom of the footings as indicated on the plans shall be considered as only approximate. The Director of Public Works may issue written orders changing the dimensions or elevations of footings necessary to provide a satisfactory foundation. All foundation excavation shall be completed so that the footings will be of the full lengths and widths indicated on the plans.

The footings shall be constructed with full horizontal beds and rounded or undercut corners and edges will not be permitted.

When required by the Director of Public Works, the foundation shall be either horizontally benched or level stepped vertically as he shall direct. All loose materials shall be removed and all seams cleaned out and filled with concrete mortar or grout. Any overbreakage in rock more than 6 inches below the plan grade for the bottom of the footing, not authorized by the Director of Public Works, shall be replaced by the Contractor with Class B concrete at the Contractor's expense.

When the structure is to be constructed on an excavated surface other than rock, particular care shall be taken not to disturb the bottom of the excavation. The final removal of the foundation material to grade shall not be done until just prior to the placement of concrete. Any foundation material disturbed below plan grade or revised plan grade shall be dressed and compacted or, if necessary, it shall be removed and replaced with suitable material as directed by the Director of Public Works at the Contractor's expense. Construction of footings shall not be started until the Director of Public Works has approved the depth of the foundation and the character of the foundation materials.

Cofferdams for foundation construction shall be carried to adequate depths and height, shall be safely designed and well braced and as watertight as necessary for the proper performance of the work.

Cofferdams shall have interior dimensions sufficient to provide ample clearance for the construction of forms and to permit the inspection of their interiors, and to permit pumping outside of the forms.

Cofferdams which become tilted or move laterally during the process of building the substructure shall be righted, reset, or enlarged as maybe required to provide the necessary clearance and this work shall be at the sole expense of the Contractor.

Cofferdams shall be constructed so that the fresh concrete will be protected against damage from a sudden rise of the water and to prevent damage to the foundation by erosion. No part of the cofferdam shall be left in such a way as to extend into the substructure masonry without the written permission of the Director of Public Works.

For substructure work the Contractor shall, upon request, submit for approval drawings indicating his proposed method of cofferdam construction and other details left open to his choice. The type and clearance of cofferdams, insofar as the details effect the character of the finish work, shall be subject to the approval of the Director of Public Works but other details of their design and construction will be left to the Contractor who shall be responsible for the successful construction of the work. The furnishing of such plans and methods shall not serve to relieve the Contractor of any of his responsibility for the safety of the work or the responsibility for the successful completion of the project.

Unless otherwise directed by the Director of Public Works, cofferdams with all sheeting and bracing shall be removed by the Contractor following the completion of the structure. The removal shall be done in such a manner that the finished masonry is neither disturbed nor otherwise injured. The Director of Public Works may require the Contractor to remove only a portion or portions of the cofferdams or to leave them entirely in place. When upon written order of the Director of Public Works cofferdams are left in place, the Contractor shall be paid for the actual cost of the material left in place but no allowance will be made for labor, tools, equipment, incidentals etc. which are to be included in the price bid for structural excavation.

The Contractor shall supply sufficient pumping capacity to unwater all cofferdams and to place all masonry in the dry except as specified below.

When conditions are encountered which, when in the opinion of the Director of Public Works, render it impractical to unwater the cofferdams when every reasonable effort has been made to reduce the inflow of water or other conditions are such that a foundation seal is necessary, the Director of Public Works may then require the construction of a concrete foundation seal of such dimensions as he determines are necessary.

If the Contractor requests permission to install a foundation seal to facilitate his operations, and such approval is granted in writing, the seal shall be to the dimensions designated by the Director of Public Works and shall be constructed at no additional cost to the Town.

When concrete foundation seals are required, or permission granted for their use, they shall be constructed as provided in the specifications for "Concrete Work". Seals shall be of Class B concrete placed continuously from start to finish. To insure thorough bonding, each successive layer shall be placed before the preceding layer has taken initial set. The cofferdam shall have been vented or ported at low water level. The surface of the concrete shall be kept as nearly horizontal at all times as practicable.

Unless otherwise directed, the bottom of the seal shall be at the elevation of the bottom of the footing as shown on the plan or as revised by the Director of Public Works and the seal shall be of the thickness ordered. When the seal has hardened sufficiently to withstand hydrostatic pressure, and not until then, the cofferdam shall be dewatered and the remainder of the concrete poured in the dry.

Pumping from the interior of any foundation enclosure shall be performed in such a manner as to preclude the possibility of the migration or erosion of any fresh concrete. During the placement of concrete and for a period of twenty-four (24) hours thereafter, no pumping will be permitted unless from a suitable pump separated from the concrete by a watertight wall or other effective means. All spaces within the excavation not occupied by the structure shall be backfilled to the level of the original ground surface with approved excavated material or borrow. No backfill material shall be placed against a newly completed structure until the masonry has cured a minimum seven (7) days and permission has been given by the Director of Public Works. Such backfill shall be thoroughly compacted and neatly graded. Adequate provision shall be made for the drainage of all fill in accordance with the provision of the plans or as ordered.

D. MEASUREMENT AND PAYMENT

"Structural Excavation-Earth" will be measured in place by taking the difference in elevation between the existing ground surface or the bottom of the roadway excavation or channel excavation, whichever is lower, and in the surface of the completed structure excavation at plan grade or approved revised plan grade.

"Structural Excavation-Rock" will be measured in place by taking difference in elevation between the existing ledge rock or bottom of roadway excavation or channel excavation, whichever is lower, and the bottom of the actual completed and accepted structure excavation except that any excavation to a depth greater than six (6) inches below the plan grade or approved revised plan grade will not be measured for payment.

Horizontal payment limits will be paid between plumb lines two (2) feet outside of the neat lines of the foundation unless otherwise shown on the plans. When a concrete foundation seal is required, the horizontal payment limits will be extended to the actual inside face of the cofferdam.

This excavation will be paid for at the contract unit price per cubic yard for quotations "Structure Excavation-Earth" or "Structure Excavation-Rock" whichever applies to the whole or in part which price shall include all materials, tools, equipment, the construction and reconstruction of cofferdams and the necessary unwatering of the same and labor necessary to complete the excavation in conformity with the requirements of the plans or as ordered.

It shall also include the preparation of foundations, the cost of removing all cofferdams, etc., the necessary filling and the removal and disposal of all surplus or unsuitable materials resulting from the excavations. Structure excavation shall not include excavation paid for under another item of work such as catch basins, manholes, etc. Any suitable surplus material shall be placed and compacted within the embankments if so ordered without additional compensation.

PRECAST CONCRETE BOX CULVERT

A. DESCRIPTION

This work shall consist of designing, furnishing and installing a precast concrete box culvert in conformity with the lines, grades, dimensions, sizes, types, length and details shown on the Contract drawings or as ordered, and in accordance with the requirements of these specifications. Included under this Item shall be all labor, tools, materials, and equipment necessary to furnish and install a precast concrete box culvert and place materials necessary for the bedding underneath the box culvert. Excavation, backfill, concrete work and bedding material is specified and paid for under the appropriate Item(s).

B. MATERIALS

1. DESIGN

The precast concrete box culvert sections shall be designed to meet the requirements of the various earth loads and live loads along the route, as shown on the Contract plans or as directed by the Director of Public Works. In addition, the culvert shall also be designed for the full range of earth cover from 0' - 0" to 8' - 0". The culvert shall also be designed for a full range from no internal pressure, to a depth of water in the box section equal to the inside height of the box and for the full range of external groundwater pressures resulting from the water table at any elevation between the ground surface and the culvert invert. Minimum dimensions of precast units shall be as shown on the Contract drawings. Design of the structures shall be in accordance with the latest ASTM, ACI and AASHTO specifications. Design live load shall be HS20-44 with impact applied in accordance with the latest AASHTO bridge specifications. Load factor shall be in accordance with AASHTO.

Soil shall be assumed to have a unit weight of 120 pcf and the lateral pressure due to earth adjacent to and above the box shall be computed for earth at rest. Assume that it amounts to at least 0.45 times the corresponding vertical earth pressure.

The culvert section shall be analyzed as rigid frames and shall be designed for bending and direct stress.

The maximum length of a culvert barrel measured between joints shall not exceed twenty (20) feet.

Box culvert section shall be four-sided monolithically cast of reinforced concrete with open ends. Inside surfaces shall be smooth so as not to restrict flow through the completed installation. Chamfered fillets shall be monolithically cast in all four corners.

Internal dimensions as specified shall be maintained. Roof and floor thickness shall be a minimum of 8" and sidewalls shall be a minimum of 6".

Floors of box culverts shall generally be designed level in cross section unless a fishway is required.

Six (6) sets of shop drawings and two (2) sets of complete design calculations sealed by a professional Director of Public Works registered in the State of Connecticut shall be submitted to the Director of Public Works for approval prior to fabrication of the units. The shop drawings shall include complete details of the methods, materials and equipment the manufacturer proposes to use.

The minimum reinforcement cover shall be 1-1/2".

2. CONCRETE

a. Concrete shall have a 28-day compressive strength of 5000 psi and conform to the requirements of Form 819.

b. The concrete shall be proportioned and mixed in a batch mixer to produce a homogeneous concrete conforming to the requirements. The transporting, placement and compaction of concrete shall be by methods that will prevent the segregation of the concrete materials and the displacement of the reinforcement steel from its proper position in the form. There shall be no interruption in the pouring of any unit. Truck mixed or transit-mixed concrete will not be allowed.

c. The concrete shall be cured by a method or combination of methods and of sufficient length of time so that the concrete will develop the specific compressive strength at 28 days or less.

3. REINFORCEMENT

Welded wire fabric shall conform to the requirements of AASHTO M55 or M221. Deformed bars, stirrups, dowels, threaded dowels and tie wire shall conform to the requirements of Form 819.

4. GASKETS

Gaskets shall be neoprene that shall form and maintain a tight and flexible joint.

5. FABRICATION

The forms used in manufacture shall be sufficiently rigid and accurate to maintain the box section dimensions within the required tolerances. All casting surfaces shall be of smooth nonpareils material.

The internal dimensions shall not vary more than 1 percent from the design dimensions.

The interior shall be smooth and free of irregularities. The slab and wall thickness shall be not be less than that shown in the design by more than 5 percent or 3/16 inch, whichever is greater. A thickness more than that required in the design will not be a cause for rejection. Variations in laying

lengths of two opposite surfaces of the box section shall not be more than 1/8 inch/foot of span with a maximum of 5/8 inch in any box section, except where beveled ends are specified. The underrun in length of a section shall not be more than 1/8 inch/foot of length with a maximum of 1/2 inch in any box section. The maximum variation in the spacing of reinforcement shall be $\pm 1/2$ inch. Cover shall be 1-1/2 inches.

The precast reinforced concrete box sections shall be produced with male and female ends with not less than a 1-1/2 inch overlap. The ends shall be of such design and so formed that when the sections are laid together, they will make a continuous line of box sections with a smooth interior free of irregularities. Each section shall have a 1-inch diameter neoprene gasket cemented to the joint surface.

Precast sections shall be provided with beveled joints as required to obtain a radius of curvature in the assembled culvert if shown on the Contract drawings. Openings shall be provided in the culvert roof slab as required by the Contract drawings for access manholes.

Formed openings in the culvert walls shall be provided of the size and location shown on the Plans. The Contractor shall field verify the size and location of inverts of the storm drains to be connected into the box culverts prior to fabrication.

Keyways shall be provided for toe wall, headwall, wing walls, and nose sections. Keyways, except for nose sections, are to have 5/8" threaded inserts located 12" on center.

Each section of precast box culvert shall be clearly marked with the size of the unit, date of manufacture, manufacturer's name, and an identification number indicating the proper location of the unit, keyed to a laying schedule supplied by the manufacturer.

Any erection holes in the box sections shall be filled with non-shrink grout. Joint in roof slab shall be filled with cement mortar.

Each precast section shall be provided with two 4-inch diameter PVC weep holes with knockout at location shown on the contract drawings.

During the casting of the units, the manufacturer shall make test cylinders. A minimum of four (4) cylinders shall be taken during each production run or as ordered by the Director of Public Works. Cylinders shall be cured under laboratory control conforming to the requirements of ASTM C192 and shall be used to determine the 28-day compressive strength requirements. Failure of any of the 28-day test cylinders to meet 90 percent of the minimum compressive strength or failure of the average to meet the full minimum compressive strength requirement may be cause for rejection. The Director of Public Works also reserves the right to request and test core specimens from the units to determine their adequacy.

No patching of the completed units will be allowed unless permitted by the Director of Public Works. The manufacturer's proposal for methods and materials to be used in the patching operation shall be submitted to the Director of Public Works for his approval.

The Vendor shall furnish all assembly hardware required for the installation of the box culverts, including bolts, nuts, angle clips, and washers.

Box culverts shall be as manufactured by United Concrete Products, Inc., Wallingford, Connecticut, or approved equal.

6. INSPECTION

The quality of materials, the process of manufacture, and the finished units shall be subject to inspection by the Director of Public Works. Precast units shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual units may be rejected because of any of the following:

- a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
- b. Defects that indicate imperfect proportioning, mixing and molding.
- c. Honeycombed or open texture.
- d. Damaged ends, where such damage would prevent making a satisfactory joint.

7. DAMPPROOFING

Exterior culvert walls shall be given heavy and thorough coats of Tremco 121 Foundation Coating made by the Tremco Manufacturing Company, Cleveland, Ohio; or Bitumastic Black Solution made by the Koppers Company, Inc., Pittsburgh, PA; or an approved equal product. The coating shall be applied along the outside and top of the culvert walls.

8. HANDLING & STORAGE

Handling devices shall be provided in each box section for the purpose of handling and placing. Care shall be taken during storage, transporting, hoisting and handling of all units to prevent cracking or damage. Units damaged by improper storing, transporting or handling shall be replaced by the Contractor at his expense.

C. CONSTRUCTION METHODS

The box culvert shall be laid as indicated on the Contract drawing or otherwise directed. All sections of culvert when in place shall be true to the line and grade specified.

Precast units shall be placed in a manner to best accommodate and facilitate the building of the project.

Control lines and grade will be furnished by the Director of Public Works. The Contractor shall transfer the vertical and horizontal alignment to the box culvert using laser beam type equipment or a surveyor's transit and level.

The culvert shall be bedded as detailed on the Contract plans and in accordance with these specifications.

The subgrade shall be brought to the required line and grade. All stones greater than 3" shall be removed to a depth of 12" below the bottom of the precast box culvert and the subgrade thoroughly compacted and leveled. A 6" base of crushed stone or screened gravel shall be placed upon the prepared subgrade and thoroughly compacted and leveled prior to placement of the box culvert sections. The bedding material shall be clean, graded gravel or crushed stone of acceptable quality, having 95% passing a 3/4" sieve and 95% retained on a No. 4 sieve.

The foundation material shall be brought carefully to the proper grade for the bottom of the culvert, well tamped or compacted as may be directed, and the culvert placed. Grade of the foundation material shall be checked at intervals of not more than 3 feet apart immediately before the culvert is placed. The foundation material shall be such that the culvert is evenly supported over its entire length and width. The box culvert shall be placed in a trench free from water. The Contractor shall furnish all equipment necessary to keep the trench free from water during the installation of the culvert.

Each section of box culvert shall be positioned in the trench only in such manner and by such means as recommended by the manufacturer. The Contractor will be required to furnish slings and all devices necessary to permit satisfactory support of the structure when lifted.

Any unit which is not in true alignment, or which shows any settlement, displacement, misfit or distortion after installation, shall be taken up and reinstalled or corrected, to the satisfaction of the Director of Public Works without additional compensation.

In case of conflict and actual field construction cannot proceed according to proposed construction, the Director of Public Works may direct special construction as may be deemed necessary for the completion of the work in a satisfactory and acceptable manner.

Bagged crushed stone shall be provided and installed behind all weep holes, and PVC knockouts removed.

Pervious structure backfill material as required shall be placed around the box culvert, keeping the elevation of the fill on both sides approximately equal at all times.

Precast nose section, when used, shall be installed per the manufacturer's instructions.

The Contractor shall connect all existing storm drainage and newly installed storm drainage into the new precast box culverts or wing walls where shown on the Plans. All pipe shall be cut in a neat and workmanlike fashion and shall not protrude into the box culvert waterways. The slopes

of the existing storm drainage shall be maintained. The joint between the box culvert and the storm drains shall be mortared inside and out.

D. MEASUREMENT AND PAYMENT

Measurement for payment of precast concrete box culvert shall be made per lineal foot along the centerline of each barrel to the ends of the precast culvert at cast-in-place structures or other locations. Measurement shall be made for each size box culvert and shall include the sloped end sections.

This work will be paid for at the contract unit price per lineal foot for Precast Concrete Culvert of the size specified.

Said unit prices shall include the cost of designing, furnishing and installing the culvert, sheeting, bracing and shoring, trench boxes, dewatering, disposal of water, support of pipes or structures over the excavation, disposal of surplus material, maintaining flow in existing system, and all materials, labor and equipment necessary for complete installation of the box culvert.

Said unit prices shall also include the cost of access manholes constructed above the precast culvert units as shown on the Contract plans, including precast concrete manhole units, openings in the culvert units, concrete, manhole masonry, frames and covers, and all materials, labor and equipment necessary to complete the work.

CONCRETE WORK

A. DESCRIPTION

Under this Item, the Contractor shall furnish all labor, materials, tools, and equipment necessary to do all concrete work, unless specifically paid for under other Items, complete as shown and specified herein. Included under this Item are all expansion joint material, waterstops, and sealant.

For payment purposes, this Item shall be subdivided as follows:

1. Class "A" Concrete
2. Class "B" Concrete
3. Steel Reinforcement

Class "A" concrete includes, in general, all reinforced concrete and that requiring considerable form work. Included for payment under this Item, Class "A" Concrete, is concrete for reinforced headwalls and toe walls, gravity wing walls, retaining walls, steps, etc.

Class "B" concrete includes all concrete not expressly shown or specified as Class "A", in particular fill concrete, concrete encasement, and that which requires little or no form work.

B. MATERIALS

1. CEMENT

Portland cement shall conform to the Standard Specifications of ASTM Designation C150, latest revision, Type I or Type II cement. It shall be made by a wellknown, acceptable manufacturer and the product of not more than one plant shall be used in the work. Cement shall be stored and handled in such a manner as to prevent deterioration or the intrusion of foreign matter. Any material which has deteriorated or which has been damaged shall not be used in the work.

2. AGGREGATES

Aggregates shall conform to ASTM Designation C33, latest revision. Coarse aggregate shall be size No. 67, nominal 3/4" to No. 4, unless permitted otherwise by the Director of Public Works. The Contractor shall obtain the services of an approved commercial testing laboratory to sample and test the aggregates to insure compliance with the above specification and shall submit the test results to the Director of Public Works before beginning work. Acceptance of sample shall not be considered as a guarantee of acceptance of all materials from the source and it shall be understood that any aggregates which do not meet with requirements of these specifications may be rejected at any time.

3. ADMIXTURES

Admixtures other than an air entraining admixture shall not be used without the written approval of the Director of Public Works. Air entraining admixtures shall be used and shall be Sika AER, or approved equal, conforming to ASTM Designation C260. The air content of the concrete with 3/4" maximum size aggregate shall be 6%, plus or minus 1% by volume. The Contractor shall provide the equipment and all necessary assistance for calculating the air content in conformity with the requirements of "Test for Air Content of Freshly Mixed Concrete by the Pressure Method", ASTM Designation C231.

4. WATER

Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, organic materials, salts, or other substances that may be deleterious to concrete or steel.

C. CONSTRUCTION METHODS

1. STORING OR HANDLING AGGREGATES

All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard, clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling, and handling to prevent segregation of the coarse and fine particles of the aggregate to such a degree as to disturb the grading.

2. MEASURING MATERIALS

The proportions of cement and fine and coarse aggregate for each batch of concrete shall be determined by weight. Equipment for measurement of the amount of water used in each mix shall be readily adjustable and capable of measuring water in variable amounts within a tolerance of 1%.

All equipment for measuring and accurately controlling the quantities of materials shall be of approved design and shall be tested before they are used. Tests shall be made of moisture content of aggregates and allowance shall be made for the variation in moisture content as required.

3. PROPORTIONS

Proportions of materials in the concrete and strength of concrete shall be approved by the Director of Public Works and shall be subject to the following limitations:

Class	Minimum 28-Day Compressive Strength psi	Maximum Net Water Content Gals. Per Sacks Cement	Minimum Cement Contents Sacks Per Cubic Yard
A	3,500	5-1/2	6.5
B	2,500	7	4.7

Prior to the beginning of the concrete work, the Contract shall submit a statement of the proportions of the cement, fine aggregate, coarse aggregate, and water, and the gradations of the fine and coarse aggregates he proposes to use for approval. He shall have standard test cylinders made and tested by an approved testing laboratory. Laboratory test reports shall show sources of materials, proportions of each material, including water, used in the test mix, consistency, and the results of 7-day and 28-day compressive strength tests. Tests shall be made as described hereafter.

The exact proportions of materials used in the work shall be subject to the approval of the Director of Public Works and shall not be changed without his approval. Slump tests shall be made from time to time during the progress of the work as specified.

4. SLUMP CONTROL

Class "A" concrete shall be furnished and placed at a slump of 2" to 4".

5. SLUMP TEST AND TEST CYLINDERS

The Contractor shall be responsible for and shall provide all labor, materials, tools and equipment necessary for making slump tests and standard compression test cylinders as the work progresses, all at the direction of the Director of Public Works, who shall be the sole judge of the number of tests and cylinders required.

The Contractor shall furnish all necessary materials for the tests, including standard slump cones and molds for concrete test cylinders in conformance with ASTM Standard C470, latest revision. The Contractor shall provide proper storage for the cylinders.

Standard test cylinders shall be made, stored, and cured in accordance with "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field", ASTM Designation C31, latest revision. A standard sample shall consist of 6 test cylinders, 3 of which normally shall be broken at 7 days and 3 of which shall be broken at 28 days. Not less than 1 standard sample shall be made for each 50 cubic yards, or fraction thereof, of concrete placed in any 1 day.

The Contractor shall provide the services on an approved testing laboratory to test the cylinders. Tests shall be made as described hereafter.

Slump tests shall be made by the Contractor in accordance with ASTM Designation C143, latest revision.

If tests do not show satisfactory results, the mix shall be adjusted as directed. Concrete which does not meet the strength requirements is subject to rejection and removal from the work or to such other corrective measures as are directed by Director of Public Works to make the work acceptable, all at the expense of the Contractor.

6. TESTS BY APPROVED LABORATORY

Compression strength tests of cylinders shall conform to "Test for Compressive Strength of Molded Concrete Cylinders", ASTM Designation C39, latest revision.

The cost of all testing work shall be borne by the Contractor. The testing laboratory shall submit certified copies of the test results in duplicate directly to the Director of Public Works and the Contractor within 24 hours after tests are made.

7. MIXING

Concrete shall be mixed by an approved rotating type batch machine, except where hand mixing of very small quantities may be permitted. The arrangements shall provide for the correct weight of each ingredient before placing in the mixer and the introduction of a measured quantity of water at any stage in the process. The quantity of ingredients to be used in each batch shall be governed by the size of the concrete mixer and shall not exceed the rated capacity specified for the mixer by the manufacturer. Unless otherwise permitted, the quantities shall be such as to require a whole number of bags of cement.

Mixing shall be thorough and all materials for each batch shall be mixed together at least 2 minutes while the drum revolves at the proper speed.

8. TRANSPORTING CONCRETE

The concrete shall be transported and placed in the work not more than one hour after the water is added to the dry ingredients. Care shall be taken to avoid spilling and separation of the mixture. No concrete in which ingredients have become separated shall be placed in the work. Retempering of partially set concrete will not be permitted. Suitable and approved equipment for transporting of concrete from mixer to forms shall be used.

9. TRANSIT MIXED CONCRETE

If the Contractor desires to use transit mixed concrete, he shall submit full information as to the physical capability of the mixing plant and trucking facilities which are available and the estimated average amount which can be produced and delivered to the job site during a normal 8 hour day, excluding the output to other customers, for approval. The number of yards of concrete placed daily will depend on the ability of the plant to deliver concrete to the site and is subject to the

approval of the Director of Public Works. The concrete shall be in accordance with the "Specifications for Ready Mix Concrete", ASTM Designation C94, as amended, and all applicable requirements of this Item.

The Director of Public Works shall have access to the mixing plant at all times. The concrete shall be mixed in revolving drum-type mixers which are in good condition and which produce thoroughly mixed concrete of the specified consistency and strength. Loads shall not exceed the proper capacity of the mixer.

Concrete shall be mixed for a minimum of 1-1/2 minutes after it arrives at the job site, or as recommended by the mixer manufacturer. The drum shall not mix while in transit. Mixing shall be continuous at proper speed until the concrete is discharged. Concrete shall be discharged from the mixer within 1 hour after water is added to the mix and shall have a maximum slump from 2" to 4".

Adequate facilities shall be available for continuous delivery of concrete at the required rates. Concrete which does not meet the requirements of this specification will be rejected.

10. FORMS

Forms shall be in accordance with the "Recommended Practice for Concrete Form Work", ACI 347, latest revision.

Forms shall be of plywood, plywood faced, or metal; shall conform to the shape, lines, and dimensions of the concrete as shown on the Contract Drawings; and shall be substantial and sufficiently tight to prevent leakage of mortar. The Contractor shall be responsible for the design and engineering of the form work, as well as its construction. The inside of forms shall be coated with non-staining mineral oil or other approved material to prevent adhesion of concrete to the forms.

All edges and corners in the finished work shall be straight and true. External corners shall have a 3/4" chamfer unless otherwise shown. For all faces which are exposed in the finished work, forms shall be smooth and so built and treated that when removed, the concrete will be left with smooth, presentable surfaces, free from offsets, ridges, discoloration, or other unsightly defects. Deformed or otherwise defective forms shall be removed from the work. The methods and materials used for tying forms in place shall be subject to approval and no wires shall be used for tying the forms on faces exposed in the finished work. Form ties shall be bolts and rods of such design that the end of the internal member will be recessed by a removable cone at least 1" from the face of the finished concrete. Holes shall be closed in a workmanlike manner as specified hereafter. Patches on exposed surfaces shall match the color of the surrounding concrete.

Concrete shall not be placed until all forms, bracing, and reinforcement are in final secure position.

Form work shall be completed and inspected prior to the placing of concrete. All pipes, sleeves, and other embedded items as shown on the Plans shall be in place before the concrete placing

commences. Temporary openings shall be provided at the base of wall forms and at other points where necessary to facilitate cleaning and inspection.

11. PIPES AND FIXTURES IN CONCRETE

Pipes, sleeves, or other inserts shall be placed in the work as shown on the Contract Drawings. Special care shall be taken to place them on the proper lines and grades. The placing of concrete around pipes, sleeves, and inserts shall be as specified. Weep holes will be 3-inch diameter PVC piping meeting with ASTM D2241.

12. PLACING CONCRETE

Immediately before placing concrete, the forms shall be thoroughly cleaned and wet and the space to be occupied by concrete shall be free from all dirt, chips, and foreign material. The concrete shall be carried up level along the whole length of the section under construction and shall be so placed so as to avoid rehandling within the forms. Concrete shall be compacted by means of approved internal vibrators to produce dense, homogenous concrete without pockets or voids. Vibrators shall not be used to move the concrete along the form. Where space under pipes or other spaces are to be filled, concrete shall be forced under from one side until visible from the other side to prevent voids.

Chutes may be used for distributing concrete only when approved in writing by the Director of Public Works. Requests for such approval shall be accompanied by sketches showing methods by which chutes will be employed. Chutes, if permitted, shall be designed with proper slopes and supports to permit efficient handling of the concrete without increasing the water-cement ratio.

Concrete shall not be permitted to free fall within the form a distance exceeding 4 feet. "Tremies" shall be used to prevent free fall and excessive splashing on forms and reinforcement.

When fresh and previously placed concrete masonry are jointed, immediately before placing fresh concrete, the contact surface of the old concrete shall be thoroughly cleaned using a stiff brush or other tools and a stream of water under pressure. The surface shall be clean and wet but free from pools of water at the moment the fresh concrete is placed. Any liganee, waste mortar, or other substance which will prevent complete adhesion will be removed. A 1" thick coat of mortar of similar proportions to the mortar in the concrete shall be placed over the contact surface of the old concrete and the fresh concrete shall be placed before the mortar has attained its initial set. No concrete shall be placed when the Director of Public Works is not present.

13. WEATHER CONDITIONS AND AT NIGHT

Concrete placement during the cold and hot weather and at night shall conform to the following requirements:

Cold Weather: All methods and materials used for winter concreting shall be in accordance with the requirements of 'Recommended Practice for Winter Concreting', ACI 306, latest revision, and

shall be subject to the approval of the Director of Public Works. Plans to protect fresh concrete from freezing and to maintain temperatures not less than the permissible minimum during the first 7 days after placing shall be made before the first frosts are to occur. The temperature of the concrete placed shall not be less than 55 degrees, nor greater than 85 degrees and a temperature of between 50 degrees F and 70 degrees F shall be maintained for at least 7 days after placing. Means shall be provided, if necessary, to insure that the ambient temperature shall not fall more than 30 degrees F in the 24 hours following the 7 day period. Admixtures, except those approved by the Director of Public Works, shall not be used. The cost of all materials furnished or required to protect against freezing shall be at the sole expense of the Contractor without extra charge therefor.

Hot Weather: All methods and materials used for hot weather concreting shall be in accordance with the requirements of "Recommended Practice for Hot Weather Concreting", ACI 305, latest revision, and shall be subject to the approval of the Director of Public Works. Concrete deposited in hot weather shall have a placing temperature which will not cause difficulty from loss of slump, flash set, or cold joints.

At Night: No concrete shall be placed at night without permission of the Director of Public Works, and the Contractor shall give at least 12 hours' notice to the Director of Public Works if he wishes to place concrete at night.

14. QUALITY OF CONCRETE WORK

Concrete shall be placed solidly against the forms and elsewhere so as to leave no voids. Every precaution shall be taken to make all masonry solid, compact, watertight, and smooth and to prevent the formation of liganence and to avoid cold joints. If for any reasons the surfaces have voids or are unduly rough, or are in any way defective, such masonry shall be cut out to the extent ordered or permitted and shall be repaired to the satisfaction of the Director of Public Works. The cost of all repairs shall be borne by the Contractor. No thin patches or plastering will be accepted.

Any concrete that is defective which, in the opinion of the Director of Public Works, cannot be properly repaired as described above, shall be removed and replaced at the expense of the Contractor.

15. CARE AND CURING OF THE CONCRETE

All exposed surfaces of finished and unfinished concrete shall be kept constantly moist by sprinkling with water at short intervals, by covering with moist burlap, or by such other means as may be approved, for a period of not less than 7 days.

No exposed work shall be laid during rainstorms and freshly laid concrete shall be protected during storms to prevent erosion. Sufficient covering shall be provided and kept ready at hand for this purpose. All fresh work shall be carefully protected from injury.

16. REMOVAL OF FORMS

Forms shall be removed in such manner as to insure the complete safety of the structure. Reshoring will not be permitted. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support safely their weight and the load thereon. The results of suitable control tests may be used as evidence that the concrete has attained such sufficient strength. The minimum time for removal of forms will be subject to the Director of Public Works approval.

17. FINISH

Immediately after the concrete forms are removed, all extrusions shall be chipped off and all tie rod holes patched with 1:2 cement mortar. All exposed vertical surfaces shall have a rubbed finish and shall be rubbed with carborundum stones. During the rubbing, water shall be constantly applied to the concrete. Rubbing shall continue until the surface is brought to a smooth, even texture. All horizontal surfaces shall be struck to the proper grade by moving a straight edged template back and forth across the placed surface in a saw motion until the required grade is reached. Shortly after the striking operation, while the surface is still plastic, it shall be floated with wood. The process shall bring the surface to the true required grade. After the surface has reached the partial hardness stage, it may have to be refloated to secure a proper finish.

18. PROTECTION FROM INJURY

Finished concrete surfaces shall be protected from injury and defacement until the work under the Contract is accepted.

19. CONSTRUCTION AND EXPANSION JOINTS

Joints in concrete shall only be made where shown on the Drawings or permitted by the Director of Public Works. In either case they shall be made in accordance with the details shown on the Drawings.

Where shown on the Contract Drawings, expansion joint material shall be premolded concrete gray, open cell sponge rubber as manufactured by Williams Products, Inc., Troy, Michigan, or approved equal.

20. SEALANT

Sealant shall be a 2-component polysulfide base compound such as Sikaflex, polysulfide sealant, or approved equal. It shall be placed in accordance with the manufacturer's instructions.

21. STEEL REINFORCEMENT

Bars or rods shall be deformed bars of an approved type and shall be free from defects and kinks and from bends which cannot be readily and fully straightened in the field. They shall conform to ASTM Designation A615, Grade 40, latest revision. Deformations shall conform to ASTM

Designation A615. The Contractor shall furnish satisfactory test certificates. All bars shall be stored in clean, dry places until incorporated in the work.

22. DETAILING, FABRICATION, AND PLACING REINFORCEMENT

All reinforcement at the time concrete is placed shall be free from loose rust, scale, or other coatings that will destroy or reduce the bond. All detailing and fabrication of reinforcement, unless otherwise noted, shall follow the ACI "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Metal supports, touching formed or exposed concrete, shall not be used. Reinforcement shall not be secured to forms by means of wire, nails, or other ferrous material.

23. ACI CODE

Except as otherwise shown on the Contract Drawings or as specified herein, "Building Code Requirements for Reinforced Concrete", ACI 318, latest revision, shall apply.

D. MEASUREMENT AND PAYMENT

Concrete placed under this Item, shall be measured for payment as the volume actually placed within the limits shown or directed, with no deductions made for openings less than (one) 1 square foot in cross-section. Class "B" concrete used as fill in areas of excess excavation shall be at the Contractor's expense.

Steel reinforcement placed under this Item shall be measured for payment by computing the weights of the bars from bar lengths and nominal weights per foot as given in ASTM A615. No allowance will be made for wires or supports or for laps in excess of those required using reasonable lengths of bars.

The unit price per cubic yard bid under this Item Class "A" or Class "B" Concrete shall include the cost of designing, furnishing, placing and removing all forms, sheeting, bracing and shoring, dewatering, support of pipes or structures over the excavation and all work necessary for the complete installation of the concrete.

The unit price per cubic yard bid under this Item, Class "A" Concrete, shall include payment in full for all labor, tools, materials, and equipment necessary to furnish and install the Class "A" concrete, including expansion joint material, water stops, weep holes, and sealant, complete as shown and specified.

The unit price per cubic yard bid under this Item Class "B" Concrete, shall include payment in full for all labor, tools, materials, and equipment necessary to furnish and install the Class "B" concrete, complete as shown and specified.

The unit price per pound bid under this Item, Steel Reinforcement, shall include payment in full for all labor, tools, materials and equipment necessary to furnish and install the steel reinforcement, complete as shown and specified.

If no item "Class "A" Concrete, Class "B" Concrete" and/or "Steel Reinforcement" appears in the Bid Schedule then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the prices bid for other items as listed in the Bid Schedule.

COMMON EXCAVATION

A. DESCRIPTION

Common excavation shall consist of the removal and satisfactory disposal of all materials of any type taken from within the limits of the work and not specifically included in other items of work.

Common excavation shall include the removal of all material necessary for the construction of the subgrade, preparation of roadway shoulders and slopes, grading and preparation for sidewalk construction, construction of driveways, steps, channels and other miscellaneous construction as shown on the plans or as directed by the Director of Public Works. It shall also include the placement of excavated material in embankments, depressions or as otherwise directed by the Director of Public Works, the disposal of surplus or unsuitable materials, and the shaping and cleaning of slopes and shoulders. It shall not include excavation classified as "Trench Excavations" or "Structural Excavation".

Common excavation shall be classified for the purpose of payment as "Common Excavation-Earth", "Common Excavation-Rock", and "Channel Excavation".

"Common Excavation-Earth" shall include the removal as indicated on the plans or as directed by the Director of Public Works of all earth, muck, hard-pan, loose disintegrated or decomposed ledge rock, topsoil, sod, pavement, or similar materials which are sufficiently soft to permit removal by normal earth excavation machinery and methods or which can be loosened by the use of a suitable ripper.

"Common Excavation-Rock" shall include rock in definite ledge formations, severed or fragmented rock and boulders or portions thereof, one (1) cubic yard or more in volume that cannot be removed by means of a ripper in good condition and properly operated without continuous drilling, blasting, barring and/or wedging.

"Channel/Pond Excavation" shall include the excavation of all materials necessary for the restoration or enlargement of an active watercourse channel, (bottom width over four (4) feet) or pond including diverting or otherwise handling all water and proper disposal of all muck or wet material. Where no item for "Channel/Pond Excavation" appears in the bid proposal, said work will be included in "Common Excavation-Earth". Excavation of temporary watercourses for stream diversion as required for the construction of work under this contract will not be measured for payment unless specifically indicated elsewhere within the contract documents.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

All excavation shall be made strictly to the required alignment, grade and cross-section indicated on the plans or directed by the Director of Public Works. All suitable materials removed during excavating operations shall be used as far as practicable in the formation of embankments to the level of the subgrade and at other locations as directed by the Director of Public Works.

Contractors shall take all reasonable care to insure that the highest quality excavated material is utilized to maximum advantage within the work. Generally, all inorganic soils excavated from within the limits of excavation except soft clays and loam shall be considered suitable for the formation of embankments. However, if at the time of excavation, these soils are wet or saturated, they shall be dried to a moisture content within three percent (3%) of the optimum moisture content as determined by AASHTO T-99 Method C prior to placement and compaction. The Contractor shall take all necessary steps to dry the excavated soil to the required moisture content and no additional compensation will be allowed for this work. The Contractor may elect to supply and haul in approved material rather than dry out excavated soil. No payment will be made for such material or for the disposal of the excavated soils.

The Contractor shall, when necessary in excavation areas, provide and maintain ditches which are adequate to prevent free water from becoming incorporated in material to be used to form embankments, such ditching to be at the sole expense of the Contractor.

All topsoil, unless otherwise specified, shall be excavated from within the limits of the pavement, shoulders, or embankment area and if suitable for use as topsoil as specified elsewhere herein shall be stockpiled. The Contractor shall exercise all reasonable care to insure that suitable topsoil is not intermixed with subsoil or otherwise spoiled to prevent its use as topsoil. Topsoil shall remain the property of the Town and shall be used elsewhere within the work or shall remain stockpiled for the Town's use. If unsuitable for use as topsoil, it may be used to flatten embankment slopes or elsewhere as directed by the Director of Public Works or otherwise disposed of as unsuitable material.

Unsuitable excavated material shall be disposed of by removing such material from within the limits of the work and disposing of such material at sites determined by the Contractor and approved by the Director of Public Works or by disposing of such material within the limits of the work as approved by the Director of Public Works. Prior to disposing of any unsuitable material within the project limits, the Contractor shall submit to the Director of Public Works for his approval a proposal outlining the locations and extent of the areas in which he intends to dispose of such material.

The proposal shall describe the nature of the material and the methods to be employed in placing and covering the material. The proposal shall be amended as required by the Director of Public Works. No such materials shall be disposed of within the project limits until the proposal has been approved by the Director of Public Works. Unsuitable material placed within the project shall be

placed in accordance with the construction methods required for said placement or as otherwise directed by the Director of Public Works.

Suitable material excavated for the disposal of the unsuitable excavated material shall be utilized elsewhere in the work or shall be used to cover the unsuitable excavated material. No additional compensation will be paid for any excavation necessary for the disposal of unsuitable material. The Director of Public Works shall not be obligated to approve any sites within the project area for disposal of unsuitable excavated material and the Contractor shall dispose of all unsuitable excavated material in excess of that which can be placed within approved areas at off-site disposal areas. Such off-site disposal areas shall be secured by the Contractor at no additional cost to the Town shall be approved by all regulatory authorities and shall be approved by the Director of Public Works.

The Contractor shall provide for cleaning and leaving the disposal areas in a well-drained and smoothly graded condition and blending into the existing topography. Unless otherwise specified, the entire disturbed shall be scarified, limed, fertilized, seeded and mulched as specified.

All surplus excavated material shall be used where directed by the Director of Public Works to uniformly widen embankments, to flatten slopes, to fill low areas, or for such other purposes as the Director of Public Works may direct. Any surplus material not required nor permitted to be used for such purposes, shall be disposed of in accordance with the requirements for unsuitable material. The Contractor shall neither excavate, remove or otherwise disturb any material outside the limits of the excavation slope and grade lines indicated on the plans unless authorized by the Director of Public Works.

If during excavation, bedrock is encountered, the Contractor shall notify the Director of Public Works after which time the Director of Public Works shall be allowed ample opportunity to make such investigations and measurements as are necessary to ascertain the nature and volume of the material.

Rock excavation shall conform with or closely approximate the lines and grades shown on the plans unless modified by the Director of Public Works. It shall be, at all times, the responsibility of the Contractor to perform all phases of this work to produce the required rock slope faces to the satisfaction of the Director of Public Works.

If necessary, the Contractor shall adjust his methods including pre-splitting the rock, so as to result in a uniform plane of rupture in the bedrock in the rock face which will be stable and will not be affected by subsequent blasting and excavation operations. All loose and unstable material shall be removed as the work progresses.

Prior to any blasting, the Contractor shall hold a blasting conference at which he will outline the methods to be used and the steps to be taken to insure the utmost safety during blasting operations. The Contractor shall be responsible for all damage due directly or indirectly to such operations.

Channel excavation shall be made in conformity with the requirements of the plans or as directed by the Director of Public Works. The ground in the vicinity where the channel is to be excavated or re-excavated shall be cleared and grubbed in accordance with the appropriate requirements said forth in "Site Preparation". The work pertaining to clearing and grubbing shall be considered as subsidiary work described under "Channel Excavation" and is included in the payment of said item.

All excavated material shall then be removed from the area adjoining the excavation and the suitable excavated material shall be dried and used in the embankments or for other construction or purposes indicated in the plans or directed by the Director of Public Works. Unsuitable materials shall be disposed of as directed.

The tops of the banks of the channel shall be graded and left in a neat and acceptable condition. The Contractor shall be responsible for determining the methods and materials required to dewater the site and shall perform such work at his expense.

The Contractor shall operate all equipment and perform all construction operation so as to minimize pollution of the watercourse and shall implement all appropriate pollution control measures specified in "Sediment and Soil Erosion Control".

D. MEASUREMENT AND PAYMENT

Payment lines for "Common Excavation-Earth" shall coincide with the slope and subgrade lines as shown on the plans or as ordered. "Common Excavation: shall not include excavation paid for under another item of work such as curbs, sidewalks, etc. The stockpiling, re-excavation and final placement of material will not be measured for payment unless the Director of Public Works determines that existing conditions differ from those that could have been foreseen or anticipated when the contract was bid.

Payment lines for "Channel/Pond Excavation" shall coincide with the side slopes and bottom of channel as shown on the plans or as directed.

Payment lines for "Common Excavation-Rock" will extend to slope and depth lines shown on the plans or as directed to include only the rock actually removed within this limit.

Where the removal of rock is necessary for reasons of safety or due to conditions clearly not attributable to the Contractor's method of operation, the payment lines will be fixed to coincide with limits ordered by the Director of Public Works. If the Contractor shall remove any rock prior to the Director of Public Works taking measurements, the Director of Public Works shall estimate the quantity of rock removed and it shall be presumed that his estimate shall be the true quantity of excavation.

The amount of excavation will be determined by the average end area method.

The work, materials, tools, equipment and labor incidental to the disposal of unsuitable or surplus excavated material breaking concrete pavement and scarifying existing bituminous pavement will not be measured for payment.

"Common Excavation" will be paid for the at the contract unit price per cubic yard for "Common Excavation-Earth", "Common Excavation-Rock", "Channel/Pond Excavation" as the case may be in accordance with the classification given herein. The price shall include all equipment, tools and labor incidental to the completion of the excavation, stripping and stockpiling all topsoil, the placement of excavated material in the formation and compaction of embankments, all dewatering of the excavation and the disposal or surplus or unsuitable material in accordance with the provisions of the plans and these specifications. All costs incidental to the disposal of unsuitable or surplus excavated material will be included in the price for "Common Excavation".

EARTH FILL

A. DESCRIPTION

The work under this Item shall consist of the placement, shaping and compaction of earth fill used to backfill trenches and structures, to construct or widen embankments, to fill and grade depressions or low areas, to flatten slopes or for such other purposes as the Director of Public Works may direct. It shall also include all grading of the sight and dressing all fill to a smooth uniform surface which conforms to the lines, grades and cross-sections shown on the plans or as may be otherwise directed by the Director of Public Works.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

Unless otherwise indicated on the plans, or otherwise directed by the Director of Public Works, all trees, stumps, and roots and other debris shall be removed and all topsoil shall be stripped prior to placement of fill for embankments. Trees, stumps, roots and brush outside embankment areas shall be cut flush with the ground and removed along with other debris.

All earth fill shall be placed and compacted to provide a stable embankment, slope or subgrade which shall not be subject to undue settlement, subsidence, slippage dislocation, or other failures.

Embankments shall be constructed of earth or a mixture of earth and rock, placed in successive layers of not more than twelve (12) inches in depth for the full width of the cross-section. Soft clay shall not be used in embankments. Stumps, trees, rubbish, sod and other types of unsuitable materials shall not be placed in the embankments. Successive layers shall be kept graded by means of a blade grader, scraper or bulldozer and thoroughly and uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors or a combination thereof. Earth moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment. The dry density after compaction shall be not less than 95% of the dry density for that soil when tested in accordance with AASHTO-T99 Method C.

Material excavated from trenches shall, if suitable, be utilized in backfilling trenches after the pipe is laid. When trenches which are located under pavement or within five (5) feet or less of pavement, sidewalks, curbs, gutters, or similar structures, the Contractor shall backfill entire trench thereof, with material complying with the specification for "Compacted Gravel Fill" unless directed otherwise by the Director of Public Works.

All approved trench backfill shall be placed in layers of not more than twelve (12) inches in depth after compaction and shall be thoroughly compacted by means of vibrators or by pneumatic or

mechanical tampers. Hand tampers shall be used only with permission of the Director of Public Works.

No stones or coarse materials shall be placed adjacent to the pipe and special care shall be taken not to injure or disturb the pipe during all backfilling operations. The backfill shall be brought to the surface of the subgrade or surrounding ground and neatly graded except that where excavation is required in existing lawn or grass areas, the backfill shall be brought to within four (4) inches of the top of the trench and the remainder shall be filled with topsoil to three-quarters (3/4) of an inch above adjacent areas as directed by the Director of Public Works.

Structure backfill shall be "Compacted Gravel Fill" placed adjacent to abutments, retaining walls, box culverts, and elsewhere as shown on the plans or directed by the Director of Public Works. It shall be placed above a plain extending on a 1 to 1 slope from the upper edge of the footing to the top of the embankment unless modified by the Director of Public Works or shown otherwise on the plans. In filling behind abutments, retaining walls, box culverts or other structures, the fill shall be built up in horizontal layers so that at all times the fill is placed against undisturbed material or against a completed and compacted embankment. The slope of the embankment on which the structure backfill is to be placed shall be plowed deeply or cut into steps before and during the placing of the backfill so that both types of material will be thoroughly bonded and compacted. Each layer of structure backfill shall be spread to a thickness not exceeding twelve (12) inches in depth after compaction and shall be thoroughly compacted as directed by the Director of Public Works by the use of power rollers or other motorized compaction equipment, by tamping with mechanical rammers or vibrators, or by pneumatic tampers. Any equipment not principally manufactured for compaction purposes and equipment which is not in proper working order in all respects, shall not be used within the area adjacent to structures.

Special attention shall be given to compaction in places close to walls where motorized compaction equipment cannot reach within three (3) feet of the back face of walls and within a greater distance at angle points of walls, each layer of backfill shall be compacted by mechanical rammers, vibrators or pneumatic tampers. The dry density of each layer of structure backfill after compaction shall not be less than 100% of the dry density for that material when tested in accordance with AASHTO-T99 Method C. Each layer of the backfill should be sprayed with just enough water to obtain optimum moisture content for proper compaction. Where weepholes are installed, bagged stone shall be placed around the inlet of each weephole to prevent movement of the backfill material into the weep hole.

Where backfill must be placed on both sides of a structure, the layers on both sides shall be brought up simultaneously and at approximately the same level to avoid unbalanced pressure. Special precautions shall be taken to prevent wedging action against the structure

Adequate drainage shall be provided at all times.

Stone which is too large to be placed in twelve (12) inch layers, may be placed within the embankment at the downstream toe as directed by the Director of Public Works. Large stones may

not be placed in nests, but shall be distributed over the area and interstices shall be filled with spall fine fragments or earth to form a solid compacted mass.

When embankments are to be made on a hillside, the slope of the original ground on which the embankments are to be constructed shall be plowed deeply or cut into steps before the placement of the fill is commenced.

Frozen material shall not be used in the construction of embankments nor shall embankment layers be deposited on surfaces of snow or ice, nor shall it be placed on frozen or unstable surfaces. The Contractor shall be required to remove, at no cost to the Town, any frozen or unsuitable material incorporated into the embankment.

Where filling in twelve (12) inch layers is impractical, as determined by the Director of Public Works, the embankment may be constructed in one layer to the minimum elevation at which equipment can be operated and above this elevation, the embankment shall be constructed as specified herein.

Embankments to an elevation three (3) feet above the water table at the time of filling, shall be constructed of free draining material.

In fills where the top of the proposed pavement will be less than four (4) feet above an existing bituminous pavement and the existing pavement is not required to be removed, it shall be scarified as directed by the Director of Public Works.

No stone over twelve (12) inches in its greatest dimension shall be placed within three (3) feet of the top of the prepared subgrade and no stone over five (5) inches in its greatest dimension shall be placed within twelve (12) inches of the elevation of the top of the prepared subgrade unless otherwise specifically authorized by the Director of Public Works. The Contractor shall be responsible for the stability of all constructed embankments and shall replace at his own expense any portions which in the opinion of the Director of Public Works have become displaced due to careless and negligent work on the part of the Contractor or to damage resulting from natural causes such as storms, cloud bursts, etc. and not attributable to the unavoidable movement of the natural ground upon which the embankment is made.

When embankments are constructed of material from roadway excavation and the Director of Public Works determines that the material cannot be sufficiently stabilized to construct a proper embankment, he may order the material disposed of as unsuitable and the embankment constructed of borrow. When embankments are constructed of borrow, they shall be stable and the methods and materials used to obtain such stability shall be determined by the Contractor and performed at his expense.

Embankments shall be so constructed that adequate surface drainage will be provided at all times. The center shall be kept higher than the sides and the surface kept uniformly graded. Embankments shall be constructed to the elevations, lines, grades, and cross-sections as shown on the drawings. The upper surface of the embankment shall be maintained in a manner satisfactory to the Director

of Public Works, and its surface shall be compacted and left in a satisfactory condition approximately true to line and grade. All slopes, both original and newly constructed in either cut sections or on embankments, shall be left in a neat, trim and workmanlike condition free from all rubbish, boulders or ledge and in conformity with the lines, grades, and requirements indicated in the plans.

Earth fill placed in areas outside the embankment and earth fill used to flatten slopes, shall be spread by bulldozer in lifts no to exceed six (6) inches and each lift shall be thoroughly compacted by successive trips back and forth with the bulldozer tread areas overlapping enough on each trip so that all portions will be compacted uniformly. The Contractor may, at his option, use vibratory compaction equipment or rollers in lieu of the above.

Where topsoil is to be placed on slopes, the Director of Public Works may direct that the slopes be tracked prior to the installation of the topsoil. Tracking shall consist of traversing the slopes with cleated tracks so that the cleat indentations are horizontal. Its sole purpose is to provide indentations in the slope to help reduce soil erosion.

D. MEASUREMENT AND PAYMENT

Unless otherwise specifically provided in the Contract, the various categories of "Earth Fill" will not be paid for directly. The cost thereof to be included in the various pay items of the Contract which payment shall include and be full compensation for spreading and compacting the earth fill material, preparation of the natural ground on which the earth fill is placed including removal and satisfactory disposal of unsuitable materials, and for all labor, equipment, tools, and incidentals necessary to complete the work involved.

BORROW

A. DESCRIPTION

Under this Item the Contractor shall furnish additional material in excess of the volume of suitable material excavated elsewhere within the project limits from approved borrow pits located beyond the limits of the project. This Item shall also include the excavation, transport, satisfactory placement and compaction of the additional material necessary to complete any embankments, backfill any trenches or excavations, fill any low areas or complete any other features of the work.

This Item shall be subdivided into two categories of work:

1. Borrow
2. Select Borrow

B. MATERIALS

1. Borrow shall consist of inorganic granular soils and/or rock having not more than 20 percent by weight passing the No. 200 sieve. The maximum stone size shall be 1-1/2 inches for use as trench backfill or 5 inches for construction of embankments, and the material shall be well-graded throughout the entire size range. Borrow shall be free from roots, leaves and other organic materials. Rubbish, garbage or trash in any quantity shall not constitute a part of the borrow. Borrow shall also be free of ice or frost and no aggregations of soil particles shall be frozen. The moisture content of the borrow shall be within ± 3 percent of its optimum moisture content at the borrow source.

2. Select Borrow shall be free-draining material consisting of sound, hard durable stone, run of the bank gravel, sand or other acceptable granular material, the particles of which shall have a maximum size of 6 inches unless otherwise specified and shall be of such size that, of the portion passing the 4 inch square sieve, not more than 20 percent by weight shall pass the No. 200 mesh sieve as determined by washing through the sieve in accordance with ASTM Test Designation D6913 and D7928.

Select Borrow shall include sufficient well-graded material to fill any voids in the embankment/backfill area in its upper strata prior to placing any courses thereon.

C. CONSTRUCTION METHODS

Borrow/Select Borrow will be permitted only to the extent necessary to complete the embankments, backfill trenches and similar details and only after all usable material from the excavation has been placed. However, with the prior written approval of the Director of Public Works, the Contractor may be permitted to place Borrow/Select borrow before all excavation is completed. Prior to receiving permission to place borrow before completing all excavation, the Contractor shall furnish the Director of Public Works with a statement waiving payment for any borrow placed in lieu of

suitable excavated material. This permission may be revoked by the Director of Public Works at any time if, in his opinion, satisfactory progress is not maintained on other operations.

Borrow/Select Borrow shall be placed where directed and in accordance with the applicable sections of these Specifications.

D. MEASUREMENT AND PAYMENT

When not included in the payment of other items, "Borrow/Select Borrow" will be measured by the number of cubic yards in place after compaction, completed and accepted within the payment lines shown on the Contract Drawings or specified by the Director of Public Works.

This work will be paid for at the unit price per cubic yard for "Borrow" or "Select Borrow" , complete in place. The unit price shall include all materials, equipment, tools, and labor incidental to or necessary for the completion of the work.

No payment will be allowed for any borrow placed in lieu of suitable excavated material.

COMPACTED GRAVEL FILL

A. DESCRIPTION

The work under this Item shall be the furnishing, placing and compacting of gravel fill to be used as a foundation for structures, to replace unstable material in slopes, replace unsuitable material, as a foundation for sidewalks and pipes, as trench backfill where directed, in shoulders and elsewhere as indicated on the Contract Drawings, required by the specifications or ordered by the Director of Public Works. It shall consist of gravel conforming to the requirements of these specifications.

B. MATERIALS

Gravel fill shall conform to the requirements of Article M.02.01 of the Standard Specifications. Samples of the material to be used shall be furnished to the Director of Public Works at least 5 days prior to its intended use so it may be tested for approval. Largest stone size shall be 3 inches.

C. CONSTRUCTION METHODS

Where gravel is used for foundations or to replace unsuitable or unstable material, it shall be deposited in layers not over 6 inches thick and each layer shall be thoroughly compacted before the addition of other layers. The surface shall be carefully brought to grade. The gravel fill shall be compacted to 98% of the maximum dry density as determined by AASHTO T-99 Method C. The moisture content of the gravel shall not vary by more than $\pm 3\%$ from its optimum moisture content.

D. MEASUREMENT AND PAYMENT

Gravel Fill will be measured for payment by the number of cubic yards in place after compaction, completed and accepted, within the payment lines shown or as specified by the Director of Public Works.

This work will be paid for at the contract unit price per cubic yard for "Gravel Fill", complete in place, which price shall include all materials, equipment, tools, labor and work incidental to or necessary for the completion of the item.

PREPARATION OF SUBGRADE

A. DESCRIPTION

This item shall consist of the preparation necessary to bring the subgrade to the required grade, alignment and cross-section in preparation for the construction of the subbase course. The bottom of the excavation and the top of the fill between the outer limits of the subbase course shall be known as the subgrade.

B. MATERIALS

Not Applicable.

C. CONSTRUCTION METHODS

After all rough grading for the road bed has been substantially completed, the subgrade shall be brought to the lines, grades and cross-sections shown on the plans. The subgrade shall not be prepared until all sewers, storm drains, culverts, conduits, utilities, etc. have been installed in the roadway. All soft and yielding material and other portions of the subgrade, which will not compact readily, shall be removed and replaced with suitable material. The surface shall be compacted uniformly by rolling with an approved power roller having a minimum ground pressure of not less than 300 pounds per inch of contact width on the rear wheel and weighing not less than 10 tons or with an equivalent vibratory roller or compactor.

The amount of compactive effort shall be as directed by the Director of Public Works, but in no case shall be less than four (4) complete passes of the compacting equipment being used. The dry density after compaction shall be not less than ninety-five percent (95%) of the dry density for that soil when tested in accordance with AASHTO T-99 Method C.

When more than one compacting unit is to be used, the unit which exerts the largest compactive effort will make the initial passes. Any portion of the subgrade not accessible to larger compacting units shall be compacted as directed by the Director of Public Works to a degree equal to that obtained on the other portions of the subgrade with equipment and by-methods appropriate to the size of the inaccessible area.

After initial compaction, the top surface of the subgrade shall be fine graded and recompacted. A tolerance of one-half (1/2) inch above or below the finish subgrade will be allowed provided that this one-half (1/2) inch deviation is not maintained for a distance longer than fifty (50) feet and that the required crown is maintained in the subgrade.

The subgrade shall not be wet, muddy, or otherwise unsatisfactory when the subbase is placed upon it. If the fine grade of the subgrade becomes rutted or displaced due to any cause whatsoever, the Contractor shall regrade same at this own expense.

The Contractor shall protect the subgrade from damage by exercising such precautions as the Director of Public Works may deem necessary. At all times, the subgrade surface shall be kept in such a condition that it will drain properly. The subgrade shall be checked and approved by the Director of Public Works prior to placing subbase material thereon.

D. MEASUREMENT AND PAYMENT

No separate payment will be made for "Preparation of Subgrade" unless otherwise specified. The cost of such work shall be considered in the contract unit price bid for other items of work.

GRAVEL SUBBASE

A. DESCRIPTION

The work under this item shall consist of the construction of a subbase for highways, roads, streets, etc. consisting of gravel placed on the prepared subgrade in accordance with these specifications and in conformity with the lines, grades, compacted thicknesses, and typical cross-section as shown on the plans.

B. MATERIALS

All materials for this work shall conform to the requirements of Article M.02.02 of the Standards Specifications for Roads, Bridges and Incidental Construction Form 819. Maximum aggregate size shall not exceed five (5) inches.

C. CONSTRUCTION METHODS

The subgrade shall be shaped true to the lines, grades and cross-sections given on the plans. Any unsuitable material in the subgrade shall be removed and replaced with satisfactory material. The subgrade shall be thoroughly compacted with equipment approved by the Director of Public Works before any subbase of gravel is placed. All utilities, sanitary sewers, storm sewers and cross-culverts shall be completed before any gravel subbase is placed.

The gravel subbase shall be spread uniformly upon the subgrade with a road grader in a single eight (8) inch course. After the gravel has been placed as specified above, it shall be compacted with equipment specifically manufactured for that purpose. The sole use of hauling and spreading equipment shall not be considered as a substitute for compaction equipment. Compaction shall be continued until the entire course is uniformly compacted to the required minimum density. The dry density after compaction shall be not less than ninety-five percent (95%) of the dry density for the subbase material when tested in accordance with AASHTO-T-99 Method C.

If the material in the subgrade becomes intermixed with the subbase material at any time, the Contractor shall, without additional compensation, remove the mixture and replace it with new subbase material to the required thickness shown on the plans or as previously required by the Director of Public Works. Such replaced subbase material shall be compacted to the required minimum density.

Should the moisture content of the subbase, either because of the weather, source or nature of the material be such that it cannot be properly compacted, the Contractor will be required to wet or dry the subbase without additional compensation. The Contractor shall take all necessary steps to insure that the subbase is properly drained and does not become saturated prior to placement of the base course.

D. MEASUREMENT AND PAYMENT

Subbase will be measured horizontally in place after final rolling. The thickness shall be as indicated on the contract drawings or as ordered by the Director of Public Works. Measurements to determine the thickness will be taken by the Director of Public Works at intervals of three hundred (300) feet or less, along lanes and shall be considered as representative of the lane.

If a measurement is taken and a deficiency found, the Director of Public Works shall take such additional measurements as he considers necessary to determine the longitudinal limits of the deficiency.

The Director of Public Works may waive an occasional deficient measurement if, in his judgment, is not representative of true conditions and provided that (1) other thickness measurements taken nearby for the courses are acceptable, (2) proper controls have been exercised by the Contractor, and (3) there would be no impairment to the serviceability of the complete construction.

Where the thickness exceeds that indicated on the plan, and is accepted by the Director of Public Works, no extra payment will be made. Areas represented by measurements deficient in thickness shall be corrected as directed by the Director of Public Works, at the Contractor's expense or with written permission of the Director of Public Works, the deficient areas may remain and payment will be reduced in proportion to the deficiency.

No measurement and payment will be made for any subbase constructed beyond the horizontal limits indicated on the plans unless said construction is specifically authorized by the Director of Public Works.

This work will be paid for at the contract unit price per square yard for "Gravel Subbase" of the thickness specified which price shall include the "Preparation of the Subgrade" and all materials, equipment, tools, labor incidental to or necessary for the completion of the work.

PROCESSED AGGREGATE BASE

A. DESCRIPTION

The work under this item shall consist of the construction of a processed aggregate base for highways, roads, streets, etc. consisting of a two course foundation placed on the prepared subbase in accordance with these specifications and in conformity with the lines, grades, compacted thickness and typical cross-section as shown on the plans. Total base thickness will be not less than six (6) inches. Single lift thickness shall not be less than two (2) inches.

B. MATERIALS

All materials for this work shall conform to the requirements of Article M.05.01 of the Standard Specifications for Roads, Bridges and Incidental Construction Form 819 except only broken stone shall be used as the course aggregate.

C. CONSTRUCTION METHODS

The processed aggregate base course shall be spread on the previously prepared subbase course. The Contractor will not be permitted to spread processed aggregate base course on a subbase course which has not been suitably compacted and which does not conform to the crown line and grade as shown on the plans or as directed by the Director of Public Works.

The Contractor will not be permitted to spread the processed aggregate base course on a wet subbase nor to spread any base material more than five hundred (500) feet ahead of the compaction operation. The Contractor shall maintain the subbase to true line and grade for a minimum distance of two hundred (200) feet in advance of his processed aggregate spreading operation.

The thickness of the bottom course shall not be more than four (4) inches after compaction unless otherwise directed. After the aggregate is spread, it shall be thoroughly compacted and bound by use of equipment specifically manufactured for that purpose. Roller shall deliver a ground pressure of not less than three hundred (300) pounds per lineal inch of contact width and shall weigh not less than ten (10) tons. Vibratory units shall have a static weight of not less than four (4) tons.

Water may be used during the compaction and binding operation as directed by the Director of Public Works. The compacting and binding operation shall begin at the outside edge and progress towards the center, parallel with the centerline of the pavement. The work shall cover the entire surface of the course, with uniform overlapping of each preceding track or pass. On banked or super elevated curve, the rolling operation shall commence on the low side and be carried toward the high side.

The compaction operation shall be continued until the voids in the aggregate have been reduced to provide a firm and uniform surface satisfactory to the Director of Public Works. The amount of compactive effort shall be as directed by the Director of Public Works but in no case shall be less than four (4) complete passes of the compacting equipment being used.

All aggregate shall be completely compacted and bound at the end of each day's work or when traffic is to be permitted to operate on the road.

If the material of the subbase becomes mixed with base course material, the mixture shall be removed and replaced with new processed aggregate base course material without additional compensation to the Contractor.

Any surface irregularities which develop during or after work on either course shall be corrected by loosening material already in place, removing or adding aggregate as required, after which the entire area including the surrounding base course shall be recompacted and rebound until it is brought to a firm and uniform surface satisfactory to the Director of Public Works.

When the bottom course has been completed as specified, the top course aggregate shall be spread over it to such a thickness that, after final compaction and binding, the total thickness of the two courses will equal the thickness specified for the completed base. The top course shall be spread, compacted and bound exactly as specified above for the bottom course.

Where the base course thickness exceeds that indicated on the plans and the Director of Public Works determines that such additional thickness will interfere with the Contractor's ability to place pavement of the required thickness, the Contractor shall, without additional compensation, remove the excess base material and regrade and recompact the base surface.

D. MEASUREMENT AND PAYMENT

All processed aggregate base shall be measured horizontally in place after compaction. The thickness shall be as indicated on the plans or as directed by the Director of Public Works. Measurements to determine the thickness will be taken by the Director of Public Works at intervals of three hundred (300) feet or less and shall be considered representative of the lane.

The thickness shall be as indicated on the plans or as directed by the Director of Public Works with a tolerance of \pm one-half (1/2) inch. The Director of Public Works may waive an occasional deficient measurement if, in his judgment, is not representative of true conditions and provided that (1) other thickness measurements taken nearby for the courses are acceptable, (2) proper controls have been exercised by the Contractor, and (3) there would be no impairment to the service ability of the complete construction.

Where the thickness exceeds that indicated on the plan, and is accepted by the Director of Public Works, no extra payment will be made. Areas represented by measurements deficient in thickness shall be corrected at the Contractor's expense or with written permission of the Director of Public Works, the deficient areas may remain and payment will be reduced in proportion to the deficiency.

No measurement and payment will be made for any base course constructed beyond the horizontal limits indicated on the plans unless said construction is specifically authorized by the Director of Public Works. This work will be paid for at the contract unit price per square yard for "Processed Aggregate Base" of the thickness specified complete in place which price shall include formation of the base and all materials, equipment, tools, labor and work incidental to necessary for the completion of the item.

MILLING OF BITUMINOUS CONCRETE PAVEMENT (0" – 4")

A. DESCRIPTION

This work shall consist of milling, removal, and disposal of existing asphalt pavement.

The Contractor shall do all work necessary for the movement of personnel, materials and equipment to and from the project site, and for the establishment and removal of all Contractor's facilities necessary to the performance of the work.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

The Contractor shall remove the asphalt material using equipment acceptable to the Director of Public Works or his designee. The pavement surface shall be removed to the line, grade, and existing or typical cross-section shown on the plans or as directed by the Director of Public Works or his designee.

The equipment for milling the pavement surface shall be designed and built for milling flexible pavements. It shall be self-propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the asphalt pavement.

The milling machine shall be equipped with a built-in automatic grade control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls shall be capable of operating from any longitudinal grade reference. The transverse controls shall have an automatic system for controlling cross-slope at a given rate. The Director of Public Works or his designee may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The machine shall be able to provide a 0 to 4 inch deep cut in one pass. The rotary drum shall utilize carbide tip tools spaced not more than 5/8 inches apart. The forward speed of the milling machine shall be limited to no more than 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture. The Contractor may request to perform a test strip to demonstrate that the same surface tolerance can be attained at an increased forward speed. The test strip shall be a maximum length of 500 feet and shall have the same criteria for surface tolerance as noted in this specification. The final decision for implementing the increased forward speed will be at the discretion of the Director of Public Works or his designee.

The machine shall be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck, all in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a lesser equipped milling machine may be permitted when approved by the Director of Public Works or his designee.

Protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense.

To prevent the infiltration of milled material into the storm drainage system, the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that has fallen into inlet openings or inlet grates shall be removed at the Contractor's expense.

The asphalt millings shall be disposed of offsite by the Contractor unless otherwise stated in the contract documents.

Surface Tolerance: The milled surface shall provide a riding surface with a uniform textured appearance. The milled surface shall be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, improper use of equipment, or poor workmanship. The Contractor, under the direction of the Director of Public Works or his designee, shall perform random spot-checks with a Contractor supplied ten-foot straightedge to verify surface tolerances at a minimum of five locations per day. The variation of the top of two ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed 1/4 inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 3/8 inch. Any unsatisfactory surfaces produced are the responsibility of the Contractor and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

The depth of removal will be verified by taking a measurement every 250 feet per each pass of the milling machine, or as directed by the Engineer. These depth measurements shall be used to monitor the average depth of removal.

Where a surface delamination between asphalt layers or a surface delamination of asphalt on Portland cement concrete causes a non-uniform texture to occur, the depth of milling shall be adjusted +/- 1/2 inch or until delamination is eliminated.

When removing an asphalt pavement entirely from an underlying Portland cement concrete pavement, all of the asphalt pavement shall be removed leaving a uniform surface of Portland cement concrete, unless otherwise directed by the Director of Public Works or his designee.

No vertical faces, transverse or longitudinal, shall be left exposed to traffic. If any vertical face is formed in an area exposed to traffic a temporary paved transition will be established as directed by the Director of Public Works or his designee. If the milling machine is used to form a temporary transition, the length of the temporary transition shall be as directed by the Director of Public Works or his designee. At all permanent limits of removal, a clean vertical face shall be established by saw cutting prior to paving.

Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a sweeper. The sweeper shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. Other sweeping equipment may be provided in lieu of the sweeper where accepted by the Engineer.

D. MEASUREMENT AND PAYMENT

Milling of Asphalt Pavement will be measured for payment by the number of square yards of area from which the milling of asphalt has been completed and the work accepted. No area deductions

will be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar structures.

This work will be paid for at the contract unit price per square yard for “Milling of Asphalt Pavement, (0 to 4 inches)”. This price shall include all equipment, tools, labor, and materials incidental thereto.

No separate payments will be made for cleaning the pavement prior to paving; providing protection and doing handwork related to removal of bituminous concrete around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractor’s negligence; providing protection to underground utilities from the vibration of the milling operation; removal of any temporary milled transitions; removal and disposal of millings; furnishing a sweeper and sweeping after milling. The costs for these items shall be included in the contract unit price.

TACK COAT

A. DESCRIPTION

This work shall consist of preparing and treating an existing bituminous or concrete surface with bituminous material, and blotter material if required, in accordance with these specifications and as directed by the Director of Public Works or his designee.

B. MATERIALS

The bituminous tack coat shall be SS-1, SS-1H, CSS-1 or CSS-1H, Emulsified Asphalt, conforming to the latest Specifications of the Asphalt Institute. Testing shall conform to AASHTO Method T-59. Application temperature shall be between 75° and 130° F.

C. CONSTRUCTION METHODS

The Contractor shall provide a system for heating and applying the bituminous material that has been designed, equipped, maintained and operated such that liquid asphalt at even temperature can be applied uniformly on variable widths of surface up to 15 feet at readily determined and controlled rates from 0.02 to 0.20 gallon per square yard, with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.02 gallon per square yard. The system shall include a calibrated tank and a thermometer for measuring temperature of tank contents. The system shall be equipped with instrumentation that continuously verifies application rates. The calibration of the system shall be verified by the contractor prior to use, and the contractor shall furnish all equipment, material and assistance necessary if recalibration is required.

The tack coat shall be applied only where the street surface is dry or contains moisture not in excess of that which will permit uniform distribution and the desired asphalt coating. It shall not be applied when the atmospheric temperature is below 50° F or the pavement surface is below 40° F, unless otherwise directed by the Director of Public Works or his designee.

The existing surface shall be free of all dust, loose material, grease or other foreign material at the time the tack is applied.

Asphalt emulsion shall be applied uniformly with a pressure distributor at the rate specified by the Director of Public Works or his designee to be within a minimum of 0.02 gallon per square yard and a maximum of 0.10 gallon per square yard. Water may be added to the asphalt emulsion and mixed therewith in such a proportion that the resulting mixture will contain no more than 50 percent of added water. The contractor shall notify the engineer of the exact quantity of added water. The application of the resulting mixture shall be such that the original emulsion will be spread at the specified rate. The asphalt emulsion shall be heated at the time of application to the specified temperature range. No more tack coat material shall be applied than can be covered with binder or surface course material during the same day's operation except where public traffic is being maintained. The tack shall be properly cured before the next course is placed. The tack coat shall be applied in such a manner as to cause the least inconvenience to traffic and to permit one-way traffic without tracking of the asphalt emulsion. All exposed tack coat shall be covered with sand or bituminous mixture prior to opening to traffic.

D. MEASUREMENT AND PAYMENT

Measurement of tack coat will be made to the nearest gallon of asphalt emulsion applied as specified. If water is added to asphalt emulsion, the quantity to be paid for will be determined prior to the addition of water. The accepted quantity of tack coat will be paid for at the contract unit price. No direct payment will be made for water added to the asphalt emulsion or for sand necessary for blotting.

PULVERIZE, RECLAIM AND COMPACT BITUMINOUS CONCRETE PAVEMENT

A. DESCRIPTION

This work shall consist of constructing base course utilizing in-place pulverizing, regrading and recompaction of the existing asphalt surface and binder course (and adding and grading additional aggregate if required) to the lines, grades and dimensions shown on the plans or as directed by the Director of Public Works or Road Foreman.

The Contractor shall do all work necessary for the movement of personnel, materials and equipment to and from the project site, and for the establishment and removal of all Contractor's facilities necessary to the performance of the work.

B. MATERIALS

1. Recycled Aggregate: The material shall consist of a pulverized mixture of existing asphalt pavements and base materials lying under the pavement. The material shall have a minimum of 97 percent passing the 2" inch sieve.

2. New Aggregate: The new aggregate shall meet the gradations and quality requirements of Article M.05.01 of the Standard Specifications for Roads, Bridges and Incidental Construction Form 819, as amended to date, except only broken stone shall be used as the course aggregate.

3. Liquid Calcium Chloride: Liquid Calcium Chloride: The calcium chloride solution shall be provided by the manufacturer as a true solution and shall not be reconstituted from flake calcium chloride. The calcium shall meet the following material specifications (see ASTM Designation D98; AASHTO-M144).

Calcium Chloride 35% +/- 1%

Alkali Chloride (as NaCl) 2% max.

Magnesium (as MgCl) 0.1%

C. CONSTRUCTION METHODS

The pulverization shall be performed with a self-propelled reclaimer capable of fully pulverizing the existing road and mixing the materials to a depth as specified to produce a homogeneous base material. The machine shall be capable of pulverizing bituminous pavement up to 8 inches deep in each pass, and shall be equipped with an adjustable grading blade (or be immediately followed by a motor grader) to leave its path smooth for traffic. Existing bituminous concrete and gravel base must be pulverized and mixed so as to form a homogeneous mass of uniformly processed base material which will bond together when compacted.

The existing asphalt surface shall be pulverized for its full depth to the required size and mixed with the underlying base course. Mixing of the underlying crushed aggregate base with the pulverized asphalt pavement may be accomplished in a single pass. Or, if required to obtain proper gradation or mixing, a multi-step process shall be utilized which consists of windrowing and repeated pulverization. If directed, new aggregate shall be mixed in with all pulverized material and the underlying base to produce a uniform gradation.

Material may be required to be removed to return the pulverized and mixed recycled base course to the original grade of the underlying base course. The Contractor will not be paid separately for this item.

Immediately after pulverizing, mixing, and placing the material to an acceptable rough grade, the base surface shall be sprayed with liquid calcium chloride. The distributor for calcium shall be capable of applying liquid calcium chloride in accurately measured quantities at any rate between 0.1 to 2.0 gallons per square yard of roadway surface, at any length of spray bar up to 20 feet. The distributor shall be capable of maintaining a uniform rate of distribution of material regardless of change in grade, width or direction of the road. The distributor shall be equipped with a Digital Volumetric Accumulator capable of measuring liters applied and distance traveled. The volume and measuring device shall be equipped with a power unit for the pump so that application is by pressure, not gravity. The spray nozzles and pressure system shall provide a sufficient and uniform fan-shaped spray of material throughout the entire length of the spray bar at all times while operating, and shall be adjustable laterally and vertically. The spray shall completely cover the roadway surface receiving the treatment. The initial application of liquid calcium chloride shall be at a rate of 0.75 gallons per square yard unless otherwise directed by the Director of Public Works or his designee.

After initial liquid calcium chloride application, the material shall be pulverized and mixed once more, then placed as directed using a motor grader. Immediately after placement, the material shall be compacted. Water shall be added to the recycled material prior to and during compaction if required to obtain maximum compaction. All rollers shall be self-propelled. The number, weight and types of rollers shall be as necessary to obtain the required compaction, and may include pneumatic rollers and vibratory steel rollers. Each roller shall have a gross operating weight of not less than 24,000 lbs. and a compacting width of not less than 60 inches. Double drum vibratory rollers must have properly working scrapers and water spraying systems.

Immediately after grading and compaction of the material, liquid calcium chloride shall be applied again at a rate of 0.25 gallons per square yard unless otherwise directed.

At the completion of each working day, the surface of the pulverized and relayed base course shall be graded and compacted to shed water and all driveways, intersecting streets, and the termination points at the beginning and end of the reclamation work shall be shimmed or wedged with aggregate to effect a smooth transition between the base course and the existing paved surface. A blunt vertical bituminous face shall not be left at any location subject to traffic.

D. MEASUREMENT AND PAYMENT

Pulverize, Reclaim and Compact Asphalt Pavement will be measured by the square yard of reclaimed material according to the existing section width and length.

Incorporation of new aggregate into the mixture of pulverized pavement and existing base, if required, will be measured by the tons of new aggregate blended into the base mixture. Placement and compaction of new aggregate used to grade and dress the finished surface at a rate of 0.12 tons/linear ft. or less shall not be measured for payment. Placement and compaction of new aggregate used to grade and dress the finished surface at a rate greater than 0.12 tons/linear ft. shall be measured for payment by computing the difference between the total amount of new aggregate placed and compacted and the amount computed at a rate of 0.12 tons/linear foot. Payment will be made on the net amount so computed.

No separate payments will be made for pavement cuts at driveways, intersections or project terminal points placement or for removal of aggregate material to provide temporary transition ramps at driveways, intersections or at pavement cuts at project terminal points, for grading of the base course, for removal of the reclaimed base course to the grade of the original base course, for protection of raised structures, valves or utility boxes, for doing handwork related to removal of material around catch basin inlets, manholes, utility valve boxes and any similar structures; or for providing protection to underground utilities from the reclaiming operation. The costs for these items shall be included in the contract unit price.

BITUMINOUS CONCRETE PAVEMENT

A. DESCRIPTION

Work under this item shall consist of bituminous concrete placed upon a completed base course or upon the surface of an existing pavement as either a full or partial leveling course or a surface course. This work shall also include resetting to proposed grade all existing or newly constructed grates, frames, valve boxes and utility access covers which must normally be set to match finished grade. This work shall be performed in accordance with these specifications and in conformity with the line, grade, compacted thickness and typical cross-section shown on the plans or as directed by the Director of Public Works.

B. MATERIALS

The materials for the bituminous concrete mixture, sources of supply, formula for mix, mix tolerances, approval of mix formula and the control of the mixture shall conform to the requirements of Section M.04 of the Standard Specifications for Roads, Bridges and Incidental Construction Form 819.

Bituminous material to tack coat and prime coat shall conform to Section M.04.

Material for joint sealer for pavement shall be a rubber compound of the hot-poured type and shall conform to Subarticle M.03.08-5.

C. CONSTRUCTION METHODS

The methods employed in performing the work and all equipment, tools, machinery and plant used in handling material and executing any part of the work shall be subject to the approval of the Director of Public Works before the work is started, and whenever found unsatisfactory, it shall be changed and improved as required by the Director of Public Works. All equipment, tools, machinery and plant used must be maintained in a satisfactory working condition.

Samples of the actual mixture may be taken by the Director of Public Works as many times as he determines are necessary at his sole discretion. The mixture shall be transported from the mixing plant in trucks having tight bodies which have previously been cleaned of all foreign material. The use of kerosene, gasoline, fuel oil or similar products for the coating of the inside of the truck bodies is strictly prohibited. Such coatings may consist of soapy water or commercial oil emulsions (also known as soluble oils) in the proportions recommended by the manufacturer. If such coatings are applied, all excess coating material shall be removed prior to loading. Loaded trucks shall be tightly covered with waterproof canvas or other suitable covers.

The mixture shall be delivered at a temperature within 25°F of the approved job mix formula. Paving equipment shall be of the self-powered type with an adapter to provide guidance of the screeding action. The screed or strike-off member shall be adjustable to the shape of the cross-section of the finished pavement. Some method shall be provided for the tilting of the screed while

in operation to secure the proper "drag" and to provide the compressive action necessary to prevent "pulling" and to result in the uniformly screeded surface required. The machine shall have a sufficient number of driving wheels so that there will be no undue amount of slippage. Whenever the design of the equipment and plan of operation are such that the driving wheels travel on the finished surface of a completed pavement, said wheels shall be equipped with rubber tires or other means to protect the finished surface. Screeding members shall be preheated, and means shall be provided for heating the screeding members by some method that will prevent accumulation of bituminous material.

Prior to the placement of the bituminous concrete, the underlying base course shall be brought to the plan grade and cross-section within the allowable tolerance. If material is to be placed upon an existing concrete surface, the area to be surfaced shall be cleaned immediately before placing the mixture by brooming or by other means acceptable to the Director of Public Works.

The mixture shall not be placed when weather conditions of fog or rain prevail nor when the pavement surfaces shows signs of any moisture. Unless specifically authorized by the Director of Public Works, the mixture shall be laid only when the base temperature is above 35°F and the depth of pavement to be placed a minimum of 1-1/2 inches. For a 1-inch depth of pavement to be placed, the base temperature shall be above 50°F.

The Director of Public Works may, at his sole discretion, permit work to continue when overtaken by sudden storms up to the amount which may be in transit from the plant at the time provided the mixture is within temperature limits specified and there is no standing water on the existing surface. At the time of placement the mixture shall be within $\pm 25^{\circ}\text{F}$ of the temperature specified in the approved mix formula unless in the opinion of the Director of Public Works job conditions warrant varying these limits. Upon arrival, the mixture shall be dumped into the approved mechanical spreader and immediately spread and struck off to the full width required and to such appropriate loose depth for each successive course that when the work is completed, the designed depth will be obtained. Each course shall be struck off by the mechanical equipment. For use in striking off the bottom course, the machine shall be equipped with easily adjustable strike-off plates. The hopper and tunnel shall be properly loaded at all times during the paving operation.

In order to obtain tight and well compacted longitudinal joints, the sequence of the bituminous concrete placing operations for all courses laid shall be subject to the control of the Director of Public Works.

Before any rolling is started, the finished surface struck by the machine shall be checked, any inequalities adjusted, and all fat spots from any source, shall be removed and replaced by satisfactory material.

In areas where, on account of physical limitations it is impracticable to operate the paving equipment, the Director of Public Works may permit the use of other type spreaders or the mixture may be spread and screeded by hand.

When hand-spreading is permitted by special provisions or when, because of any project conditions, it becomes necessary to spread by hand, the mixture, upon arrival, shall be dumped on

approved steel dump sheets outside of the area on which it is to be spread and shall then be immediately distributed into place by means of suitable shovels and other tools and spread with metal lutes in a uniformly loose layer of such depth as will result in a completed pavement having the designed depth. Any deviation from standard crown or section shall be immediately remedied by placing additional material or removing surplus as directed. The Director of Public Works may direct that other means of placing the material in addition to the metal lutes be used to insure a better control of the depths of material and the surface finish.

Contact surfaces of curbing, gutters, manholes, etc. shall be painted with a thin, uniform tack coat just before the material is placed against them. Such tack coat shall not be paid for separately. Where the bituminous material is spread on a concrete or an old bituminous base, a uniform coat of asphalt, or approved equal, shall be spread about one foot wide along each edge of the pavement to prevent water entering between the new pavement and the base. The Director of Public Works may order a very light weblike coating of emulsion applied to the old pavement. Care must be taken not to apply too heavy a coating; application rate shall be 0.03 to 0.10 gallons per square yard. Refueling of equipment in such a position that fuel might be spilled on bituminous concrete mixtures already placed or to be placed is prohibited.

Solvents and cleaners for use in cleaning mechanical equipment or hand tools shall be stored well clear of areas paved or to be paved. Before any such equipment and tools are cleaned, they shall be moved off the paved or to be paved area; and they shall not be returned for use until after they have been allowed to dry.

In the case of bridge decks, immediately before placing the bituminous concrete upon a waterproofing membrane, the waterproofing shall be cleaned by a method, which shall not damage the membrane. If damage does occur, it shall be repaired by patching as directed by the Director of Public Works at no cost to the Town. No traffic shall be allowed on the bituminous concrete course directly over the membrane.

After spreading and when sufficient set has developed to permit proper compaction, each course shall be compacted by rolling consisting of initial or breakdown rolling, intermediate rolling and final or finish rolling. Initial rolling shall be performed with power-driven steel wheel, tandem or 3-wheel rollers weighing not less than 10 tons. Intermediate rolling shall be done with a self-propelled pneumatic tire roller equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 pounds per square inch uniformly over the surface, by adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size, pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure are uniform for all wheels. Final rolling shall be done by a power-driven steel wheel tandem roller weighing not less than 10 tons.

The in-place density of each layer or course of the compacted mixture shall be compacted to a density of at least 95 percent of the target value as determined by a laboratory designated by the Director of Public Works.

The density of the completed Class 4 Premixed Bituminous Base shall be not less than 90 percent nor more than 98 percent of the theoretical void-free density. Density may be tested from samples taken from the completed base or by other acceptable methods.

When nuclear density tests taken on surface courses indicate that 95 percent compaction has not been achieved, the Director of Public Works may, at his option, request pavement cores and/or additional testing.

Cessation temperature for continued compaction shall be 175°F.

The Contractor may include a vibratory roller in the compaction train providing the vibratory roller meets the requirements stated herein. The vibratory roller shall be a self-propelled type specifically designed for the compaction of bituminous concrete and meeting the following criteria:

Frequency of vibration: 1500 vpm minimum; 2500 vpm maximum (A Reed Tachometer shall be supplied by the Contractor to determine the frequency of vibration).

Drum width: 66 inches minimum (dual vibratory drum 84 inches minimum (pneumatic drive wheels))

In addition, all vibratory rollers shall be equipped with a speedometer that accurately indicates roller speed in either 1/2-mph or 50-fpm increments (maximum) throughout the normal operating range. Vibratory rollers shall be equipped with a speed control device which shall be set by the Contractor to prevent the roller from traveling in excess of 2 1/2 mph or 220 fpm when the roller is operating in a vibratory mode. All vibratory rollers shall be equipped with an automatic vibrator shut-off and automatic reversing eccentrics (weights).

The Contractor may substitute one vibratory roller for a breakdown roller and a pneumatic roller in the conventional procedure, the course shall be finish-rolled with a steel-wheel tandem roller having a minimum weight of 10 tons.

Dual vibrating drum rollers meeting the requirements of a steel-wheel tandem roller and operating in the static mode may be used as the finish roller; however, this single vibratory roller shall not be used as both the breakdown roller and the finish roller.

One vibratory roller and one steel-wheel tandem roller shall be provided for each single lane paver.

The use of a vibratory roller in the dynamic or vibratory mode is strictly prohibited on bridge decks or concrete structures.

The Contractor assumes full responsibility for the cost of repairing all damages which may occur to highway components and adjacent property. If the Director of Public Works determines that the compaction obtained is less than that specified, or damage to highway components and/or adjacent property occurs with the use of the vibratory compaction equipment, the Contractor, at no

additional expense, shall immediately cease using the equipment and shall proceed with the work in accordance with the conventional procedure outlined in the specifications.

For the purpose of testing the finished surface, a standard 10 foot straightedge shall, at all times, be available at the work site.

The Contractor shall provide or designate an employee whose duty it is to use the straightedge in checking all surfaces.

The finished pavement shall be such that it will not vary more than 1/4 inch from a 10 foot straightedge applied parallel to the centerline of the pavement. Any irregularity of the surface exceeding the above limits shall be corrected. Depressions which may develop after the initial rolling shall be remedied.

Such portions of the completed pavement as are defective in surface, compression or composition, or that do not comply with the requirements of the specifications shall be taken up, removed and replaced with suitable mixture, properly laid in accordance with these specifications at the expense of the Contractor.

The surface of the finished base course shall not vary by more than 3/8 inch from a 10 foot straightedge applied parallel to the centerline of the base.

Placement of the bituminous material shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the Director of Public Works. Transverse joints shall be formed by cutting back on the previous run, existing bituminous concrete pavement, or bituminous concrete driveways to expose the full depth of the course. On any cold joint, a brush coat of asphaltic material or approved equal shall be used on contact surfaces of transverse and longitudinal joints just before additional mixture is placed against the previously rolled material.

The longitudinal joint in one layer shall offset the previous joint in the layer immediately below by approximately six inches; however, the joint in the top layer shall be at the centerline of the pavement if the roadway comprises two-lane width, or at lane lines if the roadway is more than two lanes in width. In compacting the joint, the steel-wheel roller shall be shifted onto the previously placed lane so that only 1 or 2 inches of the drive wheel extends over the uncompacted material. The steel wheel roller shall continue to roll along this line and its position shifted gradually across the joint until the joint has been rolled with the entire width of the drive wheel. Rolling with steel wheel and pneumatic-tired rollers shall be continued until a thoroughly compacted, neat joint is obtained. When the vibratory roller is used for breakdown rolling, compacting the joint shall be accomplished with the roller on the uncompacted material shifted 1 to 2 inches across the joint onto the previously placed lane. Sections of the newly finished bituminous work shall be protected from traffic to prevent damage to the finished mat.

D. MEASUREMENT AND PAYMENT

Work under this item shall be measured for payment by either of two alternate methods as provided in the bid proposal.

1. Bituminous Concrete Pavement (per square yard): This work shall be measured for payment by the actual number of square yards surface area of the pavement installed to the required depth. Openings less than one (1) square yard will not be deducted from the number of square yards included for payment.

The quantity to be included for payment for this work shall be subject to the following:

A. Determination of Thickness: The thickness of each course will be determined by depth measurements taken immediately after completion of breakdown rolling and while the mixture retains sufficient heat to allow corrective measures to be taken or by cores of the completed pavement. The depth measurement/cores will be considered as applying for the full width of the lane and will be taken at the same location in each course. The location and intervals of the measurements will be as determined by Director of Public Works. In the event that depth measurements or cores show a deficiency in thickness in excess of 1/2 inch, additional depth measurements/cores will be taken to determine the longitudinal limits of such variation. The cost of such additional cores shall be borne by the Contractor.

B. Adjustment of Measured Quantity: No adjustment of the quantity as determined from the measurements will be made where the combined thickness of the two courses does not exceed a tolerance $\pm 1/2$ inch of the depth shown on the plans. Where the total combined thickness of the two courses is less than that shown on the plans by more than 1/2 inch, the Contractor shall either (a) with permission of the Director of Public Works, place a corrective course of not less than 1 inch in depth after compaction provided an acceptable grade and cross-section can be achieved or (b) where an acceptable grade and cross-section cannot be achieved through the above means, the Contractor shall reconstruct by cutting back and removing a portion of the pavement a sufficient distance to permit placement of an acceptable depth and place new material to achieve the proper depth, cross-section and profile. These areas where a corrective course is placed or reconstruction of the pavement is performed, will be measured again as though originally constructed. No compensation will be made to the Contractor for the removed pavement or removal of the materials and disposal thereof, or for restoration of affected supporting base or adjacent construction, or (c) with permission of the Director of Public Works, request a payment adjustment on the following basis: (the Director of Public Works need not grant such a request unless he feels that there would be no impairment to the finish construction) where the combined thickness of the two courses is less than that shown on the plans by more than 1/2 inch and less than 1 inch, said pavement will be paid at fifty percent (50%) of the contract unit price. Where the combined thickness of the courses is less than that shown on the plans by more than 1 inch but less than 1-1/2 inch, the pavement will not be measured for payment. An adjustment in quantity will be made for each course of bituminous concrete placed beyond the horizontal limits indicated on the plans by deducting the computed weight of that material extended horizontally of more than the plan depth of each course of bituminous concrete.

2. Bituminous Concrete Pavement (Per Ton): The quantity of bituminous concrete to be included for payment shall be determined by the net weight in tons measured in the hauling vehicles of the

Contractor. Scales or automatic recording equipment shall be of a type satisfactory to the Director of Public Works and shall be sealed. The total weight will be the summation of the weigh slips of bituminous concrete actually incorporated in the work included under this item. The quantity to be included for payment for this work shall be subject to the following:

A. Determination of Thickness: The thickness of each course will be determined by depth measurements taken immediately after completion of the breakdown rolling and while the mixture retains sufficient heat to allow corrective measures to be taken or by core samples of the completed pavement. The depth measurements will be considered as applying for the full width of the lane and will be taken at the same location in each course.

The location and intervals of the measurements will be determined by the Director of Public Works. In the event that the depth measurements show a variation in thickness beyond the limits specified in "Adjustment of Measured Weight", additional depth measurements will be taken to determine the longitudinal limits of such variation. The cost of such additional core samples shall be borne by the Contractor.

B. Adjustment of Measured Weight: No adjustment of the weight as determined by the weigh slips will be made where the thickness does not exceed a tolerance of $\pm 1/2$ inch of the depth shown on the plans. Where the thickness exceeds that shown on the plans by more than $1/2$ inch an amount equal to the computed weight of that material in excess of the tolerance limit will be deducted from the weight determined by the weigh slips. Where the thickness is less than that shown on the plans by more than $1/2$ inch, the Contractor, with permission of the Director of Public Works, shall place a corrective course not less than 1 inch in depth after compaction provided an acceptable grade and cross-section can be achieved. Where an acceptable grade and cross-section cannot be achieved through the above means, the Contractor shall reconstruct by cutting back and removing a portion of the pavement a sufficient distance to permit the placement of an acceptable depth and place new material to achieve the proper depth, cross-section and profile. These areas where a corrective course is placed or reconstruction of the pavement is performed will be measured again as though originally constructed. No compensation will be made to the Contractor for the material removed or for removal of materials and disposal thereof, or for restoration of affected supporting base or adjacent construction. An adjustment in quantity will be made for each course of bituminous concrete placed beyond the horizontal limits indicated on the plans by deducting the computed weight of that material extended horizontally of more than the plan depth of each course of bituminous concrete.

Bituminous concrete used in leveling courses or one course application without leveling course will not be subject to the adjustments as specified above, but will be measured for payment by the actual weight incorporated in the accepted work.

When the material placed as bituminous concrete pavement is not within specification limits, it shall be removed and replaced with acceptable materials, except that when the Director of Public Works, at his sole discretion, determines that the material is within acceptable tolerances (acceptable tolerance shall not exceed $\pm 0.5\%$ bitumen content, $\pm 7.5\%$ for $3/8$ material and larger, 7% for #4 material, 6% for #8 material and 2.5% for #2 material), he may allow the material to remain in place provided the Contractor agrees to a suitable adjustment in payment. If the

Contractor elects not to remove and replace the mixture, the entire production day may be accepted and paid for at an adjusted unit price established by the Director of Public Works. The adjusted unit price which may range between eighty (80) and ninety-five (95) percent of the contract unit price for bituminous concrete pavement.

Payment for the item "Bituminous Concrete Pavement" or "Hand Spread Bituminous Concrete Pavement" shall, be at the Contract Unit Price for the item completed and accepted in place, which price shall include all materials, equipment, labor and work incidental thereto.

"Hand Spread Bituminous Concrete Pavement" shall only be measured for payment when the Director of Public Works determine that it is impractical to place bituminous pavement by machine.

CONCRETE CURBING

A. DESCRIPTION

This Item shall consist of the construction of concrete curbing, placed on a prepared base in accordance with these specifications at the location and to the lines, grades, dimensions and details shown on the Contract Drawings or as ordered by the Director of Public Works.

B. MATERIALS

The concrete for cast-in-place curbing shall be Class A concrete conforming to the requirements of "Concrete Work" and shall have a minimum compressive strength of 3,500 PSI at 28 days. Joint filler shall conform to the requirements of Article M.03.08 of the Standard Specifications for Roads, Bridges and Incidental Construction Form 819.

C. CONSTRUCTION METHODS

Construction methods for concrete curbing shall conform to the requirements of the specification for the item entitled "Concrete Work" as supplemented by the following requirements:

1. EXCAVATION: Excavation shall be made to the required depths below the finish grade as shown on the Contract Drawings or as directed. All soft and yielding materials shall be removed and replaced with suitable material and the base upon which the curbing is to be set shall be compacted to a firm, even surface.

2. FORMS: Forms shall be of metal or wood, straight, free from warp and of sufficient strength to resist spring from the pressure of the concrete. Forms shall be securely staked, braced and held firmly to the required line and grade and shall be sufficiently tight to prevent leakage of concrete or mortar.

All forms shall be cleaned and oiled or wetted before concrete is placed against them. If concrete curbing is to be constructed against existing bituminous pavement, the front form shall be securely fastened to the pavement. Building paper shall then be inserted behind the forms to insure that no concrete seeps under the form.

Concrete curbing at driveways shall be continuous and full depth and shall be depressed to provide a 1-1/2 inch lip above the pavement surface.

3. PLACING CONCRETE: The elevation of the forms shall be checked just before the concrete is placed. Any irregularities indicated shall be corrected.

The concrete shall contain not less than 5 nor more than 7 percent entrained air at the time the concrete is deposited within the forms. Concrete shall be placed only on a moist base. If the base is dry, it shall be thoroughly wetted a sufficient time in advance of the placing of the concrete. Concrete shall not be placed in puddles of water, nor shall it shall be placed on a soft, muddy or frozen base.

4. CURING AND PROTECTION: Concrete curbing shall be cured and protected in conformity with the requirements of the specification of the item entitled "Concrete Work".

5. BACKFILLING: After the concrete has set sufficiently, the grading shall be completed to the lines shown on the plans, or as ordered, by backfilling to the required elevation with approved material which shall be placed in layers of not over six inches in depth and compacted until firm and solid. After the curbing has sufficiently set, it shall be backfilled with no undue delay in order to insure that it is not undermined or otherwise damaged. Curbing that has been damaged shall be removed and replaced as ordered by the Director of Public Works at no additional cost to the Town.

D. MEASUREMENT AND PAYMENT

This work will be measured for payment along the top of the curb and will be the actual number of lineal feet of concrete curbing completed and accepted. Payment for this item will be made at the contract unit price per lineal foot for concrete curb complete in place which price shall include the required excavation, concrete, finishing, curing, backfilling and compaction, expansion joint and filler, disposal of surplus and unsuitable material and all materials, equipment, tools, labor and work incidental to or necessary for the completion of the item.

If no item "Concrete Curbing" appears in the Bid Schedule then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the "Restoration" Item as listed in the Bid Schedule.

BITUMINOUS CONCRETE LIP CURBING

A. DESCRIPTION

The work under this item shall consist of the construction of bituminous concrete lip curbing consisting of machine laid bituminous concrete, constructed on the pavement in conformance with these specifications, at the locations and to the lines and grades, dimensions and details as shown on the plans or as directed by the Director of Public Works.

B. MATERIALS

Materials for this work shall conform to the requirements of Article M.04 of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 819 (State of Connecticut Standard Specifications).

C. CONSTRUCTION METHODS

The methods employed in performing the work and all equipment, tools and machinery used in handling material and executing any part of the work shall be subject to the approval of the Director of Public Works before the work is started, and whenever found unsatisfactory, it shall be changed and improved as required by the Director of Public Works. All equipment, tools and machinery used must be maintained in a satisfactory working condition.

The bituminous concrete mixture shall be transported from the mixing plant in trucks having tight bodies which have previously been cleaned of all foreign material. The use of kerosene, gasoline, fuel oil or similar products for the coating of the inside of truck bodies is strictly prohibited. Loaded trucks shall be tightly covered with waterproof canvas or other suitable covers. The mixtures shall be delivered at a temperature within 25°F of the approved job mix formula.

Curbing equipment shall be of the self-powered type which shall force the hot bituminous mixture through a die or form properly shaping and compacting it to the required cross section of the curb.

If the design of the curbing machine is such that the outside wheels operate outside the limits of the paved surface, the Contractor will be required to obtain a smooth surface by grading and consolidating the area on which the outside wheel of the machine rides, and this work shall be done at his expense.

Prior to the arrival of the mixture on the work, the surface of the pavement where the curbing is to be constructed shall be cleaned of all loose and foreign material. The surface, which shall be perfectly dry and clean at the time the mix is placed, shall be coated with an RC-2 or other approved tack coat just prior to placing the mixture.

On arrival at the site, the mixture shall be transferred from the truck to the hopper of the curbing machine; and the mixture shall be kept clean and free from dirt or foreign materials at all times.

The mixtures shall not be placed when weather conditions of fog or rain prevail nor when the pavement surface shows signs of any moisture. Unless specifically authorized by the Director of Public Works, the mixture shall be laid only when the base temperature is above 40°F.

The surface of the curbing shall be tested with a 10 foot straightedge, and any variation from a true line horizontally or vertically exceeding 1/4 inch shall be satisfactorily corrected. The only compaction required shall be that obtained by the approved mechanical curbing machine.

Where machine work is impractical, the Director of Public Works may permit hand-laid curbing to be constructed.

After the completion of curbing, traffic shall be kept at a safe distance for a period of not less than 24 hours and until the curbing has set sufficiently to prevent injury to the work. The Contractor shall be responsible for the repair of any damaged curbing.

D. MEASUREMENT AND PAYMENT

This work will be measured for payment along the top of the curb and will be the actual number of linear feet of bituminous concrete lip curbing completed and accepted.

This work will be paid for at the contract unit price per linear foot for "Bituminous Concrete Lip Curbing" complete in place, which price shall include and be full compensation for furnishing, delivering and placing all materials including any tack coats, compacting, shaping and for all labor equipment, tools and work incidental to or necessary to complete the item.

If no item "Bituminous Concrete Lip Curbing" appears in the Bid Schedule, then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the "Restoration" item as listed in the Bid Schedule.

DRIVEWAY REPLACEMENT

A. DESCRIPTION

The work under this Item shall consist of the permanent repair to paved driveway aprons which have been damaged or removed during the course of construction. This work shall also include the cutting and removal of existing pavement, removal of such temporary pavements, subbase, backfill and any other materials as may be required for installation of the permanent repairs in accordance with the plans and specifications or as directed by the Director of Public Works.

B. MATERIALS

The base of the driveway apron shall consist of processed stone meeting the material requirements specified in "Processed Aggregate Base."

Bituminous concrete shall meet the material requirements specified in "Bituminous Concrete Pavement". Bituminous concrete shall be either roadway surface course or driveway mix. The pavement shall consist of a minimum of a 2 inch single course measured after compaction. Bituminous concrete shall not be placed until the base is in proper condition and has been approved by the Director of Public Works. The bituminous concrete pavement shall be spread and compacted in accordance with the specifications.

C. CONSTRUCTION METHODS

Prior to making any permanent repairs, all existing bituminous driveway pavement, excess driveway base material, any temporary repair materials and other materials as required shall be removed to required depths and widths as shown on the Contract Drawings or as directed by the Director of Public Works or his designee. If necessary, additional processed aggregate base shall be placed and compacted. Pavement thickness shall equal or exceed the thickness of the existing pavement and shall be a minimum of 2 inches after compaction. Edges of existing pavement shall be compressor cut to a straight square edge surface and shall be coated with liquid asphalt emulsion immediately prior to placing the permanent pavement repair.

Construction methods shall be as specified in the respective items for "Gravel Subbase", "Processed Aggregate Base", and "Bituminous Concrete Pavement" except that if the Director of Public Works determines that the size of the pavement repair area justifies alternate methods for placing or compacting the subbase, base or pavement, he shall so direct the Contractor who shall employ such alternate methods at no additional cost to the Town.

D. MEASUREMENT AND PAYMENT

The Item, "Driveway Replacement" shall include any cutting or trimming, all excavation, transporting and handling all pavement repair materials (subbase, base and surface) and all other materials, tools, equipment, labor and work necessary for or incidental to the completion of the item. This item shall also include any additional material and/or labor required for corrective work necessitated by settlement through the guarantee period of this contract.

This work will be measured for payment by the number of tons of Asphalt Pavement placed and compacted in driveways.

CONCRETE SIDEWALKS, DRIVEWAY APRONS, AND RAMPS

A. DESCRIPTION

The work under this item shall consist of the construction of new concrete sidewalks, driveway aprons and ramps or the replacement of existing damaged sidewalks, driveway aprons and ramps. They shall be constructed on a gravel base course at the locations and to the dimensions and details shown on the Contract Drawings or as ordered by the Director of Public Works and in accordance with these Specifications. Sidewalks shall be protected with an anti-spalling treatment.

B. MATERIALS

Materials for this work shall conform to the requirements of the specification "Concrete Work". Sidewalks, ramps and driveway aprons shall be Class "A" Concrete.

Anti-spalling compound shall be Consolideck Saltguard as manufactured by ProSoCo Inc., Kansas City, KS. or an approval equal.

Preformed Expansion Joint cement and air-entraining admixtures shall conform to Article M.03.01 and M.03.08 of the Standard Specifications, respectively.

Air-entraining Portland cement and air-entraining admixtures shall conform to the requirements of the applicable section of the Standard Specification "Concrete Work".

Gravel for the base course shall conform to the Specification for "Compacted Gravel Fill".

Reinforcement where required by this specification or where indicated by the Contract Drawings shall conform to the requirements of Article M.06.01 of the Standard Specifications.

C. CONSTRUCTION METHODS

1. **EXCAVATION:** Excavation, including removal of any existing sidewalk, driveway apron or ramp, shall be made to a minimum depth of inches below the finished grade, to accommodate a sidewalk, apron or ramp of the thickness specified together with the specified compacted gravel base, (six (6) inch minimum) or as shown on the Contract Drawings or as directed. All soft and yielding material shall be removed and replaced with suitable material.

2. **GRAVEL BASE:** The gravel base shall be placed to the dimensions six (6) inch minimum, eight (8) inch minimum at driveways, shown on the Contract Drawings and properly compacted. The base shall be wetted and rolled or tamped after the spreading of each layer.

3. FORMS: Forms shall be full dimension and shall be of metal or wood, straight, free from warp and of sufficient strength to resist spring from the pressure of the concrete. If of wood, they shall be of 2"x6" (2"x8" at driveways) surfaced plank, except that at sharp curves thinner material may be used. If of metal, they shall be of approved section and shall have a flat surface on the top. Forms shall be securely staked, braced, and held firmly to the required line and grade and shall be sufficiently tight to prevent leakage of concrete or mortar. All forms shall be cleaned and oiled or wetted before concrete is placed against them. Pre-molded bituminous expansion joints 1/2 inch in thickness, of full depth and width of the walk, driveway, or ramp shall be placed at intervals of 16 feet.

4. PLACING CONCRETE: The correct cross section of the base shall be checked just before the concrete is placed by testing with a template of wood or metal, the bottom surface of which conforms to the desired cross section. Any irregularities thus indicated shall be corrected. The base shall be kept in a satisfactory condition by rolling with an approved roller, as often as may be necessary to maintain the required contour and compaction. Concrete shall be placed on a moist base. If the base is dry, it shall be thoroughly wetted a sufficient time in advance of the placing concrete. The base shall not be allowed to dry out before the concrete is placed, but concrete shall not be placed in puddles of water. No concrete shall be placed unless the inspector is present.

5. CONCRETE: The concrete shall be proportioned, mixed, placed, etc., in accordance with the provisions of the Specifications for "Concrete Work", except as modified herein.

The concrete shall contain not less than 5 nor more than 7 percent entrained air at the time the concrete is deposited in the forms.

Air-entrainment shall be obtained and the concrete cured in accordance with the provisions of the Specifications for "Concrete Work".

6. FINISHING: The surface of the concrete shall be finished with a wood float or by other approved means. A wood float type surface will be achieved unless otherwise noted on the Contract Drawings. The outside edges of the slab and all joints shall be edged with a 1/4 inch radius edging tool. Dummy joints will be provided as shown on the Contract drawings.

Anti-spalling compound shall be spray applied in full conformance with the manufacturer's recommendations at a rate of one gallon per 100 square feet.

7. UTILITY GATES, TREE WELLS, ETC.: Merestones, gas gates, water gates and manhole frames and covers, sidewalks vault doors, frames, etc. shall be carefully adjusted to the proposed finished grade.

8. BACKFILLING AND REMOVAL OF SURPLUS MATERIAL: The sides of the sidewalk, driveways and ramps shall be backfilled with suitable material, thoroughly compacted and finished flush with the top of the sidewalk, driveway or ramp, as indicated on the Contract Drawings or as ordered by the Director of Public Works. In order to protect the completed sidewalk from

undermining, the backfill shall be placed immediately upon removal of the forms. All surplus material shall be removed and the site left in a neat and presentable condition to the satisfaction of the Director of Public Works.

9. REINFORCEMENT: Welded wire mesh (6x6x6) shall be used as reinforcement in all sidewalks at driveways and in all driveway aprons. Reinforcement where used shall be placed as shown on the Contract Drawings in accordance with the applicable methods of the Specification "Concrete Work" or as directed by the Director of Public Works.

D. MEASUREMENT AND PAYMENT

This work will be measured for payment as follows:

This work will be measured by the actual number of square feet of completed and accepted concrete sidewalk, driveway aprons, or ramp.

Any sidewalks, driveway aprons and/or ramps which, during the course of construction are damaged by negligent operations of the Contractor, shall be repaired or replaced by Contractor at his own expense as directed by the Director of Public Works. Said repairs/replacements will not be measured for payment.

Excavation below the finished grade of the sidewalk, driveway apron or ramp for the proposed sidewalk, driveway apron or ramp including excavation for the compacted gravel base and the removal of existing sidewalk, driveway apron or ramp, backfilling and disposal of surplus, removed existing concrete or other material will not be measured for payment, but the cost shall be included in the price bid for the sidewalk, driveway apron or ramp. Unless otherwise specified, excavation above the finished grade of the sidewalk, driveway apron or ramp will not be measured for payment but the cost including any necessary sloping shall be included in the price bid for the sidewalk, driveway apron or ramp.

Gravel Base: This work will not be measured for payment, but the cost shall be considered as included in the price bid for the sidewalk, driveway apron, or ramp.

Reinforcement: This material will not be measured for payment, but the cost included in the price bid for the sidewalk, driveway apron or ramp.

Basis of Payment: This work will be paid for at the contract unit price per square foot for "Concrete Sidewalk", "Concrete Driveway Apron", "Concrete Ramp" complete in place, which price shall include all excavations as specified above, backfill, disposal of surplus or removed existing concrete or other material, gravel base, expansion joints, reinforcement, anti-spalling treatment, and all materials, equipment, tools, labor and work incidental to or necessary for the completion of the item.

There will be no direct payment for adjusting to grade merestones, gas gates, water gates, manhole frames and covers, hatchways, or other existing surface structures in any existing concrete sidewalk, driveway or ramp, but the cost of this work shall be considered as included in the general cost of the work.

METAL BEAM RAIL

A. DESCRIPTION

The railing shall consist of a single line of rail elements fastened to steel posts, terminal sections, posts, concrete end anchors, and fittings, and the appropriate treatment at fixed objects, bridge parapets and terminal ends as shown on the plans. It shall be erected in the locations given and fabricated in accordance with the locations, designations, dimensions and details shown on the plans or as ordered by the Director of Public Works.

B. MATERIALS

Metal Beam-Type Rail and Anchorages: The materials for this work shall comply with the plans or Connecticut Department of Transportation Standard Drawing as to size, shape and weight.

Steel Posts, Post Plates, Brackets and Back Up Rails: All steel posts, post plates, brackets and back-up rails shall conform to the requirements of ASTM A 36. After fabrication, all steel posts, post plates, brackets and back-up rails shall be galvanized to meet the requirements of ASTM A 123.

Rail Element Rub Rail and Terminal Sections: The rail element, rub rail and terminal sections shall conform to the requirements of AASHTO M 180 except the following shall govern:

1. Class A: Base metal nominal thickness, 0.105 inches as shown on the plans.
2. Zinc coating shall be Type 2.
3. Material for the box beam rail element shall conform to ASTM A500, Grade A or B, or ASTM A501. All plates shall conform to ASTM A 36. All Material for box beam rail elements and splices shall be galvanized after fabrication in accordance with AASHTO Mill (ASTM A123).

Steel Eyebolt and Standard Turnbuckle: The steel eyebolt and standard turnbuckle shall conform to the requirements of ASTM A237 and shall be zinc-coated to conform to the requirements of ASTM A153.

Connector Plate Bolts: The connector plate bolts shall conform to the requirements of ASTM A325 and shall be zinc-coated to conform with the requirements of ASTM A153.

Cast Steel Connector Plate: The cast steel connector plate shall conform to the requirements of ASTM A27, Grade 65-35 and shall be zinc-coated to conform with the requirements of ASTM A153.

Malleable Iron Connector Plate: The malleable iron connector plate shall conform to the requirements of ASTM A47, Grade No 35018 and shall be zinc-coated to conform to the requirements of ASTM A153.

Structural Steel Anchor Rod, Steel Plates, Steel Washer Plates and Square Steel Washers: These steel fittings shall conform to the requirements of ASTM A36 and shall be zinc-coated to conform to the requirements of ASTM A153 unless otherwise noted on the plans.

Bolts, Washers, Nuts and Fittings: Anchor bolts shall conform to ASTM A449. The nuts and washers for anchor bolts shall conform to ASTM A563, Grade B. All other bolts and nuts shall conform to the requirements of ASTM A307 unless otherwise noted in the plans. Miscellaneous washers and fittings, unless otherwise shown on the plans, shall conform to ASTM A36.

Bolts, nuts, and washers shall be galvanized to meet the requirements of AASHTO M232 (ASTM A153). Fittings shall be galvanized after fabrication to conform to AASHTO Mill (ASTM A123).

Anchor: The bar reinforcement for anchors and the Class "A" concrete for anchors shall conform to the requirements of "Concrete Work".

Paint: The zinc dust-zinc oxide paint shall conform to the requirements of Type I, II or III as specified in Federal Specifications TT-P-641.

C. CONSTRUCTION METHODS

The steel posts, with the exception of end anchor posts, shall be driven. Where rock or boulders are encountered in driving, this material shall be removed so as to make a hole of sufficient size to permit the setting of the post. The post shall then be set, and the area adjacent to the post shall be backfilled and thoroughly compacted, or the hole shall be backfilled and thoroughly compacted before the driving of the posts. End anchor posts, where required, shall be set in dug holes; and the area adjacent to the post shall be backfilled and thoroughly compacted. Any surplus material remaining after the completed installation shall be removed by the Contractor.

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

In driving steel posts, suitable driving caps and equipment shall be provided to prevent battering or injury to the posts and to prevent the galvanizing on the posts above the ground line from being scratched, defaced or damaged.

The posts shall be located as shown on the plans. The top of the posts shall form a line parallel with the adjacent pavement surface. Where required, the brackets, rub rails, back-up rails and rail elements shall then be erected to produce a smooth, continuous rail as shown on the plans. The terminal section, rub rails and rail elements shall be lapped in the direction of traffic where possible.

Whenever metal beam rail or rail treatments are being constructed adjacent to roadways open to traffic, the Contractor shall complete the installation to and including the designed terminal treatment at the close of each day's work so as to prevent any hazard that would be caused by leaving an exposed end of the beam rail or rub rail.

On long runs or other locations where it is not practical to complete the installation to and including the designed terminal treatment, the Contractor shall use temporary methods for terminating the beam rail so as to minimize any hazard by lowering the rail end to the ground and providing adequate anchorage of the same by bolting, weighting, burying, etc.

The Contractor shall submit to the Director of Public Works for approval details of his proposed methods for the temporary terminal treatment of the end section. No work shall be performed adjacent to the areas open to traffic until approval is given.

The Contractor shall be required to furnish extra length posts where field conditions warrant. These posts shall be of such length that the minimum depth in the ground shall be maintained.

In the welding of steel plates to the steel posts, the welds shall be of appropriate size and shape as shown and shall conform to the applicable requirements of the current Specifications for Welded Highway and Railway Bridges of the American Welding Society as supplemented and revised by the following:

1. Only a visual inspection of welds will be required.
2. All welds shall have no visual cracks nor be defective in any way and shall be formed in a neat and workmanlike manner. Any weld found unacceptable by the Director of Public Works shall be corrected by the Contractor at no additional cost.

When the rail is to be attached to rock, the necessary rock shall be removed and the holes drilled in the rock in the proper locations. The diameter of the holes shall be sufficient to permit the placement of the bolts and the nonshrink grout, but shall not exceed twice the diameter of the bolts to be installed. The holes shall then be blown clean with an air jet.

The bolts shall be installed in the holes and the holes filled with nonshrink grout. After the steel plate is installed, it and any spalled areas shall be backfilled with nonshrink grout. When the rail is to be attached to a concrete surface, the bolts shall be installed and grouted as indicated above for installation in rock.

Before final erection, all galvanized elements which have been cut or worked so as to destroy the zinc coating and cause the base metal to be exposed shall have the exposed base metal thoroughly cleaned and painted with one coat of zinc dust-zinc oxide paint and a finish coat of aluminum paint.

D. MEASUREMENT AND PAYMENT

The length of metal beam rail measured for payment will be the number of linear feet of accepted rail installed, measured along the top of rail to the nearest foot, between centers of end posts in each continuous section, plus the terminal length of rail at anchors or bridges.

"Metal Beam Rail" will be paid for at the contract unit price per linear foot for the type indicated on the plan or ordered by the Director of Public Works, complete in place. The price shall include all materials, fittings, rub rail, back-up rail, posts, equipment, tools and labor incidental to the

installation of the rail, terminal sections, and/or anchorages. The price also includes the furnishings and installation of the terminal elements fastened to bridge parapets and all equipment, tools and labor incidental thereto.

Drilling in or removal of rock or boulders and backfilling with suitable material when required for the installation of posts will be paid for as "Extra Work".

TOPSOIL

A. DESCRIPTION

The work under this Item shall consist of furnishing, placing, spreading and shaping topsoil; or placing, spreading, and shaping topsoil from stockpiles or stripped areas; on the areas shown on the Contract Drawings or where directed by the Director of Public Works. The topsoil will be placed to a depth equivalent to the existing depth or four (4) inches whichever is greater.

B. MATERIALS

Topsoil shall consist of friable loam reasonably free of subsoil, clay lumps, brush, roots, weeds or other objectionable vegetation, stones or similar objects larger than 2 inches. Brush and other vegetation which will not be incorporated with the soil during handling operations shall be cut and removed prior to stripping. Ordinary sods and herbaceous growth such as grass and weeds need not be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. The topsoil, unless otherwise specified or approved, shall have an acidity range of approximately 5.5 PH to 6.5 PH. The organic content shall be not less than 3% nor more than 20% as determined by the wet combustion method. There shall not be less than 20% nor more than 80% passing the 200 mesh sieve.

The Contractor shall notify the Director of Public Works of the location from which he proposes to furnish topsoil to the project at least 15 days prior to delivery.

All topsoil from offsite sources will be tested unless otherwise directed. A report on representative samples from the proposed source of the topsoil by an approved Soil Testing Laboratory shall show a PH rating between 5.5 and 6.5 and agronomically acceptable levels of nitrogen, phosphorus, potash and trace elements magnesium, manganese, iron and sodium with recommendations for additions of lime and fertilizer. Soil supplements that may be necessary, based on the test results, will not be part of the work, under this Item, but will be included under the Item "Liming, Fertilizing, Seeding and/or Mulching".

All material delivered to the project which does not meet these specifications, or which has become mixed with undue amounts of subsoil during any operation at the source or during placing or spreading, will be rejected and shall be replaced by the Contractor with acceptable material at his expense.

Topsoil shall not have been treated with a residual insecticide or herbicide within one (1) year of delivery for use on the project.

C. CONSTRUCTION METHODS

The areas on which the topsoil is to be placed shall be excavated and/or brought to grade as necessary such that on placement of the specified topsoil depths, the surface will be within reasonably close conformity to the lines, grades, and cross sections specified or required. Unless otherwise specified or shown on the Contract Drawings, all existing manholes, gas gates, water gates, manhole frames, and covers, drainage or other existing structures in the proposed topsoil

areas shall be adjusted to the proposed finished grade and protected from damage during the topsoiling operations.

The Contractor shall use sufficient stakes or other approved methods to insure reasonably close conformity to the elevations or grades shown on the Contract Documents.

Areas to be topsoiled shall be cleared of all stones, roots, debris, sod, weeds and foreign materials one (1) inch or larger in any dimension and shall be loosened to a depth of two (2) inches by raking, dicing or other approved methods. On sloped areas, the raking or dicing shall be done parallel to the contours to minimize erosion.

The topsoil shall then be spread over the prepared areas in such quantities as necessary to obtain the required depth after natural settlement and compaction, and shall be raked free of all material unsuitable for, or harmful to plant growth. It shall then be compacted as directed by means of a light roller weighing not over 120 pounds per foot-width of roller. The Contractor shall perform such work as required to provide a smooth, uniform, friable surface for seed germination and plant growth prior to seeding or planting.

After shaping and grading, all trucks and other equipment shall be excluded from the topsoiled area to prevent excessive compaction.

During hauling and spreading operations, the Contractor shall immediately remove any material dumped or spilled beyond the limits of the area to be topsoiled.

It shall be the Contractor's responsibility to restore to the line, grade and surface all eroded areas with approved material and to keep topsoiled areas in acceptable condition.

Plant cover or erosion preventing materials shall be established as soon as possible on all bare earth areas to minimize air and stream pollution.

All available onsite stockpiled topsoil shall be placed and spread prior to the use of topsoil from offsite sources.

Unless stockpile areas are available or are provided, the topsoil used from offsite sources will be delivered to the project site as necessary for immediate use.

The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor's operations shall be graded if required and put into a condition acceptable for seeding. Unless specified elsewhere herein, surplus stockpiled topsoil shall be the property of the Town of Southbury and may be removed by the Town at its discretion. If not removed by the Town, it shall be used to flatten embankment slopes or placed in other locations approved by the Director of Public Works.

D. MEASUREMENT AND PAYMENT

This work will be measured for payment by the actual number of square yards for "Spreading Topsoil" or "Hand Spreading Topsoil" to the required depths, or by the actual number of cubic yards for "Furnishing and Placing Topsoil" at the required depths.

Topsoil from offsite sources shall be paid for at the contract unit price per cubic yard for "Furnishing Topsoil" at the required depths, which price shall include providing the topsoil, loading, hauling topsoil, stockpiling topsoil if necessary, placing, restoration of stockpiled areas, and all other materials, equipment, tools, labor and work incidental to or necessary for the completion of the item.

Topsoil from onsite or offsite sources shall be paid for at the contract unit price per square yard for "Spreading Topsoil" or "Hand Spreading Topsoil" at the required depths, which price shall include loading, hauling topsoil from stockpiled areas, placing, spreading, shaping, preparation for seeding, restoration of stockpiled areas, and all other materials, equipment, tools, labor and work incidental to or necessary for the completion of the item. "Hand Spreading Topsoil" shall be measured for payment only when the Director of Public Works determines that it is impractical to machine spread topsoil in a given area. All work associated with stripping and stockpiling topsoil shall be included and paid for under the item "Common Excavation".

The Contractor shall not be paid separately for adjusting to grade merestones, gas gates, water gates, manhole frames and covers, drainage or other existing structures in any proposed topsoil area or for topsoil required for the planting of trees, shrubs, and groundcover plants. The cost of this work shall be considered as included in the general cost of the work for stripping and stockpiling of topsoil. Compensation for such work and all expenses incidental thereto shall be considered as part of the price bid for this item.

If no item "Furnishing Topsoil" and/or "Spreading Topsoil" appears in the Bid Schedule then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the "Restoration" item as listed in the Bid.

LIMING, FERTILIZING, SEEDING, AND MULCHING

A. DESCRIPTION

The Work under this section consists of furnishing and placing agricultural ground dolomitic limestone, fertilizer, seed and/or mulch at the rates and by the method specified herein.

B. MATERIALS

Materials shall conform to the following requirements:

1. Lime shall be standard commercial ground dolomitic limestone.
2. Fertilizer used for non-maintained areas shall be a standard 10-6-4 mixture; in maintained areas organic fertilizer shall be used and have a quality and mixture equal to Spurzon, Milorganite, or Turf Builder. All fertilizer shall be delivered to the job in its original sealed containers.
3. Grass Seed shall be from a new crop, fresh and clean. The seed is to be delivered to the site in its original containers which shall bear the dealer's guaranteed analysis, indicating the proportions of each seed, the purity, and the germination. The following indicates the type of seed required and the minimum percentages of each.

Grass Type	Proportion by weight	Purity	Germination
Chewing Fescue	30%	97%	90%
Kentucky 31 Fescue	30%	98%	90%
Kentucky Bluegrass	20%	85%	80%
Domestic Ryegrass	20%	98%	90%

Note: Weeds and inert material shall not exceed 2%.

C. CONSTRUCTION METHODS

Construction methods shall be agronomically acceptable and feasible. The rate and recommendations for liming and fertilizing shall be established by an approved Agricultural Experiment Station in Connecticut the results of which must be approved by the Director of Public Works. In order to assist in obtaining this information the Contractor will be required to submit to this experiment station a sample of the topsoil to be used at the rate of at least one sample per acre.

Seed shall be spread at least four days after fertilization of the soil by an approved mechanical method and at the rate of 5 pounds per thousand square feet. Seed shall be lightly raked into the soil to a depth of approximately 1/8 inch (and not more than 1/4 inch) and the entire seeded area shall be rolled with a light weight roller. Planting seasons shall be between March 1st and May 1st, or between September 1st and October 15th.

Areas seeded shall be mulched unless otherwise ordered by the Director of Public Works. Woodchopper mulch shall not be used on seeded areas; unless otherwise shown on the Contract Drawings or called for elsewhere in the Contract Documents, hay mulch or wood fiber mulch (only when hydraulic seeding methods are utilized) will be used.

Hay (where used) shall be uniformly applied by an approved method to a placed depth of two (2) inches (at a rate of two tons per acre). Hay shall be held in place by one uniform application of asphalt emulsion Type SS-I, applied at the rate of 0.08 gallons per square yard. The emulsion shall have a temperature range within 50-120 degrees F. at the time of the application. The emulsion may be applied during or immediately after the application of the mulch.

The Contractor shall be required to replant, at no additional cost to the Town, using full amounts of all specified materials, those areas damaged by wind, washout, fire, equipment, pedestrian traffic, or other natural or man-made occurrences, to the satisfaction of the Director of Public Works.

The Work shall not be complete until all stones over one (1) inch in diameter, glass, cables, bale wire, and other debris have been removed from the seeded areas. Cleanup shall include the removal of all debris resulting from the seeding or planting operations on shoulders, pavement or adjacent property, public and private. The Contractor shall be required to shape, grade and establish vegetative cover in accordance with the specifications and Contract Drawings on all areas disturbed outside the normal limits of construction. The Contractor shall be required to maintain and water as required the grass through the fourth cutting. Periods of cutting shall be as ordered or approved by the Director of Public Works or when the grass reaches four inches in height.

D. MEASUREMENT AND PAYMENT

This work will be measured for payment by the actual number of square yards, surface area, on which liming, fertilizing, seeding and mulching has been completed and the work accepted.

If no item "Liming, Fertilizing, Seeding and Mulching" appears in the Bid Schedule, then no separate payment will be made for the work performed under this section and the cost of such work is understood to be included in the "Restoration" item as listed in the Bid Schedule.

PAVEMENT REPAIR

A. DESCRIPTION

The work under this Item shall consist of the permanent repair to pavement which have been damaged or removed during the course of construction. This work shall also include the cutting and removal of existing pavement, removal of such temporary pavements, subbase, backfill and any other materials as may be required for installation of the permanent repairs in accordance with the plans and specifications or as directed by the Director of Public Works.

B. MATERIALS

The base of the roadway shall consist of 6 inches of processed stone, meeting the material requirements specified in "Processed Aggregate Base" and 8 inches of compacted gravel meeting the material requirements specified in "Gravel Subbase".

Bituminous concrete shall meet the material requirements specified in "Bituminous Concrete Pavement". Base course shall be either Class I, Class II, S0.5, or S0.375 and surface course shall be Class II or S0.375. The pavement shall consist of 2 inch base course and a 2 inch surface course both measured after compaction. Bituminous concrete shall not be placed until the base is in proper condition and has been approved by the Director of Public Works. The two course bituminous concrete pavement shall be spread and compacted in accordance with the specifications.

C. CONSTRUCTION METHODS

Prior to making any permanent repairs, all temporary repairs existing pavement base and other materials as required shall be removed to required depths and widths as shown on the Contract Drawings or as directed by the Director of Public Works. Edges of existing pavement shall be compressor cut to a straight square edge surface and shall be coated with liquid asphalt emulsion immediately prior to placing the permanent pavement repair.

Construction methods shall be as specified in the respective items for "Gravel Subbase", "Processed Aggregate Base", and "Bituminous Concrete Pavement" except that if the Director of Public Works determines that the size of the pavement repair area justifies alternate methods for placing or compacting the subbase, base or pavement, he shall so direct the Contractor who shall employ such alternate methods at no additional cost to the Town.

D. MEASUREMENT AND PAYMENT

This item will be measured for payment by the actual number of square yards surface area of pavement repaired.

This item shall not include any pavement that in the Director of Public Works's opinion was not required to be removed during the completion of the work or ordered removed by the Director of Public Works and pavement damaged as a result of careless operations of the Contractor, which pavement shall be replaced as specified at the Contractor's sole expense.

This price shall include any cutting or trimming, pavement base removal, all excavation, pavement repair materials (subbase, base and surface) and all other materials, tools, equipment, labor and work necessary for or incidental to the completion of the item. This price shall also include any additional material and/or labor required for corrective work necessitated by settlement through the guarantee period of this contract.

If no item "Bituminous Concrete Pavement" appears in the Bid Schedule and the plans indicate the placement of a minor amount of new pavement, then no separate payment shall be made for the placement of new pavement, and the cost of such work including placement and compaction of base material is understood to be included in the "Restoration" item as listed in the Bid Schedule.

RESTORATION

A. DESCRIPTION

Under this item, the Contractor shall, upon completion of the construction within any section of this Contract repair or replace to a condition equal to or better than original, all pavement, curbing, topsoil, lawns, bushes, shrubs, trees, fences, fields, incidental works' or any and all other property removed or harmed in any way by reason of work done under this Contract. This work shall include all excavation, grading, placement of topsoil, fertilizing and seeding necessary to insure that all areas adjacent to new work are brought into conformance with Town Standards.

B. MATERIALS

Not applicable.

C. CONSTRUCTION METHODS

Clearing and Grubbing within these areas shall be as defined under "Site Preparation". In restoring all areas the Contractor shall:

1. Replace to an equivalent depth any topsoil that has been removed during the excavation.
2. Remove from the property and dispose of it in a fashion approved by the Director of Public Works, all trees, brush and other items that the Contractor has cut in order to prosecute his work.
3. Remove from the property upon completion of the work thereon all excess materials of construction such as stone, pipe, concrete block, gravel, etc., that the Contractor may have stockpiled for use during the course of the work.
4. Leave the land in a smooth, even condition. All ruts, holes or other undesirable grading conditions which resulted from work under this Contract shall be filled and the area so graded to eliminate ponding. All drainage courses shall be restored to their pre-existing condition or better.
5. Fertilize and seed those areas where the original ground cover was removed or disturbed by operations under this Contract.
6. Replace all curbing damaged or removed during construction.
7. Replace all bituminous concrete damaged or removed during construction including cutting pavement, emulsion seal, preparation of subgrade, processed stone base and 3" bituminous concrete pavement.
8. Reset all public or private monuments, iron pipes or other types of property line and geodetic markers damaged or disturbed by operations under this Contract. This work will be done by a

licensed land surveyor or authorized agent approved by the Director of Public Works - all at no additional cost to the Town.

9. The Contractor shall also repair, reset or replace as directed by the Director of Public Works, all pipes, walls, utilities, fences, railings, stone walls, etc., and ornamental or other surfaces, structures, or property which may have been damaged, either directly or indirectly by his operations under this Contract.

All work under this item for restoration shall also conform to construction methods of the following items of work as applicable: "Pavement Repair," "Topsoil," or "Liming, Fertilizing, Seeding and Mulching".

D. MEASUREMENT AND PAYMENT

Payment for the work under this item will be made at the contract unit price for "Restoration". This price shall be full compensation for all preparation; excavation; topsoil; liming, fertilizing, seeding and mulching; paving, curbing, and all other materials, equipment, tools, labor and work incidental to or necessary for the completion of the item "Restoration".

If no item "Restoration" appears in the Bid Schedule, then no separate payment will be made for the work performed under this section. "Concrete Curbing", "Bituminous Concrete Lip Curbing", "Pavement Repair", "Topsoil", and "Liming, Fertilizing, Seeding and Mulching", the removal or replacement of which is determined by the Director of Public Works to be necessary for the completion of the work, but not a part of the work shall not be measured and paid for separately.

The cost of all such work is understood to be included in the prices bid for other items as listed in the Bid Schedule. Work determined by the Director of Public Works to be a result of the Contractor's careless operations shall be completed as specified but shall not be measured for payment.