

CITY OF BINGHAMTON  
ENGINEERING DEPT.  
LIST OF STANDARD SPECS  
1<sup>ST</sup> EDITION [2013]

**NOTE: THIS BOOK CONTAINS A LIST OF THE MOST COMMON SPECIFICATIONS THAT ARE USED BY THE CITY OF BINGHAMTON. HOWEVER, IT IS THE SOLE RESPONSIBILITY OF THOSE WHO PERFORM THE WORK TO ENSURE THAT THEY ARE USING THE MOST RECENT UP TO DATE SPECIFICATIONS. ANY QUESTIONS REGARDING ANY SPECIFICATIONS, WHETHER OR NOT THEY ARE IN THIS BOOK, CONTACT THE CITY OF BINGHAMTON ENGINEERING DEPT. BY THE FOLLOWING:**

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<b><u>ITEM</u></b>	<b><u>PAGE</u></b>
1 – CLEARING AND GRUBBING (LUMP SUM)	6-7
1M – MOBILIZATION	8
2A – UNCLASSIFIED EXCAVATION	9
2AR – CONCRETE AND ROCK EXCAVATION	10
2EFB – SELECT GRANULAR FILL	11-14
2RER – ROADWAY EXCAVATION AND REGRADING	15
2S – STUMP REMOVAL	16
2T – TREE REMOVAL	17
2X - WASHED CRUSHED STONE	18-19
4 - SELECT GRANULAR MATERIAL	20-24
5 – TRENCHING, BACKFILLING AND COMPACTING	25-36
11P - PERFORATED UNDERDRAIN PIPE	37-38
11PX – UNDERDRAIN CLEAN-OUT	39
13CL – LATERAL CLEANOUT	40
15 – PVC PIPE	41-43
15SS – STORM SEWER PIPE	44-46
16 – DUST CONTROL	47
28EC – EPOXY COATED REINFORCING BARS	48
30A – MANHOLE FRAME AND LID	49-50
30B – CATCHBASIN FRAME, GRATE AND CURB BOX	49-50
30C – CATCHBASIN TRAP (HOOD, STORM OUTFALL)	49-50
30D – MANHOLE STEPS	49-50
30E – CATCHBASIN TRAP (HOOD AND FLAP, SANITARY OUTFALL)	49-50
30F – PVC HOOD (ELBOW)	49-50
30FG – FLAP GATE	49-50
30SL – MANHOLE FRAME AND LID WITH SLOTTED LID	49-50
30WT – WATERTIGHT MANHOLE FRAME AND LID	49-50
30SG – SLUICE GATE	55
70 - TACK COAT	52-53
71A - JOINT FILLING IN BITUMINOUS PAVEMENTS	54-56
76 – MAINTENANCE AND PROTECTION OF TRAFFIC (LUMP SUM)	57-62
77S – SANITARY SEWAGE & STORM WATERS DIVERSION	63
80 – REMOVED AND RESET EXISTING RIP-RAP	64
80H – DRY RIP-RAP (HEAVY)	65-66
80L – DRY RIP-RAP (LIGHT)	67-68
80M – DRY RIP-RAP (MEDIUM)	69-70
83PSP - Temporary Sheet Piling & Bracing for Structures	71-73

<b><u>ITEM</u></b>	<b><u>PAGE</u></b>
83TXS- TEMPORARY SHEET PILING	74-75
87 – PAVEMENT PROFILING, 0” – 6” AVERAGE REMOVAL	76-78
87 – PAVEMENT PROFILING, 0” – 8” AVERAGE REMOVAL	79-81
94SBV – STONE CURB (GRANITE)	82-83
96 – RESET GRANITE CURB	84
97 - CONCRETE CURB	85-90
97R - CONCRETE CURB ON RADIUS	85-90
97G - CONCRETE CURB AND GUTTER	85-90
97GR - CONCRETE CURB AND GUTTER ON RADIUS	85-90
104 – RESET EXISTING BRICK OR FLAGSTONE WALKS OR DRIVEWAYS	91
104A – BRICK WALK OR DRIVEWAY	91
104B – FLAGSTONE WALK OR DRIVEWAY	91
105 - CONCRETE SIDEWALK	92-98
105WP – DETECTABLE WARNING PLATE – ADA COMPLIANT	99
106 – ALUMINIZED CHAIN LINK FENCE (4’ HIGH)	100-101
106R – FENCE RELOCATION	102
106X – REMOVE EXISTING FENCE	103
111 – GUIDE RAIL	104-112
121A – TOPSOIL FURNISHED AND PLACED	113-114
123 - SEEDING	115-117
126 – GEOTEXTILE	118-120
200 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS	121-122
200 PS – PUMP STATION/WET WELL DEMOLITION	123
201PS – PUMP STATION	124-142
202 – PRECAST MANHOLE	143-146
202SB – REPAIR MANHOLE TOP SLAB	147
202WT - PRECAST MANHOLE WITH WATERTIGHT FRAME AND LID	148
202X – EXTRA DEPTH OF MANHOLE	149
202Z – REMOVE EXISTING MANHOLE	150
204A – PRECAST CATCHBASIN	151
204BT – PRECAST CATCHBASIN, TYPE ‘C’ GRATE	152
204R - REPAIRING CATCHBASINS, INLETS	153
204V - PRECAST CATCHBASIN	154
204Z - REMOVE EXISTING CATCHBASINS	155
207M - MECHANICAL PLUG	156
207M1 – SANITARY SEWER	156

<b><u>ITEM</u></b>	<b><u>PAGE</u></b>
207M-2 - WATER MAIN	156
207 – PLUG PIPE	157
209 - SEDIMENT & EROSION CONTROL	158-169
210 – DUCTILE IRON WATER MAIN, CLASS 52 CEMENT LINED	170-175
210 - WATER MAIN	176-185
210PR-PRESSURE REDUCING PIT	186-187
210PVC – PVC WATER MAIN	188-191
210SS – DUCTILE IRON STORM SEWER, CLASS 50	192-196
210SS – DUCTILE IRON STORM SEWER, CLASS 50	197-202
211 – WATER SERVICE “K” COPPER TUBING	203-204
211 – WATER SERVICE TUBING	205-206
211K - CUT OFF EXISTING WATER SERVICE	207
213 – METER AND BY-PASS PIT	208-209
214 – POTABLE WATER TUBING	210-211
220 - RESILIENT SEATED MECHANICAL VALVES	212
220-12 – DOUBLE DISC SEATED GATE VALVES WITH BOX	213
220Z – REMOVE EXISTING GATE VALVE	214
220Z(B) - REMOVE EXISTING GATE VALVE BOX	215
221 – BRICK CASTINGS	216
225 – BUTTERFLY VALVE WITH BOX	217-218
230 - HYDRANTS	219
230E – HYDRANT EXTENSION	220
230Z - REMOVE EXISTING HYDRANT	221
240 – TAPPING VALVE & SLEEVE WITH BOX	222-223
250 - CORPORATION STOP	224
251 – CURB SHUTOFF VALVE, BALL TYPE	225
403.118902 – ASPHALT CONCRETE TYPE 1 BASE	226
403.138902 – ASPHALT CONCRETE TYPE 3 BINDER COURSE	227
403.178902– ASPHALT CONCRETE TYPE 6 TOP COURSE	228
403.198902– ASPHALT CONCRETE TYPE 7 TOP COURSE	229
404.00 – STREET PRINT	230-231
420 - ASPHALT PRICE ADJUSTMENT WITH FUEL ALLOWANCE	232-234
510 – REGRADE MANHOLE, CATCHBASIN AND INLET CASTINGS	235
511 – REGRADE WATER AND GAS CASTINGS	235
512 – REGRADE LARGE CASTINGS	235
606-2 GUIDERAIL LONG TERMINAL SECTION	236
608 - BRICK PAVING AND MORTAR SETTING BED	237-238

<b><u>ITEM</u></b>	<b><u>PAGE</u></b>
1000 - SURVEY & STAKEOUT	239
1001 – SITE SIGN	240-242
02221 – DRAINAGE DITCH CLEANING	243
02222 – CUT AND SHAPE DRAINAGE DITCHES	244
16010 – GENERAL PROVISIONS – ELECTRICAL WORK	245-259
16100 – BASIC MATERIALS AND METHODS FOR ELECTRICAL	260-273
16400 – DISTRIBUTION AND SERVICE	274-276
EXCAVATION - General Specification	277-288
HYDRAULIC CUSHION FLAP GATES	289
ITEM PCB – PRECAST CONCRETE BUILDING	290-291
PROTECTION OF EXISTING STREET TREES	292-294
PD-3 - EXISTING CONCRETE BRIDGE ABUTMENT REPAIRS	295

## ITEM 1 – CLEARING AND GRUBBING (LUMP SUM)

1. Description. Under this item, the Contractor shall clear and grub the area where construction is to be done as defined within the grading limit lines shown on the plans. He shall protect existing features that are to be retained and repair injuries as specified and as directed by the Engineer.
2. Construction Details.
  - A. Location of Work. The Contractor shall clear and grub all trees and vegetation within the grading limit lines unless otherwise directed. Obtain Engineer's approval prior to removing each tree. Clearing beyond the areas of construction shall be only where specified or directed. It shall not include clearing or grubbing of borrow or other pit areas from which material is secured.
  - B. Grubbing and Cutting. All roots and stumps within the limits of the road section shall be grubbed and excavated unless otherwise specified or approved, except that no grubbing will be required where the foundations are satisfactory and the finished grade will be six feet (6') or more above the original ground surface. Where trees are cleared and grubbing is not required, the trunks shall be cut off not more than six inches (6") above the original ground surface. At the completion of the work on the contract, the Contractor shall cut all grass, weeds, and brush within the limits of the right-of-way and easement lines as directed by the Engineer.
  - C. Disposal. All wood and brush shall be disposed of within fifteen (15) days after cutting or felling unless otherwise approved. No tree trunks, stumps, or other debris shall be felled, sidecast, or placed outside the limits of the road section. No debris shall be left within 300 feet of the highway unless approved in writing by the Engineer. The location of disposal areas shall be approved in writing by the Engineer, and shall be acquired by the Contractor at his own expense.
  - D. Protection and Restoration. The Contractor shall prevent all damage to pipes, conduits, wires, cables, or structures above or below ground. No land monuments, property markers, or official datum points shall be damaged or removed until an authorized agent has witnessed or otherwise referenced their location and approved their removal. The contractor shall so control his operations as to prevent damage to trees and shrubs that are to be preserved. The Contractor shall carefully cut off all branches of trees hanging within sixteen feet (16') above any part of the roadway or which have been broken or injured during construction. Where soil over the roots of trees to be preserved has become compacted, it shall be restored by proper cultivation to a condition to permit adequate aeration of the soil.

3. Method of Measurement. Monthly payment will be made under this item in proportion to the amount of work done as determined by the Engineer.
4. Basis of Payment. The lump sum bid for this item shall include the cost of furnishing all materials, labor, and equipment necessary to satisfactorily complete the work.

## ITEM 1M - MOBILIZATION

1. Description. Under this item, the contractor shall furnish, maintain and remove such items as are necessary for his general headquarters of operation on the project. These items shall include but not be limited to: the contractor's field office, maintenance and storage sheds, fuel tanks, equipment and storage yard, and sanitary facilities. The contractor shall arrange with utility companies for fuel, temporary power and other services needed to maintain his facilities.
2. Materials. Materials required for this item are not to be incorporated into the work as such, and quantity, types and other factors, and the adequacy thereof, shall be determined by the contractor. The temporary facilities shall conform to local, State and Federal safety, health, and pollution laws in effect at the time of performing the work.

Temporary facilities provided by the contractor shall be so maintained as to comply with any pertinent local, State, or Federal law, regulation, or code. Good housekeeping shall be practiced and services performed in a workmanlike manner.

3. Method of Measurement and Basis of Payment. The lump sum price bid for this item shall include the cost of furnishing all labor, equipment, and materials necessary to satisfactorily complete the work. The cost of work in advance of construction operations, and not directly attributable to any specific bid item shall be included in the lump sum price bid for this item. The lump sum price bid shall not exceed four percent (4%) of the total contract bid price. Bids exceeding 4% shall be adjusted by the City of Binghamton.

## ITEM 2A – UNCLASSIFIED EXCAVATION

1. Description. Under this item, the Contractor shall remove and dispose of materials in accordance with these specifications.
2. Construction Details. The Contractor shall remove all earth or other material required by the plans or as ordered by the Engineer. It shall be the responsibility of the contractor to dispose of all excavated materials that are not used on this project.

Earth excavation shall include the excavation of muck, hardpan, soft shale, soft slate, loose, disintegrated, or decomposed ledge rock, old macadam, topsoil and sod.

Other material shall include the removal of all humus, spongy material, roots, stumps and other objectionable materials as ordered by the Engineer.

Excavation of all boulders of more than 13 cubic feet in volume, concrete culverts, concrete pavements, all hard and solid ledge rock, and other similar materials, shall be paid for under Item 2AR – Concrete and Rock Excavation.

Where unsuitable material has been removed, the material used for replacement shall be in accordance with details shown on the plans or as ordered by the Engineer.

The contractor shall conduct all excavation operations in a safe and prudent manner in order to avoid damage to private property and utilities and to vegetation outside of the grading limits. All damages caused by the contractor's operations shall be repaired by the contractor at his own expense and to the satisfaction of the Engineer. No direct payment will be made for any precautionary measures. The cost of these measures shall be included in the price bid for this item.

3. Method of Measurement. The quantity of excavation to be paid for under this item shall be the number of cubic yards of unclassified material measured in its original position, excavated and disposed of as required by the plans or as ordered by the Engineer.
4. Basis of Payment. The unit price bid per cubic yard for this item shall include the cost of furnishing all labor, materials and equipment necessary to complete the work.

## ITEM 2AR – CONCRETE AND ROCK EXCAVATION

1. Description. Under this item, the Contractor shall remove and dispose of materials in accordance with these specifications.
2. Construction Details. The Contractor shall remove all concrete, rock, and other materials required by the plans or as ordered by the Engineer. It shall be the responsibility of the Contractor to dispose of all excavated materials that are not to be used on this project.

Concrete pavement and rock excavation shall include excavation of all boulders of more than 13 cubic feet in volume, or pieces of concrete pavement. Any concrete pavement or rock that is smaller in size than 13 cubic yards will not be measured for payment unless jackhammers, saws or explosives are required to loosen and remove the materials.

The contractor shall conduct all excavation operations in a safe and prudent manner in order to avoid damage to private property and utilities and to vegetation outside of the grading limits. All damages caused by the Contractor's operations shall be repaired by the Contractor at his own expense and to the satisfaction of the Engineer. No direct payment will be made for any precautionary measures. The cost of these measures shall be included in the price bid for this item.

3. Method of Measurement. The quantity of excavation to be paid for under this item shall be the number of cubic yards of concrete and/or rock measured in its original position, excavated and disposed of as required by the plans and specifications. The payment limits of the excavation shall not exceed those shown on the plans unless otherwise ordered in writing by the Engineer.
4. Basis of Payment. The unit price bid per cubic yard for this item shall include the cost of furnishing all labor, materials and equipment necessary to complete the work.

ITEM 2EFB – SELECT GRANULAR FILL

1. Description. Under this item, the Contractor shall furnish and place selected granular fill necessary to complete the embankments, backfill and subbase course to the required lines and grades as shown on the plans and in the specifications.
2. Test and Control Methods. Materials tests and quality control methods pertaining to the work of this section will be performed in conformance with the procedures contained in the New York State Department of Transportation Standard Specifications which are current on the date of advertisement for bids or as otherwise stated herein.
3. Materials. Materials furnished shall consist of approved Blast Furnace Slag, Stone, Sand and Gravel or blends of these materials. The material shall be sound, hard, durable stone, run-of-bank gravel, sand, or other acceptable granular material. Contractor shall furnish evidence that material is from a New York State Department of Transportation approved source for NYS DOT Item 304.06 and that it meets all requirements stated herein.

It shall be the Contractor's responsibility to provide a material which meets this specification and is within his capabilities to fine grade to the required tolerances. Should the subbase course become unstable at any time prior to the placement of the overlying course due to the gradation of the material furnished, the Contractor shall, at his own expense, correct the unstable condition to the satisfaction of the Engineer.

A. Gradation.

Sieve Size Designation	Percent Passing by Weight
2-Inch	100
1/4-Inch	30-65
No. 40	5-40
No. 200	0-10

- B. Soundness. Material will be accepted on the basis of a Magnesium Sulfate Soundness Loss after 4 cycles of 20 percent or less.
- C. Plasticity Index. The Plasticity Index of the material passing the No. 40 mesh sieve shall not exceed 5.0.
- D. Elongated Particles. Not more than 30 percent, by weight, of the particles retained on a 1/2-inch sieve shall consist of flat or elongated particles. A flat or elongated particle is defined herein as one which has its greatest dimension more than 3 times its least dimension. Acceptance for this requirement will normally be based on a visual inspection by the Engineer. When the City of Binghamton elects to test for this requirement, material with a percentage greater than 30 will be rejected.

All material shall meet the specified gradation prior to placement on the grade.  
All processing shall be completed at the source.

4. Stockpiling. All material shall be stockpiled. Materials shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials, even though accepted before storage, shall be inspected prior to their use in the work and shall meet the requirements of the contract at the time of their use.
  
5. Construction Details.
  - A. Unless otherwise shown or indicated on the plans, filling or backfilling material shall be deposited in horizontal layers not to exceed 8 inches in thickness before compaction, and thoroughly compacted. If contractor can demonstrate that his compaction equipment can successfully place material in greater lift thicknesses, Engineer may alter requirements. Water shall be added in such amounts necessary to obtain satisfactory compaction.
  
  - B. Compaction.
    1. General. Compaction Densities shall be of the percentage of the maximum density obtainable at optimum moisture content as determined in accordance with ASTM D1557 (Modified Proctor). Filed density tests shall be made in accordance with either ASTM D1556 (sand cone method) or ASTM D2922 (nuclear method). Each layer of backfill shall be moistened or dried as required, and shall be compacted to the following densities:
      - a. To one foot (1') above pipe in all areas, 95%.
      - b. Under Paved Areas (including walkways), 95%.
      - c. Under Lawn Areas, 93%.
      - d. Structures, Building Slabs, and Steps: 97%.
      - e. Impervious Backfill, 95% for entire depth.
      - f. All other areas, 90%.
  
    2. Compaction Densities:
      - a. To one foot (1') above pipe in all areas, 95%.
      - b. Under Paved Areas (including walkways), 95%.
      - c. Under Lawn Areas, 93%.
      - d. Structures, Building Slabs, and Steps: 97%.
      - e. Impervious Backfill, 95% for entire depth.
      - f. All other areas, 90%.
  
    3. Methods and Equipment for compaction shall be at the contractor's option, except that flooding will not be allowed. The Engineer reserves the right to reject methods or equipment that does not consistently produce the specified results.  
In compacting by rolling or operating heavy equipment over the pipe lines, displacement of, or injury to pipe and structures shall be avoided. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Engineer and at the expense of the contractor.

4. Failure to Meet Specified Densities. In areas where the field density test results do not meet the required minimum density the material shall be re-excavated, backfilled, compacted and tested. The limits of the rework shall extend to the locations of acceptable field density tests.

C. Compaction Testing

1. Test Methods. Laboratory tests to determine maximum density at optimum moisture content shall be in accordance with ASTM D1557. Field density tests shall be in accordance with ASTM D1556 (sand cone method), or ASTM D2922 (nuclear method), except that moisture content may be determined by other methods if it can be shown that the method used produces similar results. Tests shall be taken to the depth of the entire lift thickness or probe limit of the gauge.

Laboratory and field tests to determine compaction shall be performed by an independent soils testing laboratory hired by the contractor and acceptable to the Engineer.

2. Number of Tests
  - a. For each change in fill and backfill material, perform one Laboratory moisture-density relationship test but not less than one test for each 5000 cubic yards or fraction thereof of material used.
  - b. Conduct not less than one field in-place density test of subgrade and one in-place density test of each compacted fill or backfill layer for every 6000 square feet of overlying area or fraction thereof. In trenches, compaction tests shall be taken in each lift of each 400 feet of trench.
3. Location of Tests. The Contractor shall be responsible for coordinating the required testing frequency with the laboratory. All tests shall be performed in the presence of the inspector, unless otherwise directed. In cases of dispute, the Engineer will determine when and where the tests shall be taken. Material for laboratory tests shall be obtained from test pits excavated at locations determined by the Engineer. These test pits shall be excavated and the sample material obtained prior to other excavation on the project. The samples shall be taken by a representative of the firm that is to do the testing. As it is the intent that the samples taken for laboratory testing be representative of the majority of the soil in the work area it may be necessary to excavate more test pits than the number of samples required. The costs of these test pits are incidental to the work.

If a technician is not available to take the test when required, the contractor may, at is option, leave that portion of the work open until the test is taken or may continue filling and compaction operations and when the technician is available, re-excavate to the required depth to allow the test to be performed.

4. The laboratory will copy all test results to the Engineer's office (2 copies).

Compaction reports shall, at a minimum, contain the following information:

- a. Street name, station, centerline offset, and depth below/above subgrade of each test.
- b. Specific use of material placed (i.e., sewer trench, water trench, etc.)
- c. Name of person taking test.
- d. Method of testing and standards used.
- e. Type and source of material.
- f. Optimum moisture content.
- g. Maximum dry density.
- h. Field wet density.
- i. Field moisture content.
- j. Percent compaction.
- k. State whether or not the tests comply with the specifications.
- l. Name and signature of person preparing report.
- m. Probe depth.

- D. When a subbase course has been placed, but subsequent paving operations have been delayed so that the subbase has been disturbed by frost action or by precipitation that saturates subbase, the Contractor shall re-work and re-compact the subbase to achieve desired densities where directed by the Engineer.

6. Basis of Payment. The quantity of selected granular fill to be paid for under this item shall be the number of cubic yards measured in place between the maximum payment lines as shown or indicated on the plans. The unit price bid for this work shall include the cost of furnishing all labor, material and equipment necessary to complete the work. No direct payment will be made for any losses of material which may result from shrinkage, compaction, foundation settlement, waste, overflow, erosion, leakage or other causes; the cost of such losses shall be included in the price bid for this item.

## ITEM 2RER – ROADWAY EXCAVATION AND REGRADING

1. Description. Under this item, the Contractor shall excavate the existing asphalt concrete pavement and subbase to the subgrade and regrade the subbase as required or as ordered by the Engineer.
2. Construction Details. Prior to removal of asphalt concrete pavement, the Contractor shall remove all castings and valve boxes in the roadway and cover with steel plates all openings where castings and valves were removed.

After the existing asphalt concrete pavement has been removed, the Contractor shall excavate material from existing subbase to the required subgrade as ordered by the Engineer. All materials excavated to meet required grades shall be removed from the site and shall be disposed of by the Contractor. The Contractor shall fill and compact any areas necessary to new subgrade with material approved by the Engineer. Undercuts below subgrade shall be paid for under Item 2A.

A new subbase shall be constructed with a maximum of twelve inches (12”) of Select Granular Material, Item 4, as ordered by the Engineer. The subbase shall be fine graded and seal rolled to the required depth, so that when new asphalt concrete pavement is placed a curb reveal of six inches (6”), or as shown on the plans, is obtained. The Engineer shall notify the Contractor as to the depth of asphalt pavement to be constructed. Select Granular Material for new subbase shall be paid for under Item 4. Prior to placement of new subbase, the Contractor shall submit for approval by the Engineer his proposed methods of compaction and rolling, and the type of equipment he proposes to use.

Upon completing the compaction of the subbase, the Contractor shall arrange, through the Engineer or his representative, for a visual inspection of the site. Any areas identified by the inspection as being soft or otherwise unacceptable shall be removed and replaced by the Contractor at his own expense. The Contractor shall be responsible for maintaining the integrity of the subbase, regardless of the time lapse between the Engineer’s acceptance and any subsequent paving. Quantities shall be adjusted accordingly for repairs made during this interim *only*.

After the base course of asphalt has been constructed and before the top course of asphalt is constructed, the Contractor shall reset all castings and valve boxes to the required finished grades. The Contractor shall make all necessary repairs to the base course of asphalt upon completion of the installation of the castings and valve boxes.

3. Method of Measurement and Basis of Payment. The unit price bid per square yard shall include the cost of furnishing labor, equipment and materials necessary to complete the work, including transportation of excavated material.

ITEM 2S – STUMP REMOVAL

- 1. Description. Under this item, the contractor shall remove designated stumps of each size group as listed in these specifications.
- 2. Size Groups. Stump removal shall be measured by the number of stumps of each size group to be removed. The size of each stump shall be determined by the diameter of the stump measured one foot (1') above ground elevation. Size groups shall be as follows:

Item 2S-1	0" – 6"
Item 2S-2	6" – 12"
Item 2S-3	12" – 18"
Item 2S-4	18" – 24"
Item 2S-5	24" – 30"
Item 2S-6	30" and over

- 3. Materials. The materials for backfilling the stump holes and establishing grass on the stump hole areas shall be paid for under Items 2EFB – Select Granular Fill; 121A – Topsoil; and 123 – Seeding.
- 4. Construction Details. The contractor shall remove the stump from its present position and dispose of it in an approved manner. Any damage done to curbs and sidewalks during removal shall be the responsibility of the contractor and shall be replaced at his expense.
- 5. Method of Measurement and Basis of Payment. The unit price bid for each stump removed under the respective size group shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

## ITEM 2T – TREE REMOVAL

1. Description. Under this item, the contractor shall fell trees, disposing of all wood and debris, as shown on the plans or as ordered by the Engineer.
2. Size Groups. Tree removal shall be measured by the number of trees of each size group to be removed. The size of each tree shall be determined by measurements made at 4½ feet (commonly referred to as “D.B.H.” – Diameter Breast High) above the ground. Size groups shall be as follows:

Item 2T-1	0” – 6”
Item 2T-2	6” – 12”
Item 2T-3	12” – 18”
Item 2T-4	18” – 24”
Item 2T-5	24” – 30”
Item 2T-6	30” and over

3. General. No tree shown on the plans or listed for removal shall be cut until it is marked by the City and specific written approval is received by the Contractor from the Engineer.

All trees shall be “topped” and “limbed” before felling unless otherwise approved.

If, in the opinion of the Engineer, unsafe tools, equipment or methods are employed, work shall be stopped until such unsafe conditions have been corrected.

The contractor shall protect and shall be liable for injuries to all plants, curbs, pavements, structures, utility lines and other features on the highway right-of-way and adjacent property. Replacements and restoration shall be as approved by the Engineer.

All trunks, branches, wood chips, rubbish and debris resulting from the work shall be removed and disposed of by the contractor.

Stump and stump hole backfill shall be paid for under item 2S, Stump Removal.

4. Basis of Payment. The unit price bid for each tree removed under the respective size group shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. Removal of stumps shall be paid for separately.

ITEM 2X - WASHED CRUSHED STONE

1. Description. Under this item, the Contractor shall furnish, place, and compact crushed stone of the size and depth called for on the plans or as ordered by the Engineer.
2. Materials. Crushed stone shall consist of washed, clean, durable, sharp angle fragments of rock or uniform quality throughout. The particles shall be of such a size gradation as that shown in the following chart.

**SCREEN SIZE**

Size Designation	4-Inch	3-Inch	2½-Inch	2-Inch	1½-Inch	1-Inch	½-Inch	¼-Inch	⅛-Inch	1/16-Inch
No. 1B			-	-	-	-	-	100	90-100	0-15
No. 1A			-	-	-	-	100	90-100	0-15	-
No. 1			-	-	-	100	90-100	0-15	-	-
No. 2			-	-	100	90-100	0-15	-	-	-
No. 3			100	90-100	35-70	0-15	-	-	-	-
No. 4	100	90-100		0-15						
No. 5	90-100	0-15								

**NOTE:** Numbers shown are percentages by weight passing that screen size.

Crushed stone used as aggregate in asphalt concrete mixes and as a subbase pavement course shall meet the physical requirements and gradation requirements as specified under Section 703-02 of the New York State Standard Specifications dated January 2008, with latest addenda.

Crushed stone used for pipe bedding and underdrain shall meet the gradation requirements specified above and shall meet the physical requirements of Soundness, Plasticity Index and Elongated Particles as specified under *Section 304-2.02 Materials Requirements for Subbase Course* of the New York State Department of Transportation Standard Specifications dated January 2008, with latest addenda.

3. Construction Methods.

- A. Crushed Stone used as a subbase material in asphalt pavement shall be placed in accordance with *Section 304-3 Construction Details Subbase Course* of the New York State Department of Transportation Standard Specifications dated January 2008, with latest addenda, except that no vibratory or sheepfoot compaction equipment will be used.
- B. Crushed Stone used for pipe bedding and underdrain shall be placed in accordance with the *Filling and Backfilling at Structures and Pipes* section under *Item 5 – Trench Excavation* of these specifications.

4. Method of Measurement and Basis of Payment. The quantity of crushed stone to be paid for under this item shall be the number of cubic yards measured in its final compacted position, as shown on the plans or as directed by the engineer. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. Delivery tickets shall accompany each delivery and may be used by the City to assist in verifying actual quantities placed.

No direct payment will be made for any losses of material which may result from shrinkage, compaction, foundation settlement, waste, overflow, erosion, leakage or other causes; the cost of such losses shall be included in the price bid for this item.

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
2X-1B	No. 1B Washed Crushed Stone	C.Y.
2X-1A	No. 1A Washed Crushed Stone	C.Y.
2X-1	No. 1 Washed Crushed Stone	C.Y.
2X-2	No. 2 Washed Crushed Stone	C.Y.
2X-3	No. 3 Washed Crushed Stone	C.Y.
2X-4	No. 4 Washed Crushed Stone	C.Y.
2X-5	No. 5 Washed Crushed Stone	C.Y.

#### ITEM 4 - SELECT GRANULAR MATERIAL

1. Description. Under this item, the Contractor shall furnish and place select granular material necessary to complete the subbase course and other areas to the required lines and grades as shown on the plans and in the specifications.
2. Test and Control Methods. Materials tests and quality control methods pertaining to the work of this section will be performed in conformance with the procedures contained in the New York State Department of Transportation Standard Specifications which are current on the date of advertisement for bids or as otherwise stated herein.
3. Materials. Materials furnish for Types 1, 3, and 4 shall consist of approved Blast Furnace Slag, Stone, Sand and Gravel or blends of these materials. For Type 2, furnish materials consisting of approved Blast Furnace Slag or of Stone which is the product of crushing or blasting ledge rock, or a blend of Blast Furnace Slag and of Stone. Contractor shall furnish a stockpile approval (from within previous year) showing material from the source was certified approved by the New York State Department of Transportation (NYSDOT) for Item 304.15 and that it meets all requirements stated herein. Contractor shall submit results of gradation and modified proctor tests for Engineer's approval prior to placement of material. Tests shall be taken from designated stockpiles for City of Binghamton projects. Conform to NYSDOT Section 304-1.02 for optional type.

It shall be the Contractor's responsibility to provide a material which meets this specification and is within his capabilities to fine grade to the required tolerances. Should the subbase course become unstable at any time prior to the placement of the overlying course due to the gradation of the material furnished, the Contractor shall, at his own expense, correct the unstable condition to the satisfaction of the Engineer.

Material shall meet the following requirements:

- A. Gradation. As per NYSDOT Table 304-1. Test in accordance with NYSDOT "Test Method for the Grain Size Analysis of Granular Soil Materials" (latest edition).
- B. Soundness.\* Material will be accepted on the basis of a Magnesium Sulfate Soundness Loss after 4 cycles of 20 percent or less.
- C. Plasticity Index.\* The Plasticity Index of the material passing the No. 40 mesh sieve shall not exceed 5.0.
- D. Elongated Particles.\* Not more than 30 percent, by weight, of the particles retained on a 1/2-inch sieve shall consist of flat or elongated particles. A flat or elongated particle is defined herein as one which has its greatest dimension more than 3 times its least dimension. Acceptance for this requirement will normally be based on a visual inspection by the Engineer. When the City of Binghamton

elects to test for this requirement, material with a percentage greater than 30 will be rejected.

NYSDOT stockpile approval within the previous year will serve as evidence these criteria will be met.

All material shall meet the specified gradation prior to placement on the grade.

All processing shall be completed at the source.

4. Stockpiling. All material shall be stockpiled at the source. Materials shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials, even though accepted before storage, shall be inspected prior to their use in the work and shall meet the requirements of the contract at the time of their use.

Material shall be furnished from stockpiles which have been designated for City of Binghamton projects. Methods of stockpiling shall be in accordance with NYSDOT procedure. Size and location and identifying # of stockpiles shall be indicated on the contractor's submittals for approval. Stockpiles may be used to supply other City projects in addition to this contract. Stockpiles shall be accessible for inspection and testing by the City during working hours. Supplier shall furnish equipment and labor required to obtain samples in accordance with this specification.

5. Construction Details.

Unless otherwise shown or indicated on the plans, filling or backfilling material shall be deposited in horizontal layers not to exceed 8-inches in thickness before compaction, and thoroughly compacted. If Contractor can demonstrate that his compaction equipment can successfully place material in greater lift thicknesses, Engineer may alter requirements. Water shall be added in such amounts necessary to obtain satisfactory compaction.

A. Compaction.

1. General. Compaction Densities shall be of the percentage of the maximum density obtainable at optimum moisture content as determined in accordance with ASTM D1557 (Modified Proctor).
2. Required Compaction Densities. Each layer of backfill shall be moistened or dried as required, and shall be compacted to the following densities:
  - a. To one foot (1') above pipe in all areas, 95%.
  - b. Under Paved Areas (including walkways), 95%.
  - c. Under Lawn Areas, 93%.
  - d. Structures, Building Slabs, and Steps, 97%.
  - e. Impervious Backfill, 95% for entire depth.
  - f. All other areas, 90%.

3. Methods of Equipment for compaction shall conform to Section 203-3.12B of the New York State Department of Transportation Specifications. Flooding will not be allowed. The Engineer reserves the right to reject methods or equipment that does not consistently produce the specified results.
4. In compacting by rolling or operating heavy equipment over the pipe lines, displacement of, or injury to pipe and structures shall be avoided. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Engineer and at the expense of the contractor.
5. Failure to Meet Specified Densities. In areas where the field density test results do not meet the required minimum density the material shall be reexcavated, backfilled, compacted and tested. The limits of the rework shall extend to the locations of acceptable field density tests.

B. Compaction Testing

1. Responsibility. Laboratory and field tests to determine compaction shall be performed by an independent soils testing laboratory hired by the contractor and acceptable to the Engineer.
2. Test Methods. Laboratory tests to determine maximum density at optimum moisture content shall be in accordance with ASTM D1557 (modified proctor). A sieve analysis shall be performed in accordance with NYSDOT procedures.

Field density tests shall be in accordance with ASTM D1556 (sand cone method), or ASTM D2922 (nuclear method). Nuclear moisture density testing by direct transmission (probe) methods will be acceptable for compacted layers not exceeding 12-inches in thickness. Nuclear backscatter methods will not be acceptable. Tests shall be taken to the depth of the entire lift thickness or probe limit of the gauge.

3. Number of Tests.
  - a. For each stockpile or change in fill and backfill material, perform one Laboratory moisture-density relationship test and sieve analysis but not less than one test for each 1000 cubic yards or fraction thereof of material used.
  - b. Conduct not less than one field in-place density test of subgrade and one in-place density test of each compacted fill or backfill layer for every 6000 square feet of overlying area or fraction

thereof. In trenches, compaction tests shall be taken in each lift of each 400-feet of trench.

4. Location of Tests. The Contractor shall be responsible for coordinating the required testing frequency with the laboratory. All tests shall be performed in the presence of the inspector, unless otherwise directed. In cases of dispute, the Engineer will determine when and where the tests shall be taken. Material for laboratory tests shall be obtained from stockpiles at the source or at locations A.O.B.E. Samples shall be taken in accordance with the publication entitled NYSDOT "Procedure for The Control of Granular Materials" (latest edition) or A.O.B.E. The samples shall be taken by a representative of the firm that is to do the testing. As it is the intent that the samples taken for laboratory testing be representative of the majority of the soil in the work area it may be necessary to take more samples than the minimum number required. The costs of these samples are incidental to the work.

If a technician is not available to take the test when required, the Contractor may, at his option, leave that portion of the work open until the test is taken or may continue filling and compaction operations and when the technician is available, re-excavate to the required depth to allow the test to be performed.

5. The laboratory will copy all test results to the Engineer's office (2 copies).

Compaction reports shall, at a minimum, contain the following information:

- a. Street name, station, centerline offset, and depth below/above subgrade of each test.
- b. Specific use of material placed (i.e., sewer trench, water trench, etc.).
- c. Name of person taking test.
- d. Method of testing and standards used.
- e. Type and source of material.
- f. Optimum moisture content.
- g. Maximum dry density.
- h. Field wet density.
- i. Field moisture content.
- j. Percent compaction.
- k. State whether or not the tests comply with the specifications.
- l. Name and signature of person preparing report.
- m. Probe depth.

- C. When a subbase course has been placed, but subsequent paving operations have been delayed so that the subbase has been disturbed by frost action or by precipitation that saturates subbase, the Contractor shall re-work and re-compact the subbase to achieve desired densities where directed by the Engineer.
6. Basis of Payment. The quantity of select granular material to be paid for under this item shall be the number of cubic yards measured in place between the maximum payment lines as shown or indicated on the plans. Delivery tickets shall accompany each delivery and may be used by the City to assist in verifying actual quantities placed. Ticket shall state NYSDOT item number, source location, and stockpile number.

The unit price bid for this work shall include the cost of furnishing all labor, material, equipment, and testing necessary to complete the work.

No direct payment will be made for any losses of material which may result from shrinkage, compaction, foundation settlement, waste, overflow, erosion, leakage or other causes; the cost of such losses shall be included in the price bid for this item.

## ITEM 5 – TRENCHING, BACKFILLING AND COMPACTING

### 1. General

- A. Description. This section covers trench excavation, backfill or disposal of excavated material and compaction as required to install pipelines, manholes, and drainage structures.
- B. Safety. The contractor is responsible for the safety of trench excavations in accordance with local, State and Federal regulations, including New York State Labor Law and OSHA.
- C. Definitions.
1. “Soil” means clay, silt, loam, sand, gravel, topsoil, muck, peat, loose rock, boulders, and all other material not classified as solid rock.
  2. “Solid Rock” means all rock material over ½ cubic yard volume that cannot readily be removed with a power driven backhoe of at least ¾ yard capacity of modern design and in good working condition, except after preliminary breaking by drilling or by the use of explosives. Large blocks of concrete with no dimension less than 18 inches will be classified solid rock if they meet all other criteria. Curb and sidewalks will not be classified as solid rock.
- D. Classifications. All excavation for the installation of pipelines and minor structures is classified as one of the following three:
1. “Trench Excavation” – includes the removal of all materials except solid rock above the elevation of the trench subgrade as shown on the trench excavation detail in the plans.
  2. “Rock Excavation” – includes the removal of all material above the elevation of the trench subgrade shown on the trench excavation detail in the plans and conforming to the definition of solid rock.
  3. “Unstable Material Excavation” – includes the removal of all material below the elevation of the trench subgrade shown on the trench excavation detail on the plans and that does not have sufficient bearing capacity, as determined by the Engineer, in its natural condition to support the pipe or structure.

### 2. Material

- A. Aggregate Pipe Bedding Material. Material for aggregate pipe bedding shall be as specified in Items 2X-1, 2X-2 and 2X-3.

Material other than crushed stone or crushed gravel will not be accepted for Pipe Bedding Material.

The Engineer reserves the right to request any additional tests he may feel necessary and to reject any material that he feels is unsatisfactory.

- B. Select Granular Fill. Select granular fill shall meet the material and gradation requirements of NYSDOT Item 203.07, and as specified in Item 2EFB.
- C. Select Granular Material. Select granular material shall meet the material and gradation requirements of NYSDOT Item 304.15 Subbase Course, and as specified in Item 4.

### 3. Construction Details

- A. General. The contractor shall remove all earth, rock and other material and utilize or dispose of the material as required by the plans and specifications. Trenches shall be excavated to the limits shown on the plans except where otherwise directed by the Engineer.

The contractor shall be responsible for providing a safe place of work in compliance with all federal, state and local safety health laws. The contractor shall notify all underground utility companies of his intended operations prior to commencing any excavation.

- B. Drainage and Dewatering.

1. The contractor shall conduct his operations to prevent the accumulation of water, ice and snow in trenches. The contractor shall construct berms or interceptor ditches, at his expense, to keep surface water from entering trenches. Water that enters the trench shall be removed with pumps or by grading the excavation to drain. Pipes under construction shall not be used for draining the excavation, except with the Engineer's permission. The contractor shall be responsible for all damage to pipes used for drainage or dewatering.
2. Excess material not required for backfill shall be immediately removed from the construction site. When the excavation is through separate layers of material suitable for use as backfill and unsuitable for backfill, the unsuitable material shall be removed separately in a manner that prevents the contamination of suitable material. If the layers of suitable material are less than twelve inches (12") thick or the unsuitable material

comprises more than 75 percent of the excavated material, the contractor will not be required to separately excavate and stockpile suitable material.

Material that becomes unsuitable for backfill because of the contractor's operations shall be removed from the construction site and replaced with material meeting requirements of select borrow at the contractor's expense. Material that is unsuitable for backfill only because of its moisture content shall be brought to the prescribed moisture content by adding water or by drying. Moisture content alone shall not classify excavated material as unsuitable.

3. Stored material shall not obstruct or interfere with road, driveways, sidewalks or drainage ways. Material that would cause such obstruction or interference shall be stored away from the site. As much of this material as necessary for backfill shall be brought back to the site at no additional cost to the owner.
  4. Excavated material meeting the material requirements of other items of the contract may be used for the other items if the contractor furnishes, at no additional cost to the owner, an equal quantity of material suitable for backfill.
- C. Prevention of Soil Erosion and Water Pollution. Disposal of excavated material in the beds of live or intermittent drainage channels will not be permitted under any circumstances. Rechannelization of streams or drainage channels resulting in the direction of flow against banks not protected with a substantial growth of vegetation will not be permitted unless the contractor provides approved protection material on such banks. Stream crossings by construction vehicles shall be kept to a minimum and shall not result in disruption of the flow in the natural stream or channel or in exposure of raw soil along the banks. Erosion control devices such as settling basins, hay bales or filters must be used to prevent sediment from leaving construction site and entering surface waters.
- D. Restoration of Borrow and Waste Areas. Borrow areas, waste areas and stockpile areas outside of the work limits of the project shall be graded and seeded before final payment for the project will be made. Areas shall be graded to blend in to the existing landscape. All areas shall be graded to drain with no depressions or unsightly mounds. No slopes shall be more than 1 vertical to 2 horizontal. Seeding shall meet the requirements of seeding for open areas or seeding of sloped areas in the Landscape Restoration specification. No separate payment will be made for this work.
- E. Trenching for Pipe Lines.

1. Length of Open Trench. The length of trench to be opened at one time shall be kept within reasonable limits and, unless otherwise permitted or directed by the Engineer, shall not be longer than 200 feet in advance of the completed work, nor more than 100 feet in the rear of the completed work. The excavation of the trench shall be fully complete at least 20 feet in advance of pipe laying unless otherwise permitted by the Engineer.
2. Depth of Trench. Trenches shall be excavated to the sub grade elevation shown on the drawings.
3. Widths of Trenches. Trenches shall be excavated to width not in excess of two feet (2') plus the outside diameter of the pipe. The sides of trenches shall be as vertical as practicable to the height of one foot (1') above the pipe. If the indicated trench widths are exceeded, then concrete cradles, or other special installation procedures may be required, and shall be provided where directed by the Engineer. Cost of redesign and increased costs due to concrete cradles and special installation shall be borne by the contractor.

F. Excavation for Structures.

1. Excavations for manholes and other structures and appurtenances shall be of sufficient size for the proper installation of the structure, including sheeting and bracing if required, and to permit inspection of the work. Care shall be taken to provide an undisturbed sub grade. If necessary, the subgrade shall be trimmed by hand to insure that an undisturbed foundation is provided.
2. Subgrade shall be approved by the Engineer before foundation concrete is placed. Where rock is encountered, the surface upon which concrete is to be placed shall be clean and free of all loose fragments, boulders, gravel, earth and other objectionable substances. Rock surfaces shall be reasonable level or shelved, and shall be sufficiently rough for proper concrete bonding.

G. Unstable Material.

1. Material at the subgrade incapable of supporting pipe lines or structures shall be removed. Unstable material shall not be removed or replaced until the Engineer is notified. Removal shall be to the extent and depth directed by the Engineer.
2. The excavation below subgrade shall be filled as directed by the Engineer. Material may be Coarse Aggregate, Run of Bank Gravel, or Unclassified Borrow, as directed by the Engineer.

- H. Pipe Bedding. Unless otherwise shown on the drawings or directed by the Engineer, all pipe shall be installed on “Class B” bedding.
1. “Class B” bedding shall be as shown on the drawings. The subgrade shall be to the depth shown on the drawings. Aggregate Pipe Bedding Material shall be placed the entire width of the trench bottom in layers not over four inches (4”) thick. Each layer shall be compacted to a minimum of 95% maximum density as determined by A.S.T.M. D1557. Bedding material around the haunches of the pipe shall be hand tamped.
  2. “Class A” bedding shall be Concrete Cradle as shown on the drawings. The sub grade shall be to the depth shown on the plans. Concrete shall be as specified in Section 03300 of the New York State Department of Transportation Standard Specifications. It shall have a minimum 28-day strength of 3,000 psi.
- I. Concrete Encasement. Pipe shall be encased in concrete at the locations shown on the plans or when directed by the Engineer. Concrete for encasement shall be as specified in Section 03300 of the New York State Department of Transportation Standard Specifications. It shall have a minimum 38-day strength of 3,000 psi.
- J. Backfill.
1. General. Trenches and excavations shall be backfilled as soon as possible after pipes are laid and structures built. Identification tape, which bears the name of the utility type, shall be placed in all trenches with utilities, in accordance with the standard details.
  2. Materials. Unless called for otherwise on the plans, or ordered by the Engineer, trenches and excavations shall be backfilled with excavated material. Stones, rock fragments, chunks of concrete or pavement larger than the maximum size allowed for the area being backfilled shall be removed from the excavated material before it is used for backfill. Where a specific material for backfill is called for on the drawing, or ordered by the Engineer, it shall meet the material requirements for Part 2, Materials.
    - a. Suitable Material. All material whose composition is satisfactory for use as backfill is designated as suitable material. In general, any mineral (non-organic) soil, blasted or broken rock, concrete or pavement and similar materials of natural or manmade origin are considered as suitable. Moisture content has no bearing upon the suitability of the material.

- b. **Unsuitable Material.** All material containing significant amounts of vegetable or organic matter such as muck, peat, organic silt, topsoil, or sod, is designated as unsuitable.
3. **Gradation.** Materials used as backfill shall meet the gradation requirements for the location where it will be used. The contractor shall remove stones or rock fragments from the material to bring it into compliance with the requirements.
  - a. **To One Foot (1') Above the Pipe.** Backfill material under, around the sides of and to one foot (1') above all pipe shall be Aggregate Pipe Bedding material as specified in Part 2, Materials.
  - b. **Under Paved Areas.** Backfill material under paved areas shall contain no stones, rock fragments, or chunks of pavement larger than six inches (6").
  - c. **Under lawn Areas.** Backfill material under lawn areas shall contain no stones, rock fragments, or chunks of pavement larger than eight inches (8").
  - d. **All Other Areas.** Backfill material in all other areas may contain stone, rock fragments, or chunks of pavement up to one (1) cubic foot in volume.
4. **Moisture Content.** All material used for backfilling trenches and excavations shall be within 2%  $\pm$  of its optimum moisture content. The contractor shall moisten or dry suitable backfill material to meet this requirement.
5. **Placing Backfill.**
  - a. **To One Foot (1') Above the Pipe.** Bedding material shall be placed and compacted in four-inch (4") layers. It shall be brought up evenly on both sides of the pipe.
  - b. **Under Paved and Lawn Areas.** Backfill above one foot (1') over the pipe under paved and lawn areas shall be placed and compacted in layers having a maximum compacted depth of six inches (6").
  - c. **All Other Areas.** Backfill above one foot (1') over the pipe shall be placed and compacted in layers having a maximum compacted depth of 18 inches.

- d. Backfill at Structures. Backfill shall not be placed around structures until concrete has cured sufficiently to withstand the loads that it will be subject to. It shall not be placed until all required coatings have cured.

Backfill shall be placed and compacted in horizontal layers having a maximum compacted depth of six inches (6"). It shall be placed uniformly around the structure.

- e. Top of Backfill. Under paved areas backfill shall be brought to the elevation of the bottom of the subbase material or to the elevation of the pavement surface. If the backfill material is brought to the elevation of the pavement surface, the contractor shall remove it to the elevation of the bottom of the subbase material prior to placing the subbase material, at no additional cost to the owner.

In other areas the backfill shall be brought up to the adjacent ground surface minus the depth of required topsoil and sod. In areas other than roadways, the top of the backfill may be slightly mounded.

All areas that settle shall be refilled to the prescribed elevations.

## 6. Compaction.

- a. General. Compaction Densities shall be of the percentage of the maximum density obtainable at optimum moisture content as determined in accordance with ASTM D1557 (Modified Proctor).
- b. Required Compaction Densities. Each layer of backfill shall be moistened or dried as required, and shall be compacted to the following densities:
1. To one foot (1') above pipe in all areas, 95%.
  2. Under Paved Areas (including walkways), 95%.
  3. Under Lawn Areas, 93%.
  4. Structures, Building Slabs, and Steps, 97%.
  5. Impervious Backfill, 95% for entire depth.
  6. All other areas, 90%.
- c. Methods of Equipment for compaction shall conform to Section 203-3.12B of the New York State Department of Transportation Specifications. Flooding will not be allowed. The Engineer reserves the right to reject methods or equipment that does not consistently produce the specified results.

- d. In compacting by rolling or operating heavy equipment over the pipe lines, displacement of, or injury to pipe and structures shall be avoided. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Engineer and at the expense of the contractor.
- e. Failure to Meet Specified Densities. In areas where the field density test results do not meet the required minimum density the material shall be re-excavated, backfilled, compacted and tested. The limits of the rework shall extend to the locations of acceptable field density tests.

7. Compaction Testing

- a. Responsibility. Laboratory and field tests to determine compaction shall be performed by an independent soils testing laboratory hired by the contractor and acceptable to the Engineer.
- b. Test Methods. Laboratory tests to determine maximum density at optimum moisture content shall be in accordance with ASTM D1557 (modified proctor). A sieve analysis shall be performed in accordance with NYSDOT procedures.
  - 1. Field density tests shall be in accordance with ASTM D1556 (sand cone method), or ASTM D2922 (nuclear method). Nuclear moisture density testing by direct transmission (probe) methods will be acceptable for compacted layers not exceeding 12-inches in thickness. Nuclear backscatter methods will not be acceptable. Tests shall be taken to the depth of the entire lift thickness or probe limit of the gauge.
- c. Number of Tests.
  - 1. For each change in fill and backfill material, perform one Laboratory moisture-density relationship test and sieve analysis but not less than one test for each 1000 cubic yards or fraction thereof of material used.
  - 2. Conduct not less than one field in-place density test of each compacted fill or backfill layer in each lift of each 400-feet of trench.

3. Location of Tests. The Contractor shall be responsible for coordinating the required testing frequency with the laboratory. All tests shall be performed in the presence of the inspector, unless otherwise directed. In cases of dispute, the Engineer will determine when and where the tests shall be taken. Material for laboratory tests shall be obtained from test pits excavated at locations determined by the Engineer. These test pits shall be excavated and the sample material obtained prior to the other excavation on the project. The samples shall be taken by a representative of the firm that is to do the testing. As it is the intent that the samples taken for laboratory testing be representative of the majority of the soil in the work area, it may be necessary to excavate more test pits than the number of samples required.

If a technician is not available to take the test when required, the Contractor may, at his option, leave that portion of the work open until the test is taken or may continue filling and compaction operations and when the technician is available, re-excavate to the required depth to allow the test to be performed.

The laboratory will copy all test results to the Engineer's office (2 copies).

4. Compaction reports shall, at a minimum, contain the following information:
- i. Street name, station, centerline offset, and depth below/above sub grade of each test.
  - ii. Specific use of material placed (i.e., sewer trench, water trench, etc.).
  - iii. Name of person taking test.
  - iv. Method of testing and standards used.
  - v. Type and source of material.
  - vi. Optimum moisture content.
  - vii. Maximum dry density.
  - viii. Field wet density.
  - ix. Field moisture content.
  - x. Percent compaction.
  - xi. State whether or not the tests comply with the specifications.
  - xii. Name and signature of person preparing report.
  - xiii. Probe depth.

5. When lift of fill has been placed, but subsequent operations have been delayed so that the fill has been disturbed by frost action or by precipitation that saturates the fill, the Contractor shall re-work and re-compact the fill to achieve desired densities where directed by the Engineer.

4. Method of Measurement

- A. Trench Excavation and Double Trench Excavation. Trench Excavation for the various depths and sizes of pipe will be measured along the centerline of pipe.

Measurement for the various depths listed in the contract will be to the depths actually excavated, determined by the measurements from the original ground surface at the centerline of the pipe to the pipe invert. Where the trench is in a new roadway cut section, depth will be measured from the subgrade of the roadway to the pipe invert. No deduction will be made for rock excavation, and no increase will be made for extra width required at manholes, valves and other structures. Double trench measurements will be a single length for both pipes measured to the greater depth. Trenching will be measured from center to center of manhole or structure, and center to center of bends or fittings.

- B. Unstable Material. Volume of Unstable material ordered removed will be the computed volume in place using the following maximum payment limits.

1. Bottom payment limit – the actual depth removed.
2. Side payment limit – vertical plains one foot (1') beyond the outside of the pipe or to the outside width of the drag shield where required. Contractor shall utilize the smallest width drag shield that is feasible.
3. Top payment limit – elevation of the trench subgrade.
4. Length – actual length ordered removed.

- C. Materials Ordered to Replace Unstable Material. Volume of materials ordered to replace unstable material will be measured in the same manner as Unstable Material. The materials used to replace Unstable Material may be Coarse Aggregate, Run of Bank Gravel, Select Granular Fill, or Unclassified Borrow as directed by the Engineer.

- D. Run of Bank Gravel, Select Granular Fill, Select Granular Material, Unclassified Borrow, and Impervious Backfill Ordered for Use as Backfill. Volume of Run of Bank Gravel or Unclassified Borrow ordered used as backfill shall be computed

using the maximum pay limits shown on the drawings. If no maximum pay limits are shown, the following shall apply:

1. Bottom payment limit – 1 foot above the outside of top of the pipe.
  2. Side payment limit – vertical plains one foot (1') beyond the outside of the pipe or to the outside width of the drag shield where required. Contractor shall utilize the smallest width drag shield that is feasible.
  3. Top payment limit – the bottom of the subbase course, or the bottom of the topsoil. In areas where no pavement or topsoil is required, the top payment line will be the adjacent ground surface.
- E. Concrete Cradle and Concrete Encasement. Volume of Concrete Cradle and Concrete Encasement shall be computed using the net cross-sectional areas shown on the plans and the length actually installed. The volume of the pipe shall not be included in the volume.
- F. Lateral Trench. Lateral Trench will be measured from the centerline of the main line sewer to the end of the lateral pipe.
- G. Test Pits. The number of test pits called for on the plans or ordered by the Engineer excavated and backfill will be counted for payment. Test pits not authorized by the Engineer will not be authorized for payment.
5. Basis of Payment
- A. Trench Excavation and Double Trench Excavation. Payment for Trench Excavation will be full compensation for all labor, materials, equipment and testing necessary to excavate, including the removal of existing pipes, dewater, backfill, and compact trenches for the installation of pipes, structures, and appurtenances. Payment also includes providing a safe place for work, furnishing and installing aggregate pipe bedding, disposal of excess or unsuitable excavated materials, maintaining the area during and after the construction, grading and seeding waste area, having laboratory and field density tests performed and all incidentals. Payment will be to the nearest lineal foot.
  - B. Impervious Backfill. Payment for Impervious Backfill will be full compensation for furnishing and placing Impervious Backfill. No additional payment will be made for the quantity of Impervious Backfill necessary in place of the aggregate pipe bedding material and select fill, nor will any deduction be made because of not using these materials where impervious backfill is placed. Payment will be to the nearest cubic yard.

- C. Concrete Cradle and Concrete Encasement. Payment for Concrete Cradle and Concrete Encasement will be full compensation for furnishing and placing the concrete, including all form work and reinforcing. No deduction will be made because aggregate pipe bedding material or select fill are not used. Payment will be to the nearest 0.1 cubic yard.
- D. Lateral Trench. Payment for lateral trench will be made at the unit price bid per lineal foot. Payment will be full compensation for furnishing all labor, materials, including aggregate pipe bedding, providing a safe place to work, disposal of excess or unsuitable material, grading and seeding waste areas and maintaining the area during and after construction. Payment will be to the nearest lineal foot.
- E. Test Pits. Payment for test pits will be made at the unit price bid per each. Payment will be full compensation for all labor and materials necessary to excavate, backfill, and compact each test pit as ordered by the Engineer, except that if the Engineer orders backfill with material other than that removed during the excavation payment will be made under the appropriate bid item. Also surface restoration, if required by the Engineer, will be made under the appropriate bid item.

Payment for work under this section will be limited to the following if, and when, they appear on the itemized proposal:

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
5	Trenching, Backfilling and Compacting	L.F.
5-1	Trenching, Backfilling and Compacting 0'-4'	L.F.
5-2	Trenching, Backfilling and Compacting 4'-Over	L.F.
5C	Concrete Encasement	C.Y.
5IB	Impervious Backfill	C.Y.
5TP	Test Pits	Each

**NOTE:**        **Item 5-1 is to be used for all underdrains.**  
**All other items to be used as shown on the itemized proposal.**

### ITEM 11P - PERFORATED UNDERDRAIN PIPE

1. Description. Under this item the Contractor shall furnish and place perforated underdrain pipe of the sizes specified on the plans and in the itemized proposal or as ordered by the Engineer. The Contractor shall furnish and place a fabric wrap for drainage control applications as shown on the plans or as ordered by the Engineer in Charge.
2. Materials. Perforated Underdrain Pipe shall conform to the requirements of ASTM 2729 for polyvinyl chloride (PVC) pipe with solvent weld joints or ASTM F810 for smoothwall polyethylene pipe with bell and spigot joints.

The fabric wrap to be used shall be Trevira Spunbond No. 1120, as manufactured by Hoechst Fibers Industries, Spartanburg, SC, or approved equal.

3. Construction Details. The pipe shall be installed true to requirements shown on the plans or as ordered by the Engineer.
  - a. Pipe installed in a subgrade section shall have not less than six inches (6") of filter material each side and above the pipe. The remainder of the underdrain installation section shall be completed using materials as specified in the plans or as ordered by the Engineer.
  - b. Pipe installed in a trench section shall be bedded on filter material in accordance with the specifications on the plan. The filter material shall be carefully placed by hand shoveling on each side and to the depth of at least six inches (6") over the top of the pipe. The pipe trench shall be filled with materials in accordance with the plans and specifications. Special care shall be taken to insure that neither the alignment nor grade of the pipe is disturbed.

Perforations shall be placed down unless the plans or special provisions indicate otherwise.

Any pipe which, in the opinion of the Engineer, is damaged or disturbed through any cause shall be replaced as directed by the Engineer, at the expense of the Contractor and at no cost to the City.

4. Method of Measurement. The quantity to be paid for under this item will be the number of linear feet (laying length) of pipe incorporated in the work in accordance with the plans and specifications and as directed by the Engineer.

5. Basis of Payment. The unit bid price per linear foot for this item shall include the cost of furnishing all labor, materials excavation, backfill, and equipment necessary to complete the work, including wye branches, fabric wrap, and all fittings and tie-ins to drainage structures. Underdrain Bedding, Excavation, Backfill, and Cleanouts will be paid for under their respective items. Payment for work under this section will be limited to the following if, and when, they appear on the itemized proposal.

<u>Item No.</u>	<u>Description</u>	<u>Pay Unit</u>
11P-4	4" Perforated Underdrain Pipe	L.F.
11P-6	6" Perforated Underdrain Pipe	L.F.
11P-8	8" Perforated Underdrain Pipe	L.F.
11P-10	10" Perforated Underdrain Pipe	L.F.

ITEM 11PX – UNDERDRAIN CLEAN-OUT

1. Description. Under this item, the Contractor shall furnish and install underdrain cleanouts as shown on the plans or as ordered by the Engineer.
2. Materials. Underdrain cleanout pipe shall be of the same material as the underdrain.
3. Construction Details. The pipe shall be installed in accordance with the details shown on the plans. Locations of all cleanouts shall be marked by chipping a notch in the curb. An approved metal cap shall also be provided to cover the pipe opening flush with the finished grade.
4. Method of Measurement and Basis of Payment. The quantity to be paid for under this item will be the number of underdrain cleanouts furnished and installed in accordance with the plans and specifications, or as ordered by the Engineer. The price bid for this item shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. Payment for work under this section will be limited to the following if, and when, they appear on the itemized proposal.

<u>Item No.</u>	<u>Description</u>	<u>Pay Unit</u>
11PX-4	4-Inch Underdrain Cleanout	Each
11PX-6	6-Inch Underdrain Cleanout	Each
11PX-8	8-Inch Underdrain Cleanout	Each
11PX-10	10-Inch Underdrain Cleanout	Each

ITEM 13CL – LATERAL CLEANOUT

1. Description. Under this item, the Contractor shall reconnect and install cleanouts on all laterals now in use according to the standard sheet or as ordered by the Engineer.
2. Materials. All materials shall conform to those shown on Standard Detail Sheet and Binghamton's Plumbing Code.
3. Construction Details. A cleanout shall be installed in the lateral between the curb and sidewalk when replaced. The cleanout shall be brought to surface so as to be easily accessible, with a wye, 1/8<sup>th</sup> bend. PVC DR26 pipe shall be used for cleanout wye branch and riser.
4. Method of Measurement and Basis of Payment. The unit price bid for each cleanout shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, including excavation and backfilling.

## ITEM 15 – PVC PIPE

1. Description. Under this item, the Contractor shall furnish and place Polyvinyl Chloride (PVC) pipe, including all required fittings and gaskets, of the sizes shown on the plans or as ordered by the Engineer.
2. Materials. PVC Pipe and Fittings shall conform to one of the following types:
  - A. PVC – SDR-35
    1. Conform to ASTM D3034 for 4” – 15” diameter.
    2. Conform to ASTM F679 for 18” – 36” diameter. Use T-1 minimum wall thickness.
    3. Bell and Spigot type rubber gasket joints shall conform to ASTM D3212 and ASTM F477.
  - B. PVC RAURIB with a Smooth Interior\*
    1. Conform to ASTM D2412.
    2. Conform to ASTM F794-89 and Uni-Bell Uni-B-9.
    3. Conform to CSA B182.4-M90.
    4. Conform to ASTM D3212.

*\*May be used only with written approval of the City Engineer.*

Contractor shall utilize only one type of pipe (“A” or “B”) between manholes unless otherwise authorized by the Engineer.

Fittings for joining new pipe to existing pipes of dissimilar material shall be as manufactured by Fernco, Inc., or approved equivalent.

3. Construction Details. Pipe shall be placed in accordance with these specifications, the plans, and applicable standard sheets. Pipe shall be installed in accordance with the manufacturer’s recommendations. All pipe shall be laid true to line and grade and shall have a full, firm and even bearing. Pipe laying shall begin at the downgrade end and progress on the upgrade. Excavation, bedding, and backfilling shall be in accordance with their respective items. Backfilling around pipe shall be done in such a way that deformation is kept to a minimum. This can be accomplished by backfilling and compacting sides of pipe equally before compacting over top of pipe.
4. Air Tests, Sanitary Sewer Installation. After the pipe has been laid, the trench completely backfilled and the manholes completed and backfilled, the interior of the pipe shall be inspected for alignment, damage, and excessive infiltration. At the time of the visual

inspection, any pipe, joint, or manhole that is found to be damaged shall be repaired or replaced to the satisfaction of the Engineer before testing proceeds.

The cost of all labor, materials, measuring devices necessary to perform all testing and re-testing, and the cost of all labor and materials for repairs or replacement shall be borne by the contractor, at no additional cost or the Owner. Any pipe or manhole that has visible leaks of running water shall be repaired, even if said leak would not be in excess of the limits specified below.

Air testing following the procedures in ASTM C-828, as modified herein, may not be used if the ground water elevation is higher than the top of the pipe to be tested.

It is not intended that a new pipeline be air tested if it is installed as an extension of an existing pipeline or if other live line conditions exist between manholes.

Air testing may be dangerous if, because of lack of understanding or carelessness, a line is improperly prepared. It is extremely important that plugs be properly installed and braced to prevent blowouts. It is the contractor's responsibility to see that no one shall be allowed in the manholes while the line is being pressurized and until all pressure has been released. Air testing equipment shall be equipped with pressure release valves that will prevent the pressure in the section being tested from exceeding 10 psi.

The contractor shall provide a certified test gauge for use in checking the accuracy of gauges used with the test equipment. The gauge shall be at least 6 inches in diameter and for a maximum pressure of 60 psi.

Plugs shall be installed in the ends of the line to be tested and the plugs properly braced. The line shall then be pressurized to approximately 4.0 psi and the pressure allowed to stabilize. *NOTE:* The pressure will usually drop during the stabilization period. The pressures shall be adjusted to 3.5 psi and the test time begun.

The Contractor shall prepare a written log of pressure tests, stating the locations tested and results. He shall deliver a copy to the Engineer or his designated representative at the end of each day of testing.

Lines in which there is no pressure drop during the times given in Table I are presumed to have passed and will be accepted, except that visible leaks must be repaired. Lines which do not pass shall be repaired and re-tested.

**TABLE I**

**Pass with No Pressure Drop**

	8-In.	10-In.	12-In.	15-In.	18-In.	21-In.	24-In.
Minutes	2:00	2:30	3:00	4:00	6:00	8:00	10:00

5. Method of Measurement and Basis of Payment. The unit price bid per linear foot for each size pipe shall include the cost of furnishing all labor, pipe and fittings, materials and equipment necessary to complete the work. Excavation and bedding shall be paid for under their respective items. Pipe shall be measured from center to center of catchbasins and manholes or to end of pipe.

Item	Description	Pay Unit
15-4	4-Inch PVC SDR-35	L.F.
15-6	6-Inch PVC SDR-35	L.F.
15-8	8-Inch PVC SDR-35	L.F.
15-10	10-Inch PVC SDR-35	L.F.
15-12	12-Inch PVC SDR-35	L.F.

ITEM 15SS – STORM SEWER PIPE

1. Description. Under this item, the Contractor shall furnish and place storm sewer pipe, including all required fittings and gaskets, of the sizes shown on the plans or as ordered by the Engineer.
2. Materials. Storm sewer pipe and fittings shall conform to one of the following types:
  - A. PVC SDR-35
    1. Conform to ASTM 3034 for 4” – 15” diameter.
    2. Conform to ASTM F679 for 18” – 36” diameter. Use T-1 minimum wall thickness.
    3. Bell and spigot type rubber gasket joints shall conform to ASTM D3212 and ASTM F477.
  - B. PVC Corrugated Sewer Pipe with a Smooth Interior
    1. Conform to ASTM F949, 46-psi stiffness.
    2. Pipe shall be “A-2000”, as manufactured by Contech Construction Products, Inc., or approved equivalent.
    3. Bell and spigot rubber gasket joints shall conform to ASTM D3212 and ASTM F477.
  - C. PVC Pipe Ultra-Rib
    1. Pipe shall be PVC Ultra-Rib Smooth Interior, as manufactured by Uponor ETI Co., or approved equivalent.
    2. Conform to ASTM F794 and Uni-bell Uni-B-9.
    3. Push on joints with flexible elastomeric seals – ASTM D3212-73T and F477.
    4. Conform to ASTM D1784.
  - D. PVC Pipe Ultra-Corr
    1. Pipe shall be PVC Ultra-Corr Smooth Interior, as manufactured by Uponor ETI Co., or approved equivalent.
    2. Conform to ASTM F794 and F1417.
    3. Push on joints with flexible elastomeric seals – ASTM D3212-73T and F477.
    4. Conform to ASTM D1784.
    5. Conform to ASTM D2412.

E. High Density Polyethylene Pipe

1. Pipe shall be Smooth Interior HDPE annular corrugated high density.
2. Conform to AASHTO M294 Type S.
3. Conform to AASHTO M294 Bell and Spigot joint with gasket.
4. Fittings shall conform to AASHTO M294.
5. Conform to ASTM D3350 Cell Classification 324420C or ASTM D1248 type III, Class C, Category 4, Grade P33.

F. PVC RAURIB Smooth Interior

1. Conform to ASTM D2412.
2. Conform to ASTM F794 – 89 and Uni-Bell Uni-B-9.
3. Conform to CSA B182.4 – M90.
4. Conform to ASTM D3212.

G. Aluminized Steel Type 2

1. Sized 30” in diameter and over.
2. Conform to AASHTO M274 and ASTM A929.
3. Joints shall be hugger band with bolt, bar and strap.

Fittings for joining new pipe to existing pipes of dissimilar material shall be as manufactured by Fernco, Inc., or approved equal.

Contractor shall utilize only one type of pipe between manholes, unless otherwise authorized by the Engineer.

3. Construction Details. Pipe shall be placed in accordance with these specifications, the plans, and applicable standard sheets. Pipe shall be installed in accordance with the manufacturer’s recommendations. All pipe shall be laid true to line and grade and shall have a full, firm and even bearing. Pipe shall begin at the downgrade end and progress on the upgrade. Excavation, bedding, and backfilling shall be in accordance with their respective items. Backfilling around pipe shall be done in such a way that deformation is kept to a minimum. This can be accomplished by backfilling and compacting sides of pipe equally before compacting over top of pipe.
4. Tests, Sewer Installation. After type pipe has been laid, the trench completely backfilled and the manholes completed and backfilled, the interior of the pipe shall be inspected for alignment, damage, and excessive infiltration. At the time of the visual inspection, any pipe, joint, or manhole that is found to be damaged shall be repaired or replaced to the satisfaction of the engineer before testing proceeds.

The cost of all labor, materials, measuring devices necessary to perform all testing and re-testing, and the cost of labor and materials for repairs or replacement shall be borne by

the contractor, at no additional cost to the Owner. Any pipe or manhole that has visible leaks of running water shall be repaired.

5. Method of Measurement and Basis of Payment. The unit price bid per linear foot for each size pipe shall include the cost of furnishing all labor, materials and equipment necessary to complete the work. Excavation and bedding shall be paid for under their respective items. Pipe shall be measured from center to center of catchbasins and manholes or to end of pipe.

Payment for work under this section will be on the following items if, and when they appear on the itemized proposal.

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
15SS-15	15-Inch Storm Sewer Pipe	L.F.
15SS-18	18-Inch Storm Sewer Pipe	L.F.
15SS-24	24-Inch Storm Sewer Pipe	L.F.
15SS-30	30-Inch Storm Sewer Pipe	L.F.
15SS-36	36-Inch Storm Sewer Pipe	L.F.
15SS-42	42-Inch Storm Sewer Pipe	L.F.
15SS-60	60-Inch Storm Sewer Pipe	L.F.

ITEM 16 – DUST CONTROL

1. Description. Under this item, the contractor shall control dust in the project area caused by his operations.
2. Materials.
  - A. Water. Water shall be free of oil and toxic substances.
  - B. Calcium Chloride. Solid Flake Calcium shall meet the requirements of ASTM D98 and upon analysis shall show not less than 77.0% of CaCl<sub>2</sub>. The calcium chloride shall be supplied in the form of dry, loose flakes, pellets or granules and shall be fine enough to feed through the common types of spreaders used in roadwork. It shall be supplied in 50-pound bags.
3. Construction Details. The contractor shall apply calcium chloride to control dust at the locations and during periods as the Engineer may direct. The calcium chloride shall be applied on a dampened surface by means of an approved spreader. The surface shall be dampened by sprinkling water with an approved distributor.

Calcium chloride shall not be used near any wetland or waterway.
4. Method of Measurement. Calcium chloride will be measured by the number of 50-pound bags furnished and applied as directed by the Engineer.
5. Basis of Payment. Payment for furnishing and applying calcium chloride will be made at the unit price bid per 50-pound bag. Payment will be full compensation for furnishing all labor, material, and equipment necessary to complete the work including furnishing and applying water to dampen the surface. No payment will be made for calcium chloride used to control dust at areas other than backfilled trenches. That work is a subsidiary part of Maintenance and Protection of Traffic.

## ITEM 28EC – EPOXY COATED REINFORCING BARS

1. Description. Under this item, the Contractor shall furnish and install epoxy coated reinforcing steel for concrete structures where indicated on the plans.
2. Materials. Steel reinforcing bars shall conform to the requirements of Section 709-01, Bar Reinforcement, Grade 60, of the New York State Department of Transportation Standard Specifications.

The epoxy coating material shall be organic, powdered epoxy resin that is applied by electrostatic methods.

The surface of bars to be coated shall be blast cleaned in accordance with the Steel Structures Painting Council Surface Preparation Specification No. 10.

The powdered epoxy resin coating shall be applied to the cleaned surface as soon as possible after cleaning and before visible oxidation occurs. In no case shall more than eight (8) hours elapse between cleaning and coating.

3. Construction Details. Prior to placing reinforcing steel all grease, dirt, mortar, and any other foreign substances shall be removed.

Reinforcing steel shall be placed with chairs, wires, and other devices used to support, position, or fasten. The reinforcement shall be made of or coated with a dielectric material.

No field bending of bars will be permitted.

Concrete shall not be placed until reinforcing steel is inspected and permission to place concrete is granted by the Engineer.

4. Method of Measurement and Basis of Payment. The amount bid for reinforcing steel shall be the number of pounds of steel bars placed and will be computed by utilizing the unit weight for each size bar indicated on the plans.

The unit price bid per pound shall include the cost of furnishing all labor, materials (including chairs, supports, fasteners, and connections), and equipment necessary to complete the work.

ITEM 30A – MANHOLE FRAME AND LID

ITEM 30B – CATCHBASIN FRAME, GRATE AND CURB BOX

ITEM 30C – CATCHBASIN TRAP (HOOD, STORM OUTFALL)

ITEM 30D – MANHOLE STEPS

ITEM 30E – CATCHBASIN TRAP (HOOD AND FLAP, SANITARY OUTFALL)

ITEM 30F – PVC HOOD (ELBOW)

ITEM 30FG – FLAP GATE

ITEM 30SL – MANHOLE FRAME AND LID WITH SLOTTED LID

ITEM 30WT – WATERTIGHT MANHOLE FRAME AND LID

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1. Description. Under these items the Contractor shall furnish and place Manhole Frame and Lid, Curb Inlet Frame, Grate and Curb Box, Catchbasin Trap, Manhole Steps, Flap Gates, or Watertight Manhole Frame and Lid, as shown on the plans and in accordance with these specifications.
2. Materials. All Castings and Fittings shall conform to the following or an approved equal:

Casting

Manhole Frame and Lid (To be supplied by the City of Binghamton)	R-1713 (Neenah)
Curb Inlet Frame, Grate and Curb Box	R-3250A (Neenah)
Catchbasin Trap (Hood)	R-3701-10 (Neenah)
Manhole Steps	R-1980-E (Neenah)
Catchbasin Trap (Hood & Flap)	R-3709 (Neenah)
PVC Hood (Short Bend Spigot 90° Elbow)	PVC-3034
Flap Gate (30" Diameter)	Model 10C (Armco)
Manhole Frame & Lid with Slotted Lid	1154A (Syracuse)
Watertight Manhole Frame & Lid	R-1755-F2 (Neenah)

Manhole frame and lid shall be supplied by the City of Binghamton, Department of Water/Sewer. Contractor shall pick up castings at #1 Broome Street, Binghamton, New York. Castings to be transported to the construction site and installed as shown on the manhole detail sheet. Arrangements shall be made with the Water/Sewer Department and a twenty four hour notice shall be given prior to picking up castings. Metal used in the manufacture of castings shall conform to ASTM A48-83 Class 35B for gray iron.

Brick shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

All usable castings removed during construction shall remain the property of the City of Binghamton and stored as ordered by the Engineer.

3. Method of Measurement. The quantity to be measured under these items will be the number of each casting furnished and placed.

4. Basis of Payment. The unit price bid per each shall include the cost of furnishing all labor, equipment and materials necessary to complete the work. Materials shall include all brick and mortar necessary to place the castings, including any excavation.

ITEM 30SG – SLUICE GATE

1. Description. Under this item, the Contractor shall furnish and install a heavy-duty sluice gate assembly where indicated on the plans. The sluice gate assembly shall include the gate, frame, wall thimble, stem, stem guides, and lift.
2. Materials. The heavy-duty sluice gate shall have rising stem, flush bottom seal, anchor bolt mount. The wall thimble shall be nine inches (9”) in length, Type F, with round opening. The lift shall be an enclosed gear pedestal lift (Model CPE-4) mounted on concrete.

The Series 501 heavy-duty sluice gate assembly shall be manufactured by Hydro-Gate Corporation or approved equal, and have the following materials and specifications:

- Frame, slide, wall thimble, pedestal, gear housing, wall brackets, and stem guide brackets – Cast iron, per ASTM A126, Class B
  - Wedges, thrust nut and lift nut – Bronze, per ASTM B584, Alloy C86500 or C86700
  - Seating faces – Bronze, ASTM B21, Alloy C48200
  - Stem and stem couplings – Stainless steel, ASTM A276, Type 304
  - Fasteners – Stainless steel, ASTM F593/F594, Alloy Group I
  - Flush bottom seal – Neoprene, ASTM D2000
  - Flush bottom retainer – Stainless steel, ASTM A276, Type 304
3. Construction Details. The sluice gate assembly shall be installed in accordance with the manufacturer’s installation manual, and as detailed on the plans.
  4. Method of Measurement and Basis of Payment. The amount bid for this item shall be the cost of furnishing and installing each sluice gate assembly and restoration of the manhole top according to the plans. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

## ITEM 70 - TACK COAT

1. Description. This work shall consist of preparing and treating an existing bituminous or Portland cement concrete surface, including curbs with bituminous tack coat in accordance with these specifications and within the limits shown on the plans or established by the Engineer.

Tack coat shall be applied to all curbs and pavement saw cuts, prior to paving. Tack coat shall be applied to existing asphalt surfaces prior to applying top course of asphalt unless otherwise directed by Engineer.

2. Materials. The bituminous tack coat shall meet the requirements of the following New York State Department of Transportation Item #702-90 Asphalt Emulsion for Tack Coat.

The bituminous tack coat will be sampled and tested in accordance with the NYSDOT's written instruction. Certifications or NYSDOT Std. Forms shall be supplied with each shipment.

3. Construction Details:

407-3.01 - Equipment. Tack Coat shall be applied by one of the following methods:

- A. Distributor Truck: The distributor shall be designed, equipped, maintained and operated so that the tack coat can be heated and applied uniformly on variable widths of surface up to 15 feet at readily determined and controlled rates per square yard, with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.02 gallons per square yard. Distributor equipment shall include a tachometer, specified rate not to exceed 0.02 gallons per square yard. Distributor equipment shall include a tachometer, accurate metering device or calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically.

The distributor may be equipped with an attached bristle broom designed such that it drags on the pavement behind the spray bars. If the broom is used, it shall be adjustable laterally and vertically so that the full width of the applied tack coat is broomed uniformly into the pavement surface.

Distributors shall be equipped with an approved bituminous material sampling valve. The valve shall be installed as described in NYSDOT written instructions. When samples are taken through such valves, they shall be considered representative of all material in the tank.

- B. Power Spray Units: Smaller power spray units of hand spray equipment will be permitted provided that such units are capable of placing tack coat at the approved application rate, plus or minus 0.02 gallons per square yard.
- C. Brushes: Tack coat may be applied by hand brushing on curb faces.

407-2.02 - Application of Bituminous Material. The tack coat shall be uniformly applied by a pressure distributor to a prepared clean pavement, prior to paving. The tack coat shall be applied as approved by the Engineer to offer the least inconvenience to traffic and to permit one-way traffic, where practical, to prevent pickup or tracking of the bituminous material.

Tack coat shall not be applied on a wet pavement surface or when the surface temperature is below 45°F. The temperature and areas to be treated shall be approved by the Engineer prior to application. The application rate shall be 0.03 to 0.07 gallons per square yard as approved by the Engineer.

- 4. Method of Measurement and Basis of Payment. The quantity to be paid for will be the number of gallons of asphalt emulsion for tack coat measured at 60°F incorporated into the work. The unit price bid per gallon for tack coat shall include the cost of furnishing materials and all equipment and labor necessary to complete the work.

## ITEM 71A - JOINT FILLING IN BITUMINOUS PAVEMENTS

1. Scope of Work. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, and materials necessary to perform all operations in connection with the filling of construction joints in bituminous concrete pavements. Traffic control and supervision to be supplied by the contractor.
2. Materials. The materials used shall meet all the requirements of the New York State Department of Transportation Standard Specification Section 633.

Asphalt Cement: The asphalt cement shall be paving grade asphalt meeting the following specifications:

<u>Grade</u>	<u>NYSDOT Specification</u>	<u>Bituminous Material</u>
18-60	Section 702-07	Section 702

Fibers: The fibers may be composed of either polypropylene or polyester. The contractor shall submit the following fiber information to the Department of Public Works for approval, prior to beginning the work:

Brand Name: Composition; Tensile strength; Specific Gravity; Melt Temperature; Elongation; Length of Fiber.

Composition of Sealant Mixture: The following asphalt cement and fiber proportions shall apply:

Asphalt Grade	Minimum % Fiber by Weight of Asphalt	
	Polyester	Polypropylene
18-60	5.0	7.0

Mixing Temperatures: The sealant shall be mixed at the temperature recommended by the fiber manufacturer, but shall not exceed 325° F.

3. Equipment. Equipment used in the performance of the work required by this section of the specifications shall be subject to the approval of the Engineer and maintained in a satisfactory working condition at all times.
  - A. Air compressor: Air compressor shall be portable and capable of furnishing not less than 125 cubic feet of air per minute at not less than 90 pounds per square inch pressure at the nozzle. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water.

- B. Manually operated gas power air-broom or self-propelled sweeper designed especially for use in cleaning highway and airfield pavements shall be used to remove debris, dirt, and dust from cracks.
  - C. Hand tools shall consist of brooms, shovels, metal bars with chisel shaped ends, and any other tools which may be satisfactorily used to accomplish this work.
  - D. Melting Kettle: The unit used to melt the joint sealing compound shall be double boiler, indirect fired type. The space between the inner and outer shells shall be filled with a suitable heat transfer oil or substitute having a flash point of not less than 600° F. The kettle shall be equipped with a satisfactory means of agitating the joint sealer at all times. This may be accomplished by continuous stirring with mechanically operated paddles and/or by a continuous circulating gear pump attached to the heating unit. The kettle must be equipped with thermostatic control calibrated between 200° F. and 550° F. Application equipment shall be capable of applying 800 gallons per day, and capable of heating 75% of the capacity of the tank in one hour when ambient temperatures are 70° F.
  - E. Hand pouring pots must be equipped with mobile carriage and rubber shoe and have a flow control valve which allows all joints to be filled to refusal so as to eliminate all voids or entrapped air, and not leave unnecessary surplus joint sealer on pavement surfaces.
4. Preparation.
- A. Cracks over 1/2-inch in width do not require widening or reshaping, and must be thoroughly cleaned by compressed air as specified above.
  - B. Debris removal: All old material and other debris removed from the cracks shall be removed from pavement surface immediately by means of power sweepers, hand brooms or air brooms.
  - C. General: Joint sealing material will not be applied in wet cracks, or where frost, snow, or ice is present, or when the ambient temperature is below 40° F.
5. Preparation of Sealer. Joint sealing material shall be heated and applied at the temperature specified by the manufacturer and approved by the Engineer.
6. Installation of Sealer. All joints shall be sealed as specified herein and the sealer shall be well bonded to the pavement. Unless otherwise directed, the joints shall be completely filled flush with the pavement, and not less than 1/8-inch below surface, without formation of voids or entrapped air. More than one application of joint sealer may be necessary to fill joints to required level.

7. Workmanship. All workmanship shall be of the highest quality, and excess or spilled sealer shall be removed from the pavement by approved methods and discarded. Any workmanship determined to be below the high standards of the particular craft involved will not be accepted, and will be corrected and/or replaced as required by the Engineer-in-Charge.
8. Sampling and Testing. Joint sealer will be tested for conformance with NYSDOT Specification Table 702-1, dated January, 2008, with latest addenda. Joint material sample shall be submitted approval prior to start of work. Certification that the Joint Sealer is in accordance with NYSDOT Specification Table 702-1 will be submitted to the Engineer.
9. Method of Measurement and Basis of Payment. The unit price bid per linear foot for joint filling in bituminous pavements shall include the cost of furnishing all labor, materials and equipment necessary to complete the work.

ITEM 76 – MAINTENANCE AND PROTECTION OF TRAFFIC (LUMP SUM)

1. Description. Under this item, the Contractor shall maintain traffic and protect the public from damage to person and property, within the limits of and for the duration of the contract. Traffic shall be maintained over a reasonably smooth traveled way which shall be so marked by signs, delineation and/or other methods that a person who has no knowledge of conditions can safely, and with a minimum of discomfort and inconvenience, ride, drive or walk over all or any portion of the project under construction where traffic is to be maintained. All work under this item shall be in accordance with the plans and/or as ordered by the Engineer.

Prior to commencing work, the Contractor shall submit a Maintenance and Protection of Traffic Plan to the Engineer for approval. This plan shall show locations and types of traffic control devices to be used, proposed detour routes, and a list of specific dates when each area of pavement is scheduled for work. The contractor shall coordinate this schedule so as to maintain necessary access to businesses, residents, institutions, etc. No work may be started until the Maintenance and Protection of Traffic Plan is approved by the Engineer.

The Contractor shall strictly adhere to all guidelines called for in the following: *Manual of Uniform Traffic Control Devices*, New York State Department of Transportation, latest addendum, and *Manual of Uniform Traffic Control Devices*, Federal Highway Administration, latest addendum.

The Contractor is placed on notice that the Maintenance and Protection of Traffic over this roadway during construction is considered as important and necessary an item of work as is the actual construction itself. The Contractor shall at all times conduct his operation in a manner to insure the safety of not only the motorist but also the pedestrian and his own employees.

The Contractor shall protect the user from damage to person and property by reason of any construction operation (for example: painting, paving, tree work, demolition, etc.) by such protective screens, devices or methods as are as approved by the Engineer.

Under this item, the Contractor shall be responsible for the maintenance within the limits of the contract of the entire pavement, drainage facilities and other roadway elements, both old and new, beginning on the date that the contract is awarded and ending on the date the contract is officially accepted. He shall not be responsible for the plowing of snow or the control of ice on the pavement or on the travel way, as the case may be.

The Contractor shall construct a temporary ramp or bridge with railings to permit full access to private properties. Access shall be provided where new curb and sidewalks are placed for the full length of the property. Ramps and or bridges shall be installed at each property where new curbs and walks are installed. The materials shall be sound, square-edged, free from shales, loose knots or decay.

The Contractor shall so schedule his work as to keep to a minimum the disruption of normal traffic.

2. Materials. All materials used shall comply with the requirements for the various items or materials as established in these specifications or on the plans. Existing pavement shall be kept in repair by using suitable plant-mix bituminous materials for concrete or bituminous pavements. Earth or gravel travel ways shall be repaired and maintained by the use of the basic material or other suitable material approved by the Engineer. The contractor may, at his own expense, and if approved by the Engineer, utilize a stabilizing agent in the material used for maintaining or patching gravel or earth travel ways.

All temporary signs, delineators and other warning and guiding devices shall be as specified in the plans or as approved by the Engineer and, except as otherwise specified, will remain the property of the Contractor.

3. Construction Details.
  - A. The Contractor shall generally provide a travel way suitable for two or more lanes of traffic. This travel way shall be kept well drained and reasonably smooth and hard at all times and free of potholes, bumps, irregularities and depressions that hold or retain water. He shall conduct his operations to insure a minimum of delay to traffic. Stopping traffic for more than approximately five (5) minutes is considered unsatisfactory. The necessary equipment and personnel to attain and maintain a satisfactory riding surface shall be available and used as needed at all times, both when work is under way and when work is temporarily suspended for any period of time. Special attention shall be given to maintenance of a satisfactory travel way over weekends, holidays and during the winter season.
  - B. The Contractor shall keep the travel way free of foreign objects such as rocks, timber and other items that may fall from transporting vehicles. Spillage of material carried by or dropped from the undercarriage of any carrying vehicle across any public traveled way shall be removed immediately, and such traveled way, both within and outside of the contract limits, shall be kept free of such spillage by the Contractor. Whenever dusty conditions resulting from the Contractor's operations occur, they shall be corrected by the use of calcium chloride and/or water. Where water is used, it shall be distributed uniformly over a minimum of eight feet (8') by the use of suitable spray heads or spray bar. Whenever it becomes necessary to maintain traffic on one lane, the Contractor shall provide adequate traffic controls on the section of roadway on which vehicle operation is maintained. He shall employ a sufficient number of competent flagmen and/or temporary traffic lights operating continuously during the time traffic is so maintained. In the event the length of one lane operation is extremely short and conditions are favorable to safe operation, the Engineer may, in writing, authorize the Contractor to dispense with flagmen or traffic control signals. The Contractor shall also provide a sufficient number of competent flagmen in areas where traffic is congested, particularly where construction equipment is operating.
  - C. The Contractor shall maintain all elements of the roadway, both old and new, beginning on the date of award of the contract and ending on the date the contract

is accepted by the City unless otherwise designated on the plans or in the proposal. He shall provide an adequate travel way as specified. He shall devote particular attention to all drainage facilities keeping them fully operative at all times. Ditches shall be provided at all times, even during grading operations, to adequately drain the travel way and the remainder of the right-of-way. The contractor will not be required to plow snow or control ice on the travel way.

He shall, however, keep the entire contract in such condition that snowplows and related equipment may safely traverse the area to plow snow and/or control ice on the travel way. He shall be responsible for the moving of any plowed snow that may be necessary to adequately maintain any element of the roadway, except that he will not be responsible for the moving of any plowed snow from driveways or entrances.

Any damage to any portion of the work occasioned by lack of adequate maintenance shall be repaired by the Contractor at his own expense.

- D. The Contractor shall provide and maintain at all times a safe and adequate ingress and egress to and from intersecting roadways, homes, businesses and commercial establishments at existing or new access points, consistent with the work, unless otherwise authorized by the Engineer. The Contractor will not be responsible for snow removal from driveways or entrances. On highways on which motor bus service is maintained, he shall provide suitable areas or locations for the loading and unloading of passengers. The existing pavement at improved intersecting streets shall not be disturbed without prior consent of the Engineer.

During sidewalk and driveway apron replacement, the Contractor may block residential driveway access for not more than seven (7) consecutive days, unless otherwise authorized by the Engineer. In instances where residents request continuous driveway access for valid reason, it shall be provided by the Contractor. The Engineer shall determine validity of such requests in cases of dispute.

- E. The Contractor shall furnish and erect, as required and directed by the Engineer, reflectorized signs for the information of the motorist, and to adequately and legally post the roadway under construction as to its status.

All signs shall be kept clean, mounted at the indicated height, and so placed as to be effective both day and night. Signs, warnings, and delineators and barricades shall be used to adequately inform the motorist of any unusual or unsafe condition and to safely and clearly guide him through the contract area. Such signs, warnings or devices shall be so placed as to give timely warning and permit the motorist to take the necessary action to traverse the area safely.

The Contractor shall delineate areas where there is a drop-off near the edge of the travel lanes and areas on which it is unsafe to travel. Where the drop-off is less than six inches (6"), and where soft and unsafe areas occur, an approved delineator shall be placed along the edge of the traveled way at intervals of not more than 200 feet. Where the drop-off is between six inches (6") and eighteen

inches (18”), a continuous delineation consisting of a white board or band shall be used in addition to individual delineators. Thirty- to fifty-gallon drums or containers set on end may be used as delineators, provided they are painted white and kept clean at all times. Other markers or delineators may be circular or rectangular in shape and shall be constructed of reflective sheeting having a minimum area of 20 square inches or of reflective buttons having a minimum diameter of three inches (3”). All reflective delineators or markers shall be yellow or amber in color except that at entrances to commercial establishments, the contractor shall place a green reflective marker on each side of the designated safe entrance to the establishment. The entire entrance area between adjacent green markers shall be kept safe and smooth for convenient ingress and egress. Delineators shall be substantially mounted so that the bottom of the reflective unit is four feet (4’) above the elevation of the traveled way. Any area judged by the Engineer to be particularly hazardous shall be marked by the use of signal flashers with large reflectorized orange lens in addition to the reflective markings. All signs and markers shall indicate actual conditions existing and shall be moved, removed or changed immediately, as conditions require. Sign sizes and details are indicated on the plans. These are minimum requirements and the Contractor shall have an adequate quantity of each of these signs available for use as required. The Engineer may, if conditions exist, require additional signs. In that event, they shall be consistent with the arrangement, material and details of those shown in the plans.

- F. All existing signs and supports within the contract limits are to be maintained for the duration of the contract by the Contractor as directed by the Engineer.

The Contractor shall, when ordered, remove these existing signs, store, protect and keep them clean, and replace them on the contract as directed by the Engineer. Signs not to be replaced shall be cleaned and delivered to the Engineer as directed by him.

Signs and markers lost or damaged because of negligence on the part of the Contractor shall be replaced at the Contractor’s expense.

- G. When directed by the Engineer, the Contractor shall open to traffic any portions of new pavement before final acceptance of the contract.
- H. Whenever it becomes necessary to close a street completely to vehicular traffic, the following conditions shall be met:
1. The Contractor shall submit a formal written request to the Engineer specifying the reasons for the closing, the period of time for which the closing shall be necessary, and the proposed detour to be used.
  2. An affirmative written reply from the Engineer must be obtained prior to closing of the street.

- I. Temporary structures shall be constructed in such a manner and sequence that interference with and inconvenience to the public is kept to a minimum. The Contractor shall be responsible for the materials, workmanship, upkeep and safety of all temporary structures.

Prior to beginning construction of any structures designed by the Contractor or his agents, the Contractor shall submit detailed plans to the Engineer for review and written approval.

Temporary access shall be used to span the full width of excavation. Temporary ramps shall remain in place until backfill is completed and all hazards to pedestrian traffic are removed.

The contractor shall not store material or equipment within the street right-of-way except for the materials he intends to use within 24 hours. All equipment except for track laying equipment that is necessary for the immediate work shall not be stored in the street overnight or when the contractor is working. Any equipment or materials that are stored on the street r.o.w. shall not block pedestrian or vehicular traffic and shall be properly delineated so as to identify its location and extent to the traveling public, including pedestrians. The Contractor shall not use the street as his storage yard for equipment and materials.

4. Method of Measurement. The work of maintenance and protection of traffic shall be paid for on a lump sum basis. In the event that, in the judgment of the Engineer, traffic is not maintained adequately and/or safely on any part of the contract, on any day, no payment for maintenance and protection of traffic will be made for that day. The amount of such daily non-payment will be determined by the greater of two methods:
- A. The lump sum amount bid for this item divided by the number of calendar days between the date of award and the date of completion as designated in the proposal without regard to any extension of time; or
  - B. Five percent (5%) of the total bid price of the contract divided by the number of calendar days between the date of award and the date of completion as designated in the proposal without regard to any extension of time.

If the Contractor fails to maintain and protect traffic adequately and safely for a period of twenty-four (24) hours, the Engineer may correct the adverse conditions by the use of City forces, augmented by such other equipment and personnel as deemed necessary by the Engineer. The entire cost of this work by such forces shall be deducted from monies due the Contractor on this contract. The cost of this work shall be in addition to the daily non-payment deductions listed above.

5. Basis of Payment. Maintenance and protection of traffic shall be paid for on a lump sum price bid for this item, less any deductions for unsatisfactory accomplishment as determined under Method of Measurement. The price bid shall include the cost of

furnishing all labor, materials and equipment necessary to satisfactorily complete the work.

The price bid shall also include the cost of any detour, temporary pavement, or temporary structure not shown on the plans or in the proposal. Furnishing and applying calcium chloride for dust control within the right-of-way and bituminous plant mixed material for patching existing pavement or where specifically ordered by the Engineer, or as shown on the plans shall be paid for under their respective items. Monthly payments will be made for this item in proportion to the total amount of work complete, less any amounts deducted for unsatisfactory accomplishment.

ITEM 77S – SANITARY SEWAGE & STORM WATERS DIVERSION

1. Description. Under this item, the Contractor shall divert the flow of sanitary sewage and storm waters as ordered by the Engineer.
2. Construction Details. The Contractor shall furnish, place, maintain and remove any facilities necessary to keep the excavation free from sanitary sewage, storm waters, earth, ice and snow. Dewatering equipment shall be of adequate quality and capacity, and so arranged as to perform their proper function of keeping the excavation free from water of any source. Any dewatering equipment, pipes, etc., which the Contractor may elect to use are subject to written approval of the Engineer.

The written approval of the facilities by the Engineer shall be intended merely as helpful guidance to the contractor and shall not in any way cause the City of Binghamton to be liable for any failure or malfunction of dewatering or water diversion facilities. Any and all damage caused by failure or malfunction of such facilities shall be solely the responsibility of the Contractor. It shall also be his responsibility to protect the creek banks from erosion by reason of any restriction of the channel that he has caused.

3. Basis of Payment. Payment will be made at the lump sum price bid and shall include the cost of furnishing all labor, material, and equipment necessary to satisfactorily complete the work.

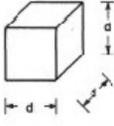
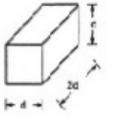
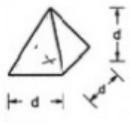
ITEM 80 – REMOVED AND RESET EXISTING RIP-RAP

1. Description. This work shall consist of removing and resetting existing stone filling in accordance with these specifications, at locations shown on the plans or as ordered by the Engineer.
2. Materials. Stone filling shall be the existing stone at sites where resetting will be done as shown on plans or A.O.B.E. Stone spalls of suitable size for placing between reset stones shall be furnished by the Contractor.
3. Construction Details. The Contractor shall remove and reset existing dry stone filling to original configuration at sites shown on plans or A.O.B.E. The Contractor shall furnish and place stone spalls of suitable size between the reset stones.
4. Method of Measurement. The quantity to be measured will be the actual number of square yards of dry stone filling reset, as determined by field measurements.
5. Basis of Payment. The price bid per square yards shall include the cost of all labor, material and equipment necessary to complete the work, including any unclassified excavation to initially remove the stone filling.

ITEM 80H – DRY RIP-RAP (HEAVY)

1. Description. Under this item, the Contractor shall furnish and place dry rip-rap as shown on the plans, or as required to complete the work to the satisfaction of the Engineer.
2. Materials. Dry rip-rap shall be formed and constructed of stone meeting the requirements of Sections 620-1.01 Soundness Approval, 620-2.02 Stone Filling and 620-3.03 Dry Rip-Rap, of the New York State Department of Transportation Standard Specifications, except that at least 50% of the stones shall weigh in excess of 300 pounds each, and the remainder of the stones shall weigh from 100 to 300 pounds each.  
The gradation of materials furnished for use as dry-rip will be accepted or rejected based on a visual examination of the material by the Engineer.

<b>FIGURE 620-1 STONE FILLING GRADATION REQUIREMENTS</b>			
Stone Filling Item	See Notes	Stone Size <sup>1</sup>	Percent of Total by Weight
Fine	2, 3, 4	Smaller than 8 inch	90 - 100
		Larger than 3 inch	50 - 100
		Smaller than No. 10 Sieve	0 - 10
Light	2, 3, 4	Lighter than 100 pounds	90 - 100
		Larger than 6 inch	50 - 100
		Smaller than 1/2 inch	0 - 10
Medium	2, 4	Heavier than 100 pounds	50 - 100
		Smaller than 6 inch	0 - 10
Heavy	2, 4, 5	Heavier than 600 pounds	50 - 100
		Smaller than 6 inch	0 - 10

<b>APPROXIMATE SHAPE</b>					
Specified Weights and Sizes					
600 pounds	d = 18 inches	d = 23 inches	d = 15 inches	d = 23 inches	d = 27 inches
300 pounds	d = 15 inches	d = 18 inches	d = 12 inches	d = 18 inches	d = 21 inches
150 pounds	d = 12 inches	d = 15 inches	d = 9 inches	d = 15 inches	d = 17 inches
100 pounds	d = 10 inches	d = 13 inches	d = 8 inches	d = 13 inches	d = 15 inches
d = 8 inches	50 lbs.	25 lbs.	100 lbs.	25 lbs.	16 lbs.
d = 6 inches	20 lbs.	10 lbs.	40 lbs.	10 lbs.	7 lbs.

**NEW YORK STATE DEPARTMENT OF TRANSPORTATION  
STANDARD SPECIFICATIONS of May 1, 2008**

3. Construction Details. The stones shall be placed so that the weight of the stone is carried by the underlying material and not by the adjacent stones. On slopes, the largest stones shall be placed at the bottom. All dry rip-rap shall be properly aligned and in close

contact and shall rest on a 6-inch bed of stone chips, crushed stone, crushed slag or washed gravel unless the material in the underlying natural slope or embankment is suitable granular material as determined by the Engineer. The spaces between the stones shall be filled with spalls of suitable size.

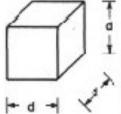
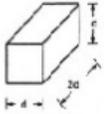
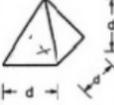
4. Method of Measurement. The quantity of dry rip-rap paid for under this item will be the number of tons measured in final position. The porous bed placed under the dry rip-rap will be included in the quantity of dry rip-rap and will be paid for as such.
5. Basis of Payment. The unit price bid per ton of Dry Rip-Rap (Heavy) shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

Excavation and backfill will be paid for under the item "Unclassified Excavation".

ITEM 80L – DRY RIP-RAP (LIGHT)

1. Description. Under this item, the Contractor shall furnish and place dry rip-rap as shown on the plans, or as required to complete the work to the satisfaction of the Engineer.
2. Materials. Dry rip-rap shall be formed and constructed of stone meeting the requirements of Sections 620-1.01 Soundness Approval, 620-2.02 Stone Filling and 620-3.03 Dry Rip-Rap, of the New York State Department of Transportation Standard Specifications, see figure below.  
The gradation of materials furnished for use as dry-rip will be accepted or rejected based on a visual examination of the material by the Engineer.

<b>FIGURE 620-1 STONE FILLING GRADATION REQUIREMENTS</b>			
Stone Filling Item	See Notes	Stone Size <sup>1</sup>	Percent of Total by Weight
Fine	2, 3, 4	Smaller than 8 inch	90 - 100
		Larger than 3 inch	50 - 100
		Smaller than No. 10 Sieve	0 - 10
Light	2, 3, 4	Lighter than 100 pounds	90 - 100
		Larger than 6 inch	50 - 100
		Smaller than 1/2 inch	0 - 10
Medium	2, 4	Heavier than 100 pounds	50 - 100
		Smaller than 6 inch	0 - 10
Heavy	2, 4, 5	Heavier than 600 pounds	50 - 100
		Smaller than 6 inch	0 - 10

<b>APPROXIMATE SHAPE</b>					
Specified Weights and Sizes					
600 pounds	d = 18 inches	d = 23 inches	d = 15 inches	d = 23 inches	d = 27 inches
300 pounds	d = 15 inches	d = 18 inches	d = 12 inches	d = 18 inches	d = 21 inches
150 pounds	d = 12 inches	d = 15 inches	d = 9 inches	d = 15 inches	d = 17 inches
100 pounds	d = 10 inches	d = 13 inches	d = 8 inches	d = 13 inches	d = 15 inches
d = 8 inches	50 lbs.	25 lbs.	100 lbs.	25 lbs.	16 lbs.
d = 6 inches	20 lbs.	10 lbs.	40 lbs.	10 lbs.	7 lbs.

**NEW YORK STATE DEPARTMENT OF TRANSPORTATION  
STANDARD SPECIFICATIONS of May 1, 2008**

3. Construction Details. The stones shall be placed so that the weight of the stone is carried by the underlying material and not by the adjacent stones. On slopes, the largest stones shall be placed at the bottom. All dry rip-rap shall be properly aligned and in close contact and shall rest on a 6-inch bed of stone chips, crushed stone, crushed slag or

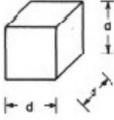
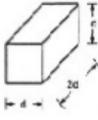
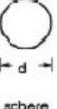
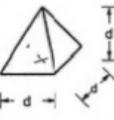
washed gravel unless the material in the underlying natural slope or embankment is suitable granular material as determined by the Engineer. The spaces between the stones shall be filled with spalls of suitable size and/or rock lining.

4. Method of Measurement. The quantity of dry rip-rap paid for under this item will be the number of cubic yards computed from the payment lines shown on the plans, or as directed by the Engineer. The spaces between the stones filled with spalls of suitable size and/or rock lining shall be included in the unit price of this item. In addition, the porous bed placed under the dry rip-rap will be included in the quantity of dry rip-rap and will be paid for as such.
5. Basis of Payment. The unit price bid per cubic yards of Dry Rip-Rap (Light) shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

**ITEM 80M – DRY RIP-RAP (MEDIUM)**

1. **Description.** Under this item, the Contractor shall furnish and place dry rip-rap as shown on the plans, or as required to complete the work to the satisfaction of the Engineer.
2. **Materials.** Dry rip-rap shall be formed and constructed of stone meeting the requirements of Sections 620-1.01 Soundness Approval, 620-2.02 Stone Filling and 620-3.03 Dry Rip-Rap, of the New York State Department of Transportation Standard Specifications, see figure below.  
The gradation of materials furnished for use as dry-rip will be accepted or rejected based on a visual examination of the material by the Engineer.

<b>FIGURE 620-1 STONE FILLING GRADATION REQUIREMENTS</b>			
<b>Stone Filling Item</b>	<b>See Notes</b>	<b>Stone Size<sup>1</sup></b>	<b>Percent of Total by Weight</b>
Fine	2, 3, 4	Smaller than 8 inch	90 - 100
		Larger than 3 inch	50 - 100
		Smaller than No. 10 Sieve	0 - 10
Light	2, 3, 4	Lighter than 100 pounds	90 - 100
		Larger than 6 inch	50 - 100
		Smaller than 1/2 inch	0 - 10
Medium	2, 4	Heavier than 100 pounds	50 - 100
		Smaller than 6 inch	0 - 10
Heavy	2, 4, 5	Heavier than 600 pounds	50 - 100
		Smaller than 6 inch	0 - 10

<b>APPROXIMATE SHAPE</b>					
<b>Specified Weights and Sizes</b>					
600 pounds	d = 18 inches	d = 23 inches	d = 15 inches	d = 23 inches	d = 27 inches
300 pounds	d = 15 inches	d = 18 inches	d = 12 inches	d = 18 inches	d = 21 inches
150 pounds	d = 12 inches	d = 15 inches	d = 9 inches	d = 15 inches	d = 17 inches
100 pounds	d = 10 inches	d = 13 inches	d = 8 inches	d = 13 inches	d = 15 inches
d = 8 inches	50 lbs.	25 lbs.	100 lbs.	25 lbs.	16 lbs.
d = 6 inches	20 lbs.	10 lbs.	40 lbs.	10 lbs.	7 lbs.

**NEW YORK STATE DEPARTMENT OF TRANSPORTATION  
STANDARD SPECIFICATIONS of May 1, 2008**

3. **Construction Details.** The stones shall be placed so that the weight of the stone is carried by the underlying material and not by the adjacent stones. On slopes, the largest stones shall be placed at the bottom. All dry rip-rap shall be properly aligned and in close contact and shall rest on a 6-inch bed of stone chips, crushed stone, crushed slag or

washed gravel unless the material in the underlying natural slope or embankment is suitable granular material as determined by the Engineer. The spaces between the stones shall be filled with spalls of suitable size.

4. Method of Measurement. The quantity of dry rip-rap paid for under this item will be the number of tons measured in final position. The porous bed placed under the dry rip-rap will be included in the quantity of dry rip-rap and will be paid for as such.
5. Basis of Payment. The unit price bid per ton of Dry Rip-Rap (Heavy) shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

Excavation and backfill will be paid for under the item "Unclassified Excavation".

ITEM 83PSP – TEMPORARY SHEET PILING & BRACING FOR STRUCTURES

1. Description. Under this item, the Contractor shall furnish, place, maintain sheet piling at locations as shown on the plans for pump stations. All necessary wailing and bracing shall be included under this item.
2. Special Requirements. All sheeting and bracing shall conform to Public Law 91-596 (Williams Steiger Act); the Occupational Safety and Health Administration Act (OSHA) of 1970 and its amendments and regulations; or to the New York State Industrial Code Rule 23, entitled "Protection in Construction, Demolition and Excavation Operations" as issued by New York State Department of Labor, Board of Standards and Appeals; whichever is the most stringent.

Conform to New York State Industrial Code Rule 53; entitled "Construction, Excavation and Demolition Operations at or Near Underground Facilities" as issued by the State of New York Department of Labor, Board of Standards and Appeals.

All sheeting and bracing shall be designed and monitored by a Professional Engineer licensed in New York State.

Design shall include all loading conditions to which the sheeting and bracing will be subjected during construction.

Design sheeting and bracing systems to enable safe construction of structures, utilities and appurtenances, and prevent excessive ground loss, displacement of adjacent foundations, and displacement of the bottom of the excavation.

3. Submittals. The Contractor shall submit detail plans showing the layout, sizes and configuration on the sheeting being proposed. These plans and details shall be reviewed and stamped by a Professional Engineer licensed in the State of New York.

Submit manufacturer and style of interlocking steel sheet piling.

4. Materials. Sheeting can be used material, but must be approved by licensed Professional Engineer who designed sheeting, and the Engineer-in-Charge. Steel – ASTM A36 as required by ASTM A328. Interlocking type.
5. Construction Details. When so designated on the drawings or stated in the specification or to comply with local, state or federal (OSHA) regulations, or when sloped excavation or temporary sheeting are not feasible, not possible or allowed, or if excavations endanger adjacent facilities or A.O.B.E., sheeting shall be installed by the Contractor in locations approved by the Engineer.

Provide all materials, equipment and labor necessary to construct and maintain all required excavation support systems.

Sheeting and bracing support systems shall include, but shall not be limited to, wall support such as wood sheeting, ringwales, lagging, soldier piles, steel sheeting and bracing members such as stringers, wales, struts, rakers, shores, tieback anchors, etc. necessary to prevent damage to the work and for the safety of workers, the general public or adjacent property.

No excavation shall be performed below a line drawn down and away at a slope of two horizontal and one vertical from the nearest footing or grade beam of existing buildings or as shown on the drawings without providing sheeting, shoring and bracing to provide lateral support for soils beneath the foundations of buildings and to prevent damage to buildings.

Design of bracing shall be such as to permit proper construction of the walls and footings and proper installation of the utilities as shown on the drawings.

Sheeting shall not be driven while concrete is being placed, or within 24-hours after placement, nor during pile load testing.

Do not brace to concrete without written approval of the Engineer.

Install sheeting and bracing systems in a logical sequence as excavation operations are performed.

Where shown on the drawings, or A.O.B.E., sheeting shall be cut off as required to avoid all utilities, or a minimum of 5- feet below proposed final grade.

Provide to the Engineer a drawing of cut-off sheeting locations. Drawing should show site plan with dimensioned locations of sheeting, type of material remaining, and depths or elevations to top and bottom of remaining sheet.

6. Maintenance. Maintain sheeting and bracing systems as functional on a 24-hour basis. Provide a means of determining movement of excavation walls, and adjacent soil, buildings and structures and utilities.
  - A. If movement or damage occurs, immediately cease all construction activities, install temporary measures to prevent further movement or damage and notify the Engineer.
  - B. Movement or damage due to failure of sheeting and bracing systems shall be permanently repaired as soon as possible, at no cost to the Owner and at no additional cost for time.

7. The temporary sheeting shall be removed after the structure is complete and backfill has been placed to a depth where a stable situation occurs (such as no undermining or cave-ins). The sheeting shall be completely removed, unless ordered to be left in place by the Engineer-in-Charge. This order will be in written form. If the sheeting is left in place, it must be cut off as specified in this section.
8. Method of Measurement. The quantity of permanent sheet piling to be measured under this item will be the number of square foot of piling obtained by multiplying the vertical length of piling, as designed by the Contractor's licensed Professional Engineer, by the horizontal length of piling, measured along the centerline of piling installed at the finished grade. The quantity of sheet piling ordered left in place shall be the quantity ordered left in place in writing by the Engineer-in-Charge.
9. Basis of Payment. The quantity to be paid for under this item will be the number of square feet of sheet piling, determined from the measurements made under section 8, Method of Measurement.

The unit price for this item shall include the cost of furnishing all labor, materials and equipment necessary to complete the work, including all necessary sheeting and bracing. The cost of maintaining the excavated area from earth, water, ice and snow will be included in the price bid.

The following items to be measured and paid for under this specification shall be as follows if and where they appear in the itemized proposal:

<u>Item</u>	<u>Description</u>	<u>Unit</u>
83PSP-1	Sheet Piling & Bracing for Structures	S.F.
83PSP-2	Sheet Piling & Bracing for Structures ordered left in place	S.F.

## ITEM 83TXS- TEMPORARY SHEET PILING

1. Description. Under this item, the Contractor shall furnish, place, maintain and remove temporary sheet piling including the necessary waling and bracing, at locations as shown on the plans or as ordered by the Engineer.
2. Materials. Sheet piling for this item shall be of adequate cross section and shall be adequately braced to protect workers against the hazard of falling or sliding material. The selection of materials, their arrangement, and details shall be the Contractor's option and responsibility, but subject to the approval of the Engineer.
3. Construction Details. Sheet piling shall be installed where unstable soil conditions make it necessary to protect trench from the hazards of falling or sliding material; or for the protection of exposed utility lines within the excavated trench; or where indicated on the plans and directed by the Engineer. Any material which stops the driving of the sheet piling shall be removed by the Contractor, and payment for the removal of such material will be made under the trench excavation. Sheet piling installed under this item shall be tight or continuous, except where skeleton sheet piling is permitted under Industrial Code Rule No. 23 of the New York State Department of Labor, Board of Standards and Appeals. Skeleton sheeting shall be considered as any sheeting other than tight or continuous sheeting.
4. Method of Measurement. The quantity of tight or continuous temporary sheet piling to be measured under this item will be the number of square feet of piling obtained by multiplying the vertical length of piling, measured between the payment lines herein described, by the horizontal length of piling, measured along the centerline of piling installed.

The quantity of temporary skeleton sheet piling to be measured under this item, when skeleton sheet piling is used, will be the number of square feet of piling actually used.

Unless indicated otherwise on the plans or in the proposal, the lower payment line shall be the bottom of the structure immediately adjacent to the sheet piling, and the upper payment line shall be the existing ground surface or finished grade (whichever is lower), or as ordered, in writing, by the Engineer.

Additional sheet piling driven only to provide support for the sheeting shown on the plans or ordered by the Engineer shall be considered part of the bracing system and shall not be paid for as sheet piling. Its cost shall be included in the unit price bid for the ordered quantity.

5. Basis of Payment. The quantity to be paid for under this item will be the number of square feet of temporary sheet piling, determined from the measurements made under Section 4, Method of Measurement.

The unit price bid for this item shall include the cost of furnishing all labor, materials and equipment necessary to complete the work, including all necessary sheeting and bracing. The cost of maintaining the excavated area from earth, water, ice and snow will be included in the price bid for the appropriate excavation line.

The unit price bid for Item 83TXS shall be not less than 40 cents per square foot, but may exceed said 40 cents by any amount as determined by the bidder. In the event that a unit price of less than 40 cents per square foot is indicated in the itemized proposal for Item 83TXS, the unit price of 40 cents per square foot shall be substituted and the necessary adjustments made to determine the total amount of the bid.

If the Engineer, in writing, orders that Temporary Sheet Piling be left in place, payment will still be made under Item 83TXS, but the area of such left in place Temporary Sheet Piling to be paid for will be one and one-half (1½) times the actual area left in place, measured in accordance with the specifications for 83TXS. No payment will be made for use of a drag shield under this item.

ITEM 87 – PAVEMENT PROFILING, 0” – 6” AVERAGE REMOVAL

1. Description. Under this item, the Contractor shall furnish all labor, material and equipment necessary to mill, shape and remove portions of existing bituminous pavement surfaces by a cold milling process, within the areas indicated in the specifications or as directed by the City. The Contractor shall also be required to clean all milled streets after completion of each street. In the event that the street is not completed at the end of the workday, the street shall be cleaned and left in a milled and dust free condition.

The Contractor shall provide for the maintenance and protection of traffic. The Contractor shall strictly adhere to all guidelines called for in the following: *Manual of Uniform Traffic Control Devices*, New York State Department of Transportation, latest addendum, and *Manual on Uniform Traffic Control Devices*, Federal Highway Administration, latest addendum.

2. Equipment. The milling machine shall be a self-propelled machine designed and built for milling bituminous pavements without heating. The machine shall be equipped with automatic grade and cross slope controls with independent sensors, and consist of a carbide tip teeth cutting drum with down cutting capability in order to control chunk size meeting the gradation listed below. The speed of the machine shall be variable so that it will produce a striated milled surface with the striations generally no deeper than 3/8 of an inch. The width of the cutting drum shall be a minimum of 60 inches.

The machine shall be equipped with a means to control dust and other particulate matter created by the cutting action.

The referenced elevation shall be determined through the use of taut reference lines positioned at or near the edge of the milling machine, or through the use of a moving reference line such as a “floating beam or ski” of at least twenty feet (20’) in length that is attached to the machine. A short ski or shoe may be used as a moving reference line, with the approval of the Engineer, provided a satisfactory fixed reference plane is available on or near the milling machine.

3. Construction Details. The depth of milling for each traveled lane shall be determined by the City and shall not exceed seven inches (7”). The maximum size of milled material shall be ½ inch.

It is anticipated that certain areas of the roadway will require additional milling in excess of the initially milled depth because of excessive wear in wheel lanes and asphalt shoving. These areas shall again be milled at an average depth of two inches (2”) or fraction thereof when indicated on the plans or directed by the City. In the event additional milling is directed by the City, the area will be milled a third time in the same manner.

Areas not accessible to the milling machine such as around and/or adjacent to inlets, catchbasins, manholes, curbs, valves, and traverse joints on structures, will be removed by the Contractor, by hand work or other methods approved by the City.

The milled material shall remain the property of the City and shall be transported by the Contractor to designated sites within the City of Binghamton as determined by the City. The stockpile height shall not exceed eight feet (8'). All millings to be loaded directly into trucks. No storage on street will be allowed.

In the event that the City of Binghamton does not intend to utilize the millings from a particular street, the Contractor will be so notified and will be responsible, at his own expense, for the removal and disposal of the millings.

When working adjacent to traffic, extreme care is to be exercised to avoid spillage of milled material onto the travel way. In the event that such a condition should occur, the Contractor shall take immediate steps to correct the condition.

The milling operation shall be capable of producing a finished profile and cross slope within ¼ inch of City of Binghamton standard right-of-way cross section.

No sharply defined drop-offs will be permitted within or between travel lanes carrying traffic, which are attributable to milling. All near vertical or vertical longitudinal faces exceeding 1-¼ inches in height shall be sloped in a manner acceptable to the City.

The milling operation shall be performed in such a manner that at the end of each workday, the milled area shall be cleaned thoroughly of all loose material utilizing approved vacuum and mechanical type sweepers, prior to opening to traffic.

4. Time of Completion. The City of Binghamton will notify the Contractor in advance as to the sequence of streets to be milled. This sequence shall correspond to the paving operation of the City of Binghamton paving crews. It will be necessary for the contractor to wait for a period of time to commence further milling operations. If the Contractor elects to move the milling machine to another location, the City of Binghamton will notify the Contractor one week in advance as to when milling operations may resume. No extra payment will be made for relocation of the milling machine.
5. Contractor's Qualifications.
  - A. The bidder will supply with the profiling bid documentation that he has performed the proposed scope of work on four successful projects in the past year. This documentation will show name, location, quantities, completion date, and a person to contact for verification. Past performance will be a factor in determining the award.

- B. In addition, the Contractor shall comply with Section 220 of the New York State labor Law including the prevailing hourly wage rate and all other requirements of Section 220 for all applied contracts.
  - C. The Contractor shall comply with all laws of the State of New York applicable to work involved and shall not discriminate on account of race, color, creed or national origin in employment on public works projects.
  - D. The Commissioner of Public Works reserves the right to make any investigation or inquiries necessary to determine the competence and ability of the bidder to properly perform the work. If, after said investigation of the commissioner of Public Works, he is not satisfied that the bidder is properly qualified to meet all requirements contained herein and to perform all work in a satisfactory manner, he may recommend to the Board of Contract and Supply that the bidder be rejected as unsatisfactory.
6. Method of Measurement. The quantity to be paid for will be measured by the number of square yards of pavement surface milled in accordance with the plans, specifications, and as ordered by the City Engineer.
7. Basis of Payment. The unit price bid per square yard shall include the cost of furnishing all labor and equipment necessary to complete the milling, the removal and hauling of milled material to a designated storage area, and cleaning the resultant surface after milling.

Minor areas of heaved, shoved, or high Portland Cement concrete pavement milled in order to maintain the proper profile and cross slope and incidental to the milling of bituminous pavement shall be included in the unit price bid for this item.

ITEM 87 – PAVEMENT PROFILING, 0” – 8” AVERAGE REMOVAL

1. Description. Under this item, the Contractor shall furnish all labor, material and equipment necessary to mill, shape and remove portions of existing bituminous pavement surfaces by a cold milling process, within the areas indicated in the specifications or as directed by the City. The Contractor shall also be required to clean all milled streets after completion of each street. In the event that the street is not completed at the end of the workday, the street shall be cleaned and left in a milled and dust free condition.

The Contractor shall provide for the maintenance and protection of traffic. The Contractor shall strictly adhere to all guidelines called for in the following: *Manual of Uniform Traffic Control Devices*, New York State Department of Transportation, latest addendum, and *Manual on Uniform Traffic Control Devices*, Federal Highway Administration, latest addendum.

2. Equipment. The milling machine shall be a self-propelled machine designed and built for milling bituminous pavements without heating. The machine shall be equipped with automatic grade and cross slope controls with independent sensors, and consist of a carbide tip teeth cutting drum with down cutting capability in order to control chunk size meeting the gradation listed below. The speed of the machine shall be variable so that it will produce a striated milled surface with the striations generally no deeper than 3/8 of an inch. The width of the cutting drum shall be a minimum of 60 inches.

The machine shall be equipped with a means to control dust and other particulate matter created by the cutting action.

The referenced elevation shall be determined through the use of taut reference lines positioned at or near the edge of the milling machine, or through the use of a moving reference line such as a “floating beam or ski” of at least twenty feet (20’) in length that is attached to the machine. A short ski or shoe may be used as a moving reference line, with the approval of the Engineer, provided a satisfactory fixed reference plane is available on or near the milling machine.

3. Construction Details. The depth of milling for each traveled lane shall be determined by the City and shall not exceed seven inches (7”). The maximum size of milled material shall be ½ inch.

It is anticipated that certain areas of the roadway will require additional milling in excess of the initially milled depth because of excessive wear in wheel lanes and asphalt shoving. These areas shall again be milled at an average depth of two inches (2”) or fraction thereof when indicated on the plans or directed by the City. In the event additional milling is directed by the City, the area will be milled a third time in the same manner.

After milling the existing pavement, the Contractor shall remove any unsuitable material from the subbase as ordered by the City Engineer. Undercuts to be made to a depth when suitable subbase material is encountered. Backfill shall be made with Select Granular Fill. Geotextile shall be placed between the subbase and subgrade. Payment for this work shall be made under Items 2A, 2EFB and 126.

Areas not accessible to the milling machine such as around and/or adjacent to inlets, catchbasins, manholes, curbs, valves, and traverse joints on structures, will be removed by the Contractor, by hand work or other methods approved by the City.

The milled material shall remain the property of the City and shall be transported by the Contractor to designated sites within the City of Binghamton as determined by the City. The stockpile height shall not exceed eight feet (8'). All millings to be loaded directly into trucks. No storage on street will be allowed.

In the event that the City of Binghamton does not intend to utilize the millings from a particular street, the Contractor will be so notified and will be responsible, at his own expense, for the removal and disposal of the millings.

When working adjacent to traffic, extreme care is to be exercised to avoid spillage of milled material onto the travel way. In the event that such a condition should occur, the Contractor shall take immediate steps to correct the condition.

The milling operation shall be capable of producing a finished profile and cross slope within ¼ inch of City of Binghamton standard right-of-way cross section.

No sharply defined drop-offs will be permitted within or between travel lanes carrying traffic, which are attributable to milling. All near vertical or vertical longitudinal faces exceeding 1-¼ inches in height shall be sloped in a manner acceptable to the City.

The milling operation shall be performed in such a manner that at the end of each workday, the milled area shall be cleaned thoroughly of all loose material utilizing approved vacuum and mechanical type sweepers, prior to opening to traffic.

4. Time of Completion. The City of Binghamton will notify the Contractor in advance as to the sequence of streets to be milled. This sequence shall correspond to the paving operation of the City of Binghamton paving crews. It will be necessary for the contractor to wait for a period of time to commence further milling operations. If the Contractor elects to move the milling machine to another location, the City of Binghamton will notify the Contractor one week in advance as to when milling operations may resume. No extra payment will be made for relocation of the milling machine.

5. Contractor's Qualifications.
- A. The bidder will supply with the profiling bid documentation that he has performed similar types of pavement profiling or related pavement type projects on four successful projects in the past five years. This documentation will show name, location, quantities, completion date, and a person to contact for verification. Past performance will be a factor in determining the award.
  - B. In addition, the Contractor shall comply with Section 220 of the New York State labor Law including the prevailing hourly wage rate and all other requirements of Section 220 for all applied contracts.
  - C. The Contractor shall comply with all laws of the State of New York applicable to work involved and shall not discriminate on account of race, color, creed or national origin in employment on public works projects.
  - D. The Commissioner of Public Works reserves the right to make any investigation or inquiries necessary to determine the competence and ability of the bidder to properly perform the work. If, after said investigation of the commissioner of Public Works, he is not satisfied that the bidder is properly qualified to meet all requirements contained herein and to perform all work in a satisfactory manner, he may recommend to the Board of Contract and Supply that the bidder be rejected as unsatisfactory.
6. Method of Measurement. The quantity to be paid for will be measured by the number of square yards of pavement surface milled in accordance with the plans, specifications, and as ordered by the City Engineer.
7. Basis of Payment. The unit price bid per square yard shall include the cost of furnishing all labor and equipment necessary to complete the milling, the removal and hauling of milled material to a designated storage area, and cleaning the resultant surface after milling.

Minor areas of heaved, shoved, or high Portland Cement concrete pavement milled in order to maintain the proper profile and cross slope and incidental to the milling of bituminous pavement shall be included in the unit price bid for this item.

ITEM 94SBV – STONE CURB (GRANITE)

1. Description. Under this item, the Contractor shall furnish and set stone curb of the type shown on the plans or as ordered by the Engineer.
2. Materials. Stone curb shall be granite from approved quarries. The stone shall be sound and durable, free from seams which impair its structural integrity, and of a smooth splitting and/or machining character. Natural color variations that are characteristic of the deposit will be permitted.
  - A. Dimensions. Curb shall be cut to conform to the shape and size shown on the plans. Minimum lengths of curb shall be three feet (3'). Minimum lengths do not apply to radial curb and closures. Curb to be set on a radius of 100 feet or less shall be cut to the curve required and ends shall be cut on radial lines or as shown on the plans. Curb to be set on a radius of from 101 feet to 200 feet shall be cut in 3'-0" to 4'-0" straight lengths if so directed by the Engineer.
  - B. Width of Bottom of Curbs – shall be in accordance with that shown on the plans.
  - C. Finish.
    1. Surfaces shall be finished as indicated on the plans. Sawn or hammered surfaces shall be approximately to true planes with no projection or depression greater than 1/8". Saw marks normal to the sawing process will be permitted if within the above-prescribed tolerance.
    2. Front arris lines shall be straight and true with no variations from a straight line greater than 1/8" when measured from a 2-foot straight edge placed along the arris line. Back arris lines and the lower front arris lines shall be straight and true with no variations from a straight line greater than 1/4 inch measured in the same manner.
    3. Back surfaces shall have no projection or depression for a distance of 3 inches down from the top which would exceed a batter of 1 inch in 3 inches.
    4. Front exposed faces of curbs, when split, shall have no projection greater than 3/4 inch or depression greater than 1/2 inch measured from a vertical plane passing through the arris line at the top of the split face.
    5. Ends of curbs shall be approximately square with the planes of the exposed curb surfaces and so finished that when the stones are set no space more than 3/4" shall show in the joint for the full length of the exposed portion of the joint. Exposed arris lines at the joints shall not project beyond the plane of a split face and shall not fall under the plane of

a split face more than ¼ inch. Ends of curbs shall be sawed at locations called for on the plans.

6. Drill holes will not be permitted in exposed surfaces of curbs.

D. Mortar. Mortar for filling joints shall consist of one part of Portland Cement, Type 2, with one part of Mortar Sand, M3A, by volume, mixed as stiff as practicable and of such consistency that it will require rodding when placed in joints. The mortar for bedding the curbs shall consist of one part of Portland Cement, Type 2, and two parts of Mortar Sand, M3A, by volume.

When the plans indicate that a curb is to be placed on an epoxy mortar bed, this bed shall consist of 3 parts of mortar sand to one part of M20B, Epoxy Polysulfide Binder, by volume.

E. Anchor Bars. Anchor bars for curbs shall meet the requirements of M17, Bar Reinforcement for Cement Concrete, and shall be galvanized in accordance with M19, Galvanizing and Galvanized Sheets.

3. Construction Details. Curb sections shall not be fitted together closer than ¼ of an inch at arris line.

The joints in the curb shall be carefully filled with cement mortar, rodded in place and mixed as indicated in "Mortar." The top and exposed front shall be neatly pointed flush with the curb surfaces and satisfactorily cleaned of all excess mortar.

The Contractor shall protect the curb and keep it in alignment and first class condition until the completion of the contract. Any curb that is damaged at any time previous to the final acceptance of the work shall be removed and satisfactorily replaced at the Contractor's expense.

4. Method of Measurement. The quantity to be paid for under this item shall be the number of linear feet of curb, measured along top front arris line, placed in accordance with the plans, specifications and as ordered by the Engineer.

5. Basis of Payment. The unit price bid per linear foot shall include the cost of furnishing the stone curb with its anchor bar, the mortar bed and mortar joints including the epoxy mortar and Portland Cement and all labor and equipment required to satisfactorily complete the work.

### ITEM 96 – RESET GRANITE CURB

1. Description. Under this item, the Contractor shall reset existing granite curb which is found to be out of plumb or as directed by the Engineer. All work under this item shall be in accordance with the plans, details and/or as ordered by the Engineer.
2. Materials and Construction Details. Care shall be taken in removing existing curb so that there should be no unnecessary breakage. All curb damaged in removing, hauling, storing, or resetting, due to the carelessness of the Contractor, shall be replaced at his expense.

Existing bedding material shall be removed sufficiently to allow the curb to be reset in a fresh bed of mortar.

Curbs shall be reset to conform to the line and grade of the existing curb, sidewalks, and pavement. Where possible, individual sections of curb shall be reset at their original locations. Mortar composed of one part cement and two parts mortar sand shall be used under and at the back face of the curb for bedding.

Joints in the curb shall be redressed, carefully filled with cement mortar, and be neatly pointed flush with the curb surface.

A layer of 6-mil polyethylene sheeting shall be placed between the granite curb and the proposed sidewalk as part of this item.

The void created between the curb and pavement due to resetting the curb shall be filled with hot asphalt cement AC20. Where the void is larger than one inch wide, crushed stone size 1A may be used to fill the void to within ½-inch of the surface before filling with the hot asphalt. Both void and aggregate should be dry when applying the hot asphalt cement.

3. Method of Measurement and Basis of Payment. The quantity to be paid for under this item will be the amount of linear feet of granite curb reset in accordance with these specifications. The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work. No extra payment shall be made for pavement replacement, unless specified by the Engineer, in writing, by change order.

ITEM 97 - CONCRETE CURBITEM 97R - CONCRETE CURB ON RADIUSITEM 97G - CONCRETE CURB AND GUTTERITEM 97GR - CONCRETE CURB AND GUTTER ON RADIUS

1. Description. Under this item, the Contractor shall place Fiber mesh Micro-Reinforced™ concrete curb/curb and gutter of the type shown on the plans, where shown on the plans or as ordered by the Engineer.
2. Materials.
  - A. Concrete for conventionally formed curb/curb and gutter shall comply with the requirements of the New York State Department of Transportation Standard Specification Section 501 – Class A, Portland Cement Concrete, except that fly ash shall not be allowed and fibers (micro-reinforced) shall be added as specified below.
  - B. Concrete for machine formed curb/curb and gutter shall comply with the requirements of the New York State Department of Transportation Standard Specification Section 501 – Class J, Portland Cement concrete, except that fly ash shall not be allowed and fibers (micro reinforced) shall be added as specified below.
  - C. Items listed in the New York State Department of Transportation Concrete Specifications as optional may be used at the contractor’s option, subject to the Engineer’s approval.
  - D. Fibers – Micro-Reinforced. Use only 100 percent virgin polypropylene fibrillated, MD Graded, fibers containing no reprocessed olefin materials and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. Application per cubic yard shall equal a minimum of 1.5 pounds (0.9 Kg/m<sup>3</sup>). Fiber manufacturer must document evidence of 5-year satisfactory performance history, ISO 9002 Certification of manufacturing facility, compliance with applicable building codes and certify performance in accordance with ASTM C1116, Type III, 4.1.3 and ASTM C-1116 (Ref. ASTM C-1018) Performance Level 1, I<sub>5</sub> outlined in Section 21, Note 17 and a minimum average Residual Strength of 50 psi, of 4 beams from a single batch. Fibrous concrete reinforcement shall be manufactured by Fiber mesh, 4019 Industry Drive, Chattanooga, Tennessee, USA, 37416, (423) 892-7243, or approved equal.
3. Compressive Strength of Concrete. The concrete used shall develop a minimum 28-day compressive strength of 3,000 psi in accordance with ASTM C-39.
4. Concrete Proportioning. Perform in accordance with New York State Department of Transportation Standard Specification 501-3.01.

5. Concrete Batching Plant Requirements. Conform to New York State Department of Transportation Standard Specification 501-3.02.
6. Handling, Measuring, and Batching Materials Conform to New York State Department of Transportation Standard Specification 501-3.03.
7. Concrete Mixing, Transporting, and Discharging. Conform to New York State Department of Transportation Standard Specification 501-3.04.
8. Cold Weather Concreting. Special precautions and protection, both subject to the approval of the Engineer, shall be provided for any concrete work to be placed when the anticipated low air temperature, as forecast by the U.S. National Weather Service, is likely to fall below 40° F. in the 72 hours following placement. If the anticipated low temperature is below freezing, but not below 20° F. for the 24 hours following placement, concrete may be poured only with the Engineer's specific approval in addition to his approval of the precautions and protection methods to be provided. No concrete shall be placed when the official air temperature is below 20° F. In any case, the Engineer's approval does not relieve the Contractor of the responsibility for furnishing highest quality concrete work in full compliance with the intent of the specifications. Any concrete damaged by frost or freezing shall be removed and replaced by the Contractor at his expense.

Materials for Cold Weather Concreting shall be heated and prepared in accordance with Conform to New York State Department of Transportation Standard Specification 501-3.03B.

In addition to the above precautions, the Contractor shall provide the method of protection as specified below before starting the concrete pour. In any event, the concrete shall be cured as hereinafter specified and temporarily protected during placing and finishing so that the temperature of the concrete does not fall below 50° F. before the curing medium is laid and the protection installed.

The concrete shall be protected by completely covering with at least a 2-inch thickness of insulating material, such as glass fiber, rock wool, balsam wood, or other approved commercial insulating material. The insulating material shall be completely enclosed with a waterproof covering of 40-pound Kraft paper impregnated with asphalt, or an equivalent, and maintained in good condition. Any tears or cut edges shall be resealed with adhesive waterproof tape or vapor barrier or other waterproof covering, and the entire protection left in place for a period of 7 days. The Contractor shall provide a means of checking the temperature at the surface of the concrete during the curing period.

9. Forms. The forms for this work shall be made of metal or of acceptable planed and matched lumber, and of such construction that there will be no interference to inspection of grade and alignment and that a smooth surface will be provided.

All forms shall be straight, free from bends and warps at all times, and shall be cleaned thoroughly and oiled before concrete is placed against them. Form oil shall be a product approved by the New York State Department of Transportation Materials Bureau. It shall be applied in accordance with the manufacturer's instructions. Cleaning and oiling shall be repeated as often as the forms are reused. The forms shall rest firmly upon a thoroughly compacted and dampened sub-grade throughout their entire length. The entire depth of the forms shall be filled with concrete.

10. Placing Concrete and Forming Joints.

- A. Before any concrete may be placed, each section of sub-grade must be checked and approved by the Engineer or his designated representative. Concrete shall be handled in such a manner as to prevent the segregation of materials and the intrusion of foreign matter and excess water.
- B. Time Limits for Delivery
1. Central Mixed concrete shall be discharged within 90 minutes of completion of mixing at the plant, when transported in agitating-rotating drum units or within 30 minutes when transported in non-agitating units.
  2. Transit mixed concrete shall be discharged within 90 minutes of the moment that the cement first makes contact with the aggregates.
  3. Truck mixed concrete shall be discharged within 30 minutes of completion of mixing.
- C. Placement. Concrete shall be placed in the forms in accordance with the applicable requirements of New York State Department of Transportation Standard Specification Section 555.304. If Contractor elects to place machine formed curb, the Engineer may require the Contractor to demonstrate that the specific equipment he proposes to use is capable of satisfactorily placing the concrete mix.
- Any curb or curb and gutter placed outside of tolerance of ½ inch of the established line or ¼ inch of the established grade shall be removed and replaced at the Contractor's expense.
- D. Vibration. After the concrete has been placed and spread so as to produce the specified depth, and before it is screeded or finished, the concrete shall be compacted by means of an approved immersion type, mechanical vibrator of a size and weight sufficient to thoroughly vibrate the entire concrete mass without damaging or misaligning the form.

The vibrator shall be introduced into the concrete at one-foot intervals for a period not to exceed two seconds for each immersion and shall vibrate at not less than 5000 impulses per minute.

- E. Forming Joints. Curbs and gutters shall have transverse construction joints to the full depth of the concrete spaced twenty feet to twenty-five feet apart. Transverse contraction joints, extending one-third of the way through from the top, shall be placed every five feet. Contraction joints may be sawed.

Three-quarter-inch preformed elastic joint sealer shall be placed where curb and gutter join sidewalks, driveways, etc.

- F. Finishing Concrete. The concrete shall be screeded and floated to a true, even surface without bringing free water and fines to the surface. No water shall be added to the surface for finishing. Joints and edges shall be rounded with a suitable tool. The forms shall be left in place at least twenty-four hours or until the concrete has set sufficiently so that, in the opinion of the Engineer, they can be removed without injury to the curb. Upon removal of the forms, the curb shall be immediately rubbed down to a smooth and uniform surface, but no plastering will be permitted. For this work, competent and skillful finishers shall be employed. The Contractor shall apply an asphalt emulsion (tack coat) compatible with asphalt concrete on area of curb that is to be in contact with need asphalt concrete pavement.
- G. Protection of Concrete. The Contractor shall protect the curb/curb and gutter and keep it in alignment and first class condition until the completion of the contract. Any curb/curb and gutter which is damaged at any time previous to the final acceptance of the work shall be removed and replaced with new curb and gutter at the Contractor's expense.
- H. Curing. All curbs and gutters shall be cured by spraying on a membrane curing compound immediately after finishing operations have been completed and the surface water has evaporated; compound shall conform to New York State Department of Transportation Standard Specification Section 711-05 (white pigmented or clear with fugitive dye). Small projects having not more than one adjacent property owner may be cured by covering with waterproof paper blankets, quilted covers, polyethylene coated burlap bags or polyethylene curing covers which shall be kept moist for seven days.

11. Quality Assurance.

- A. Contractor shall submit to the City Engineer's office the proposed concrete mix design for project minimally 15 days prior to concrete placement. When optional items are included in the mix, submittal must be accompanied by documentation that proposed mix design has performed satisfactory, either by laboratory testing or field performance. Reference documentation shall not be older than 6 months.
- B. Each load of concrete delivered to project must have documentation that concrete being delivered conforms to pre-approved concrete mix design. Documentation

required is a computerized print-out showing actual batch weights and a certification of conformance signed by concrete producer's batch plant personnel that loaded truck. Documentation shall be forwarded to the Engineer (or his/her representative).

- C. The contractor shall employ an independent testing laboratory to test concrete at the job site, technician performing field tests must be ACI certified Grade 1. The following tests shall be performed in accordance to ASTM: C-231 or C-173 Air Content, C-143 Slump, C-138 Unit Weight, C-1064 Temperature and C-31 Cast Test Cylinders. A total of 4 test cylinders shall be cast and tested 1 at 7 days, 2 at 28 days and 1 hold cylinder.
- D. If concrete fails strength test at 28 days, the 2 hold cylinders will be tested at 56 days. When concrete fails at 28 days, but meets strength at 56 days, the City of Binghamton may pay proportionally less for the concrete in place.

Test laboratory will copy all test results to the Contractor and the Engineer's office (2 copies).

- E. The cost of all testing by an independent testing laboratory is the responsibility of the Contractor. The contractor shall be responsible for coordinating the required testing frequency with the laboratory. All tests shall be performed in the presence of the inspector, unless otherwise directed. In cases of dispute, the Engineer will direct when and where testing shall be done. The Contractor should base this cost on the following:
1. For every 50 cubic yards of concrete, perform slump, air content, and temperature tests.
  2. For every 200 cubic yards of concrete, perform unit weight and cast test cylinders tests.

The Engineer may require more frequent testing when:

- a. Cylinders tested at 28 days have failed in 2 or more series.
- b. Noticeable character changes of concrete
- c. The concrete is non-consistent between loads.

The additional cost incurred by more frequent testing is the responsibility of the contractor.

- F. Concrete shall meet the following specified requirements at placement (in accordance with New York State Department of Transportation Standard Specification Section 501):

	<b>Class A</b>	<b>Class J</b>
Slump Range	2½" – 4"	½" – 1½"
Air Content Range	5.0% - 8.0%	4.0% - 8.0%

**1<sup>ST</sup> EDITION**

Temperature Range		50° - 90°	50° - 90°
Temperature (Cold weather concreting)		50° - 70°	50° - 70°

G. Test laboratory will copy all test results to the Engineer's office (2 copies).

Concrete test reports shall, at a minimum, contain the following information:

1. Street name and centerline offset of test location.
2. Use of concrete (i.e., curb, sidewalk, etc.).
3. Truck number and time of transit.
4. Time mixed on the job.
5. Time placement was started.
6. Amount of water added, water content and water/cement ratio.
7. Name of person taking test.
8. Compression strength.
9. Type of fracture.
10. Age at testing.
11. Concrete supplier.
12. Mix number and specification strength.
13. Air content.
14. Slump.
15. Temperature.
16. State whether or not the concrete complies with the specifications.
17. Name and signature of person preparing report.

12. Backfill. Prior to backfilling, the Contractor shall notify the Engineer or his representative that the site is ready to be visually inspected. The contractor shall not commence backfilling in the curb area until 24 hours after receipt of a written notice from the Engineer, or his designated representative, to so proceed.
13. Method of Measurement. The quantity to be paid for under this item shall be the number of linear feet of curb or curb and gutter placed in accordance with the plans, specifications, and as ordered by the Engineer.
14. Basis of Payment. The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including any excavation, removal of existing curb/curb and gutter, cutting of tree roots, cutting or sawing concrete pavement, backfilling, expansion and contraction joints, tack coat, protection, sampling and testing of the concrete.

ITEM 104 – RESET EXISTING BRICK OR FLAGSTONE WALKS OR DRIVEWAYSITEM 104A – BRICK WALK OR DRIVEWAYITEM 104B – FLAGSTONE WALK OR DRIVEWAY

1. Description. Under this item, the Contractor shall reset the existing brick or flagstone walks and driveways as shown on the plans or as ordered by the Engineer.
2. Materials. Brick or stone to be used shall be from the existing walks or driveways. All brick or flagstone damaged by the Contractor's operations shall be replaced at the Contractor's expense.
3. Construction Details. The existing brick or flagstone shall be reset on the line and grade as shown on the plans or as ordered by the Engineer. Brick and stone shall be replaced on suitable subgrade so that the weights of the brick or stones are carried by the underlying material, and not by adjacent brick or stones. The subgrade shall be two inches (2"0 of a Select Granular Fill (Item 2EFB), or suitable material as ordered by the Engineer. All brick or flagstone shall be laid in the pattern shown on the plans or as directed by the Engineer to provide a uniformly even surface. Joints shall be hand tight unless otherwise specified. No brick or stone shall be laid in raining or freezing weather.
4. Method of Measurement. The quantity to be paid for under this item will be the number of square feet of brick or flagstone that is to be reset.
5. Basis of Payment. The unit price bid per square foot shall include the cost of furnishing all labor, materials, tools and equipment necessary to satisfactorily complete the work. The brick and flagstone walk or driveways shall be paid for under its respective item. No payment shall be made for re-grading of subbase under this item. The use of a material for subgrade shall be paid for under its respective item. No payment will be made for subgrade under this item.

Payments

104A - Per Square Foot

104B - Per Square Foot (as with other specs)

## ITEM 105 - CONCRETE SIDEWALK

1. Description. Under this item, the Contractor shall build Fiber mesh Micro-Reinforced concrete sidewalk, approach walk, approach walks above steps that are not an integral part of the steps, courtesy walk, driveway, and driveway aprons, upon properly prepared sub grades as indicated on the plans or as ordered by the Engineer.
2. Materials.
  - A. Cement - Cement used shall conform to the requirements of A.S.T.M. C-150 for Type 1A - Air Entraining Portland Cement.
  - B. Water - Water for concrete shall be free from oil, acid, alkali, vegetable matter, organic matter, or other deleterious substances and shall be suitable for drinking. Doubtful sources of water for concrete shall be subjected to Laboratory testing before use. Tests shall be in accordance with AASHO T-26.
  - C. Aggregates - All aggregates used shall conform to A.S.T.M. C-33 except that coarse aggregate shall consist only of crushed stone. The gradation of coarse aggregates shall be as follows:

<u>Screen Size</u>	<u>% Passing</u>
1½"	100
1"	93-100
½"	27-58
¼"	0-8

- D. Admixtures - No admixture other than coloring agents, air entraining agents and/or retarders shall be used. All air entraining admixtures used in the manufacture of Portland Cement shall conform to the requirements of A.S.T.M. C-266.
- E. Pozzolans - The Contractor may substitute Portland Cement with fly ash, pound for pound, up to 15 percent of the weight of cement specified for any concrete class listed in Table 501-3, Concrete Mixtures, except Class F. No fly ash is permitted in Class F.

Fly ash shall meet the requirements of §711-10, Fly Ash. Any fly ash hardened by moisture will be rejected. Fly ash stored over the winter at the concrete producing plant will be retested for specification compliance by the Materials Bureau.

When a pozzolan is weighed cumulatively with the cement, the pozzolan shall be last in the weighting sequence and the tolerance for each material draw weight shall be based upon the total weight of cement plus pozzolan.

- F. Fibers - Micro-Reinforced. Use only 100 percent virgin polypropylene fibrillated, MD Graded, fibers containing no reprocessed olefin materials and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. Application per cubic yard shall equal a minimum of 1.5 pounds (0.9 Kg/m<sup>3</sup>). Fiber manufacturer must document evidence of 5-year satisfactory performance history, ISO 9002 certification of manufacturing facility, compliance with applicable building codes and certify performance in accordance with ASTM C-1116, Type III, 4.1.3 and ASTM C-1116 (Ref: ASTM C-1018) Performance Level 1, I<sub>5</sub> outlined in Section 21, Note 17 and a minimum average Residual Strength of 50 psi, of 4 beams from a single batch. Fibrous concrete reinforcement shall be manufactured by Fiber mesh, 4019 Industry Drive, Chattanooga, Tennessee, USA, 37416, (423) 892-7243, or approved equal.
- G. Quality Assurance.
1. Contractor shall submit to the City Engineer's office the proposed concrete mix design for project minimally 15 days prior to concrete placement. Submittal must be accompanied by documentation that proposed mix design has performed satisfactory, either by laboratory testing or field performance. Reference documentation shall not be older than 6 months.
  2. Each load of concrete delivered to project must have documentation that concrete being delivered conforms to pre-approved concrete mix design. Documentation required is a computerized print-out showing actual batch weights and a certification of conformance signed by concrete producer's batch plant personnel that loaded truck. Documentation shall be forwarded to the City Engineer (or his/her representative).
  3. The contractor shall employ an independent testing laboratory to test concrete at the job site, technician performing field tests must be ACI certified Grade 1. The following tests shall be performed in accordance to ASTM: C-231 or C-173 Air Content, C-143 Slump, C-138 Unit Weight, C-1064 Temperature and C-31 Cast Test Cylinders. A total of 6 test cylinders shall be cast and tested 2 at 7 days, 2 at 28 days and 2 hold cylinders.
  4. If concrete fails strength test at 28 days, the 2 hold cylinders will be tested at 56 days. When concrete fails at 28 days, but meets strength at 56 days, the City of Binghamton may pay proportionally less for the concrete in place.

5. Test laboratory will copy all test results to the Contractor, the City Engineer's office and the Concrete Producer.
6. Though the cost of all testing by an independent testing laboratory is the responsibility of the Contractor, the City Engineer (or his/her representative) will direct when testing shall be done. The Contractor should base this cost on a complete series of tests being performed on the first 50 cubic yards, then after every 200 cubic yards. The City Engineer may require more frequent testing when:
  - a. Cylinders tested at 28 days have failed in 2 or more series.
  - b. Noticeable character changes of concrete
  - c. The concrete is non-consistent between loads.

The additional cost incurred by more frequent testing is the responsibility of the Contractor.

2A. Materials:

- A. Cement shall meet ASTM C-150, Type I, II or I/II. One source of cement shall be used throughout entire project.
- B. Fine aggregate used must conform to NYSDOT Item #703-01 and 703-07. Fine aggregate used must be from a NYSDOT Approved Operating Source and meet all requirements prescribed for use in Portland Cement Concrete.
- C. Coarse aggregate used must conform to NYSDOT Item #703-02. Source of coarse aggregate used must be from a NYSDOT Approved Operating Source and meet all requirements prescribed for use in Portland Cement Concrete.
- D. Admixtures:
  1. Air Entrainment - Air entrainment agent used must conform to ASTM C-260. Use air entrainment agent to produce concrete with specified air content.
  2. Water Reducer - Water reducers may be used at the option of the Contractor for workability, set retarding or set accelerating. The use of water reducers may not be used to exceed specified slump or specified water to cement ratio. Water reducers must conform to ASTM C-494 Type A (water reducing), Type D (water reducing/retarding), Type E (water reducing/accelerating). Water reducers containing more than 0.01% chlorides are not allowed.
  3. Fiber Reinforcement - Fiber reinforcement must conform to ASTM C-1116. Fiber used shall be manufactured using Polypropylene. Use

manufacturers recommended dosage.

- E. Concrete batch plant must maintain NYSDOT certification.
- F. Calcium Chloride is not permitted.
- G. Mixes:

Strength at 28 days: 4000 psi  
 Air Content: 6% (+,-1%)  
 Slump: 4" Maximum  
 W/C Ratio: 0.48  
 Fiber Reinforcement 1.5lb. per cubic yard

Consider:

Sidewalk - Strike off level, level to 1/4" within 5' random direction.

Curb - Regardless cast-in-place or slip formed, the top 6" of face of curb and the top of curb shall be level to 1/4" within 10'.

3. Concrete Proportioning. The concrete used shall develop a minimum 28-day compressive strength of 4000 P.S.I. and shall contain 6% plus or minus one percent, entrained air. The water-cement ratio shall be such as will produce the required strength using a minimum of 6 bags of cement per cubic yard without admixtures except air-entraining agents. The proportions of aggregate to cement shall be such as to produce a mixture which will work readily into corners of the forms with the method of placing employed in the work, but without permitting the materials to segregate or excess free water to collect on the surface.
4. Mixing Concrete. Truck mixed concrete is defined as concrete mixed completely in a truck mixer at the point of deposition following the addition of mixing water at the point of deposition.

Truck mixed concrete shall be from fully automated batch plant only.

Unless otherwise shown on the plans or in the proposal, the Contractor shall use approved Truck Mixed Concrete. Approved placement devices will be required. When Truck Mix Concrete is used, the Contractor shall maintain a continuity of supply of concrete consistent with the operation and satisfactory to the Engineer.

5. Cold Weather Concrete. Special precautions and protection, both subject to the approval of the Engineer, shall be provided for any concrete work placed when the anticipated low air temperature, as forecast by the U.S. Weather Bureau, is likely to fall below 40° F. for the 24 hours following placement, concrete may be poured only with the Engineer's specific approval in addition to the approval of the precautions and protection methods to

**1<sup>ST</sup> EDITION**

be provided. No concrete shall be placed when the official air temperature is below 20° F. In any case, the Engineer's approval does not relieve the Contractor of the responsibility for furnishing highest quality work in full compliance with the intent of the Specifications. Any concrete damaged by frost or freezing shall be removed and replaced by the Contractor at his expense.

The mixing water and aggregates shall be heated for all cold weather concrete work. The water shall not be heated above 175° F. The sand only may be heated to a maximum of 150° F. if, when combined with the heated water and upon delivery at the work, the concrete has a minimum temperature of 60° F. Otherwise, the coarse aggregate shall also be heated. No frozen lumps of aggregate shall be charged into the mixer. The aggregates and water shall be charged and mixed before the introduction of the cement to eliminate the possibility of a flash set when the cement is introduced. The concrete shall have a temperature between 60° F. and 90° F. when delivered at the site for placement in the work. No concrete shall be placed upon frozen fill, in frosted forms or in contact with concrete in place which contains frost. No accelerating admixtures shall be used in the concrete mix unless specifically authorized by the Engineer.

In addition to the above precautions, the Contractor shall provide the method of protection as specified below before starting the concrete pour. In any event, the concrete shall be cured as hereinafter specified and temporarily protected during placing and finishing so that the temperature of the concrete does not fall below 50° F. before the curing medium is laid and the protection installed.

The concrete shall be protected by completely covering with at least a 2-inch thickness of insulating material such as glass fiber, rock wool, balsam wool, or other approved commercial insulating material. The insulating material shall be completely enclosed with a waterproof covering of 40-pound Kraft paper impregnated with asphalt, or an equivalent, and maintained in good condition. Any tears or cut edges shall be resealed with adhesive waterproof tape of vapor barrier material asphalted in place. The top blanket shall also be covered with tarpaulins or other waterproof covering and the entire protection left in place for a period of 7 days. The Contractor shall provide a means of checking the temperature at the surface of the concrete during the curing period.

6. Forms. The forms for this work shall be made of metal or of acceptable planed and matched lumber, and of such construction that there will be no interference to inspection of grade and alignment and that a smooth surface will be provided.

All forms shall be straight, free from bends and warps at all times, and shall be cleaned thoroughly and oiled before concrete is placed against them. Cleaning and oiling shall be repeated as often as the forms are reused. The forms shall rest firmly upon a thoroughly compacted and dampened sub-grade throughout their entire length. The entire depth of the forms shall be filled with concrete.

7. Placing Concrete and Forming Joints. Before any concrete may be placed, each section of the subgrade must be checked and approved by the Engineer. Concrete shall be handled in such a manner as to prevent the segregation of materials and the intrusion of foreign matter and excess water. All concrete shall be placed within 20 minutes after being mixed.

A. Vibration - After the concrete has been placed and spread so as to produce the specified depth, and before it is screeded or finished, the concrete shall be compacted by means of an approved immersion type mechanical vibrator of a size and weight sufficient to thoroughly vibrate the entire concrete mass without damaging or misaligning the forms.

The vibrator shall be introduced into the concrete at one-foot intervals for a period not to exceed two seconds for each immersion and shall vibrate at not less than 5000 impulses per minute.

B. Forming Joints - Sidewalks shall have transverse construction joints to the full depth of the concrete spaced 20 to 25 feet apart. Transverse contraction joints, extending 1/3 of the way through from the top, shall be placed every 5 feet. Contraction joints may be sawed.

3/4" preformed elastic joint sealer shall be placed where the sidewalk joins curbs, walls, building, etc.

C. Finishing Concrete - The concrete shall be screeded and floated to a true, even surface without bringing free water and fines to the surface and shall then be given a "broom" finish. No water shall be added to the surface for finishing. Joints and edges shall be rounded with a suitable tool. The forms shall be left in place at least 24 hours or until the concrete has set sufficiently so that, in the opinion of the Engineer, they can be removed without injury to the sidewalk.

D. Protection of Concrete - The Contractor shall protect the sidewalk and keep it in alignment and first class condition until the completion of the contract. Any sidewalk which is damaged at any time previous to the final acceptance of the work shall be removed and replaced with new sidewalk at the Contractor's expense.

E. Curing - All sidewalks shall be cured by spraying on a white pigmented membrane curing compound immediately after finishing. Small projects having not more than one adjacent property owner may be cured by covering with waterproof paper blankets, quilted covers, polyethylene coated burlap bags or polyethylene curing covers which shall be kept moistened for seven days. Curing compounds shall comply with A.S.T.M. C-309.

- F. Identification - The Contractor will imprint, neatly and clearly, in all concrete work, the company name and year of installation. Imprint shall be done by means of a concrete stamp, two inches (2") wide by six inches (6") long, block letters, one-half inch (1/2") in length, with a letter imprint of one-eighth inch (1/8"). No hand printing will be permitted.
8. Method of Measurement. The quantity to be paid for under this item shall be the number of square yards of concrete sidewalk, approaches and driveways placed in accordance with the plans, specifications, and as ordered by the Engineer.
9. Basis of Payment. The unit price bid per square yard shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including any excavation, removal of existing sidewalk, cutting of tree roots, backfilling, expansion and contraction joints, protections, sampling, and testing of the concrete.

ITEM 105WP – DETECTABLE WARNING PLATE – ADA COMPLIANT

1. Description. Under these items, the Contractor shall furnish and place Detectable Warning Plates as shown on the plans as directed by the Engineer in Charge and in accordance with these specifications.
2. Materials. Detectable Warning Plates shall conform to the following or an approved equal:  
  
Armor-Tile, VCP Detectable/Tactile Warning Surface. Size 24"x48", color Brick Red, Federal color no. 20144.  
  
Warning plates shall be cast in place with integral embedment flanges.
3. Construction Details. Plates shall be laid in the pattern shown in the contract documents or as directed by the Engineer to provide a uniformly even surface.  
Unless otherwise specified in the contract documents, or directed by the Engineer, the Contractor shall install the pavers in accordance with the manufacturer's recommended procedures. Two (2), four foot square plates shall be installed at each location shown on the plans or as directed by the engineer
4. Method of Measurement. The quantity to be measured under this item will be the number of square foot of detectable warning plates installed to the satisfaction of the Engineer.
5. Basis of Payment. The unit price bid per square foot shall include the cost of furnishing all labor, equipment and materials necessary to complete the work. Concrete sidewalk to be paid for under Item 105.

ITEM 106 – ALUMINIZED CHAIN LINK FENCE (4' HIGH)

1. Description. Under this item, the Contractor shall furnish and erect aluminum chain link fencing of the type and size indicated on the plans or directed in these specifications and in locations shown on the plans or as ordered by the Engineer.
2. Materials. Materials for use in the fabrication of chain link fencing shall conform to the material specifications and shall be of alloy, temper and dimensions as follows:

<b>Material</b>	<b>Spec</b>	<b>Dimension</b>
Fabric (Aluminum Coated)	ASTM A 120 + A491-74	9 Gauge – 2 Inch Mesh
Coating	A-428	0.40 Ounces/Square Foot
Tension Wire	ASTM A824 Type 1	No. 7 Gauge
Hot Ring		12 Gauge Alum Alloy Wire
Fabric Ties		11 Gauge Alum Alloy
Framework	ASTM A120	As Specified
Fittings	ASTM F626	As Needed
Gates	ASTM A120	As Specified

The aluminum coating shall be a minimum of 0.40 ounces per square foot of wire surface for No. 9 gauge fabric. The fabric shall be thoroughly cleaned of all foreign material including oil, dust, film, etc.

Pipe framework such as intermediate and terminal posts, top, middle and bottom rails shall be galvanized steel standard weight ASTM A120 Schedule 40 or SS-40, diameter as specified. Each length of pipe shall be sealed to prevent internal corrosion. Fabric shall conform to fence specifications listed herein.

Fittings and other appurtenances shall be dressed steel, primed and galvanized or aluminized.

3. Construction Details. All posts shall be spaced equidistant in the fence line a maximum of 10 feet centers. Posts shall be set plumb in galvanized sleeves as indicated on the plans or ordered by the Engineer and to the proper line and grade. Epoxy grout shall be placed between sleeve and fence post

Terminal posts shall be placed at all ends, corners, changes in directions greater than 15°, and at intervals no greater than 500 feet, or abrupt grade changes of 5:1 slope or as determined by the Engineer. Pull posts will be located at terminal and corner sections adjacent to terminal and corner posts. At intermediate sections only terminal (pull) post is required. Truss bracing is required with all terminal posts in fences of 4 feet or greater height. Diagonal brace rods 3/8" will be trussed from the brace end or the line post back to the terminal posts, corner post or pull post and fastened to it by a turnbuckle. Tension wire shall be attached to fence fabric with hog rings every 24 inches. The chain link fabric shall be securely fastened to all terminal, pull, and corner posts using 1/4" and 3/4" tension bars, and 11 gauge tension bands spaced one (1) foot apart. The fabric will be securely fastened to all rails, braces and intermediate posts by means of heavy aluminum bands or ties or the equivalent thereof, not less than 5/32 inch at point of contact and spaced not more than 12" O.C.

Unless otherwise noted, the top selvage of 4" fence fabric will be knuckled. All other fence selvages shall be twisted or barbed. The bottom of the fabric shall be held as uniformly as is practicable to the finished grade.

Braces shall be securely fastened to posts by heavy pressed steel and malleable fittings, then securely trussed from line post to base of terminal posts with a 3/8" truss rod and tightener.

4. Method of Measurement and Basis of Payment. The quantity to be paid for under this item will be the number of linear feet of fencing measured along the top of the fencing center to center of end posts.

The unit price bid per linear foot shall include the cost of furnishing all labor, materials, tools and equipment necessary to satisfactorily complete the work and shall include the transportation, clearing and grubbing, excavation, fill, cement, concrete, posts, hardware, fencing and all other necessary materials or work.

ITEM 106R – FENCE RELOCATION

Type A – Chain Link Fence

Type B – Wood Rail Fence

1. Description. Under this item, the contractor shall relocate existing fencing as shown on the plans or as ordered by the Engineer. Fencing shall be relocated to allow proper installation of sidewalk.
2. Construction Details. Fencing shall be removed only when necessary to allow for the proper installation of concrete sidewalk as ordered by the Engineer. Fence may be stored adjacent to the property involved until sidewalk has been installed. Fence shall be reinstalled in the same manner it was originally constructed. Location of reinstalled fence shall as close as is practical to its original position. Any gates found in fence shall be reinstalled in a similar manner. In general, all posts shall be set plumb at their original spacing. Fabric, if applicable, shall be tightly stretched between terminal posts. Any additional hardware necessary for reinstallation shall be provided under the price of this item.
3. Method of Measurement and Basis of Payment. The quantity to be paid for under this item will be the number of linear feet of fencing relocated as measured along the top of the fence center to center of end posts including gates. The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work. No extra payment shall be made for any excavation, fill, concrete or hardware necessary to properly reinstall the fence.

ITEM 106X – REMOVE EXISTING FENCE

1. Description. Under this item, the Contractor shall remove the existing fencing as shown on the plans.
2. Construction Details. Fencing shall be removed to allow for the proper construction of the project. The Contractor shall be responsible for the removal of the fencing fabric, poles, and concrete posts. All holes shall be backfilled to existing grade. The Contractor shall be responsible to protect from his operations all existing facilities.
3. Method of Measurement and Basis of Payment. The lump sum bid price to be paid for under this item will include all labor, materials and equipment necessary to remove the existing fence and dispose of it from the job site.

## ITEM 111 – GUIDE RAIL

1. General Description This work shall consist of the construction, reconstruction, removal, disposal, storage, and resetting of Corrugated Beam Guide Railing, Box Beam Guide Railing and component parts in accordance with the specifications, standard sheets, manufacturer's drawings, manufacturer's directions and contract documents to the lines and grades shown on the plans or established by the Engineer.
  
2. Materials. Materials shall meet the requirements specified on Section 606 from New York State Department of Transportation Standard Specification; in the following subsections of Section 700-Materials and ASTM Specifications:
  - Galvanized Steel Barrier Posts 710-14
  - Corrugated Beam Guide Railing End Terminal 710-17
  - Heavy Post Blocked-Out Corrugated Beam Guide Railing End Terminal 710-18
  - Corrugated Beam Guide Railing 710-20
  - Box Beam Guide Railing 710-21
  - Box Beam End Assembly Type III and Type C 710-24
  - Epoxy Polysulfide Grout 721-03
  - Anchor Bolts 723-60
  - Reflective Sheeting 730-05 (Materials Designation 730-05.02)
  - Paint for Galvanized Surfaces 708-06
  - Rolled Steel Channels for Continuity Connections ASTM A36
  - Steel Plates for Continuity Connections ASTM A36
  - A. Steel Hardware. Steel posts, plates, channels, stiffeners, block-outs, angles, brackets, slipbases and other miscellaneous steel hardware not referenced to or specified by §710-14, §710-20, §710-21, §710-22, §710-24 or other sections of the NYSDOT Standard Specifications shall be fabricated as shown in the contract plans and documents from steel meeting the requirements of ASTM A36 unless specified otherwise. All components shall be galvanized in accordance with §719-01, Type I or II. Components shall be fabricated prior to galvanizing.
  
  - B. Anchor Bolts and Studs. Anchor bolts and studs embedded or grouted in concrete for securing post and railing base plates shall meet the requirements of §723-60 of the NYSDOT Standard Specifications. Nuts and washers shall meet the requirements of ASTM A325M. Anchor studs; bolts or rods embedded in concrete anchorage units for terminating guide rail systems shall have minimum yield and tensile strength meeting the requirements of ASTM F568 Class 4.6. Anchor studs, bolts, rods, nuts and washers shall be galvanized in accordance with §719-01 of the NYSDOT Standard Specifications, Galvanized Coatings and Repair Methods, Type II unless indicated otherwise on the plans or standard sheets. Grout for anchor studs and bolts shall conform to the requirements of §721-03 or §701-05 of the NYSDOT Standard Specifications.

- C. Fasteners. Bolts, nuts and washers shall conform to the following unless specified otherwise on the plans, standard sheets of NYSDOT, manufacturer's drawings', or in the contract documents. Bolts ASTM A307 Grade A; Nuts ASTM A563M Grade A or Better & Washers ASTM F436. Bolts, nuts and washers shall be galvanized in accordance with the provisions of §719-01 Galvanized Coatings and Repair Methods, Type II of the NYSDOT Standard Specifications.
- D. Concrete for End Assembly Anchors Units. Cast-in-place concrete shall meet the requirements of Class A Concrete in Section 501 Portland Cement Concrete-General of the NYSDOT Standard Specifications. The Contractor may submit, for approval by the Engineer, a mix at least equivalent to the specified Class A Concrete, with a minimum cement content of 575 lb\cu yd. Precast concrete anchorage units, when selected as an alternate to cast-in-place units by the Contractor shall meet the requirements of Section 704-03 Precast Concrete-General of the NYSDOT Standard Specifications.
- E. Resetting Guide Railing, Anchorage Unit Assemblies and End Assemblies. The materials comprising the existing system shall be used if they conform to the materials requirements specified for new guide rail systems and are found to be in satisfactory condition as determined by the Engineer. The Contractor shall supply all new hardware (splice tongues, plates, nuts, bolts, washer, etc.) Replacement materials shall meet the material requirements specified for new guide rail systems. Galvanizing of railing and posts may be repaired in accordance with §719-01, Galvanized Coatings and Repair Methods of the NYSDOT Standard Specifications.
- 3 Construction Details. General: All barrier systems and transitions described by these specifications shall be subject to the following requirements.
- A. Inspection of Rail Elements. Immediately prior to erection, the rail elements shall be inspected for damage. Bends or kinks in the railing, not specifically required by the contract documents, shall constitute sufficient cause for rejection. Straightening of such bends or kinks will not be allowed. Erection of all guide rail, transitions and connections shall be subject to the inspection of the Engineer who shall be given all facilities required for a visual inspection of workmanship and materials.
- B. Field Galvanizing For Repair. Field galvanizing repair shall be allowed only when the total damaged area on each piece or component is less than 2 percent of the coated surface, or 10 000 mm<sup>2</sup>, whichever is less. Any single piece or component with total damaged area greater than the amount specified above shall be rejected and replaced by the Contractor. Field galvanizing repair shall be done in accordance with the requirements of the Repair section of §719-01 Galvanized Coating and Repair Methods of the NYSDOT Standard Specifications.

- C. Field Welding. Field welding shall not be permitted unless noted in the contract documents. When specified, welding shall comply with the requirements of the SCM.
- D. Erection. Posts, railing, barrier systems, rail transitions, end assemblies, anchorage units, and pier protection shall be erected in the position and manner indicated on the NYSDOT Standard Sheets, Manufacturer's drawings, manufacturer's directions and contract plans and in a manner approved by the Engineer. Rail mounting height shall be within ¼" of that indicated on the detail sheets and plans.

Prior to installing guide rail, transitions, or end terminals, the Contractor shall determine the locations of all structures, including underground structures, that may be affected by the installation. If the determinations disclose that there are conflicts between the proposed installation of guide rail, transition, or end terminal and other structures, including underground structures, the Contractor shall discuss with and recommend to the Engineer alternative locations or types of guide rail, transition, or end terminal, subject to the approval of the Engineer, that will not be in conflict with the structure, including underground structure.

Posts and foundation tube(s) shall be driven unless otherwise specified by the Engineer. The driving shall be accomplished with approved equipment and methods that will leave the posts and foundation tube(s) in their final position, free of any distortion, burring or other damage. When post and foundation tube(s) are driven through asphalt concrete or a bituminous treated material, the Contractor shall take care to prevent damage to the paved or treated areas. Large holes and voids caused by driving the posts and foundation tube(s) shall be filled and compacted with a bituminous treated material or asphalt concrete similar to that damaged. The small area adjacent to the post and foundation tube(s) disturbed during installation or where gaps exist at the post and foundation tube(s) after pavement repairs shall be sealed with a bituminous material approved by the Engineer.

As an alternate to driving posts and foundation tube(s) on unpaved medians and where site conditions are such that driving is not possible, the Contractor shall carefully excavate for all post and foundation tube(s) holes. Post and foundation tube(s) holes and post and foundation tube(s) foundation structures shall be backfilled and compacted backfilled material.

On structures and paved medians, base plates for posts shall be anchored as shown on the plans and as specified by the Engineer. Where drilling and grouting is required, the Contractor shall take care to prevent damage to the concrete, asphalt or other paved surfaces. The proposed construction method and equipment for drilling and grouting of holes shall be submitted to the Engineer for approval before drilling and grouting operations begin. Anchoring devices shall be grouted with Concrete Grouting Material or Epoxy Polysulfide Grout.

The work of installing the guide railing system when it abuts stabilized shoulder courses shall be coordinated and progressed to provide the least disturbance between the two phases of the work. All posts shall be aligned to a tolerance of ¼” for plumb and grade line.

- E. Concrete Anchorage Units. The bottom of the anchor shall have a full and even bearing on the surface under it. After the concrete anchor is in place, the excavation shall be backfilled.
- F. End Terminals and Assemblies. The following shall apply to end terminals or assemblies to be installed under this section.
1. Drawings. For end terminals and end assemblies not shown on detail sheets or detailed in the plans, the Contractor shall submit two copies of the manufacturer’s drawings, modified as necessary to reflect site conditions, to the Engineer for approval prior to ordering any materials required under this section. Drawings of parts not detailed on the plans, but which are necessary to develop the full performance of the end assemblies or terminals shall also be provided. The Contractor shall commence work of installation of end assemblies or terminals only after approval of the above mentioned drawings and authorization from the Engineer to do so.
  2. Manuals. In addition to the drawings mentioned above, the Contractor shall deliver to the Engineer two (2) copies of design manuals, installation manuals, parts lists, and maintenance manuals prepared for each type end terminal or assembly being installed but not shown on the standard sheet.
  3. Coordination with Other Work. The work of furnishing and installing all types of end assemblies shall be coordinated with the removal of existing impact attenuators or end assemblies, the installation of guide railing, or the installation of the object to be shielded, so as to minimize the time that motorists are exposed to the possibility of collision with the shielded object, unprotected ends of barriers, or incomplete end terminals or assemblies. Also, the contractor shall minimize exposure of approaching vehicular traffic to the possibility of impact on the back of the end assembly. Unless modified in the Contract Documents, minimization shall mean seven (7) or fewer calendar days.
  4. Traffic Protection. Traffic protection devices, such as cones, drums, lights, signs, barricades, or other articles directed by the Engineer, shall be provided and maintained under their respective pay items. These devices shall not be removed until the end assembly, including required transition pieces, is fully operational. If the end assembly is to be installed in lighted

areas, or in areas to be lighted, the mentioned traffic protection articles shall also be maintained until the lighting system is operational.

5. Reflective sheeting. End Terminals and assemblies which have a vertical face towards approaching traffic and are located on or closely adjacent to the shoulder shall be provided with reflective sheeting in accordance with Section 2C.65 of the MUTCD. The yellow and black stripe shall be 4 inches.
- G. Box Beam Guide Railing. Rail sections for tangent runs shall be at least 18 feet long. Rail splices shall be a minimum of 18 inches from the centerline of any post. During non-working hours, exposed approach ends (free ends) of the box beam guide railing shall be temporarily terminated with box beam guide railing end assemblies utilizing two splice plates and eight bolts per temporary termination connection. No posts for anchorages will be required.
- H. Corrugated Beam Guide railing. In the erection procedures, the free end of the rail element shall not be allowed to swing free and cantilever around the mounting bolt. The free end shall be supported in a manner approved by the Engineer while the splice bolts and mounting bolts are fastened. During non-working hours, exposed approach ends (free ends) of the guide railing shall be dropped to the ground and pinned in a manner approved by the Engineer.
1. Corrugated Beam Guide railing. The rail elements shall be installed so the weight of the beam rests on the double-nutted support bolt before the 5/16" mounting bolts are torqued. Before the final torquing, six of the 5/16" mounting bolts in the installation shall be selected at random and with a suitable torque wrench tightened to failure. The six readings shall be averaged, the six failed bolts replaced and all the mounting bolts in the installation torqued to 50% of the average value. Support bolts shall be installed on all the guide rail posts except the three posts adjacent to the anchors.
  2. Heavy Post Blocked-Out Corrugated Beam Guide Railing. The heavy post blocked-out corrugated beam guide railing shall be erected from the approach end anchorage unit and downstream along the flow of traffic. The heavy post blocked-out median barrier shall be erected from one of the anchorage sections and shall be completed as the work progresses. During non-working hours no uncompleted anchorage units or heavy posts without rail will be permitted on either heavy post blocked-out guide railing or median barrier.  
For heavy post blocked-out corrugated beam guide railing connections to walls (trailing ends), the holes for the expansion anchors shall be drilled to the minimum depths and diameters shown on the plans or standard sheets or to larger values if specified by the manufacturer. The holes shall be

drilled with care to avoid damage to the wall. Any damage caused by the drilling operation shall be repaired by the Contractor and to the satisfaction of the Engineer.

I. Resetting Guide Railing. The Contractor shall remove, store, clean and reset railing, and posts as shown on the NYSDOT Standard Sheets, or as directed by the Engineer. The reset guide railing shall be placed in accordance with the requirements of 111-3.01 through 111-3.06. During non-working hours, exposed approach ends (free ends) of the reset guide railing shall be temporarily terminated as follows: Box beam guide railing shall be temporarily terminated with box beam guide railing end assemblies utilizing two (2) splice plates per temporary termination connection. No posts for anchorages shall be required. Special temporary splice plates will be needed to adopt box beam guide rail end assemblies to box beam median barriers. Corrugated guide railing shall be temporarily terminated by dropping the exposed approach ends (free ends) of the rail element to the ground and pinning it in a manner approved by the engineer. Any rail element damaged shall be replaced by the Contractor.

J. Resetting Anchorage Unit Assemblies and End Assemblies for Guide Rail. The Contractor shall remove, store, clean and reset existing anchorage units and end assemblies for Guide Railing as shown on the plans or as directed by the Engineer.

The anchorage units and end assemblies shall be reset and placed in accordance with the requirements of 111-3.01 through 111-3.06. Existing concrete anchors and deadman may be left in place and replaced with new ones if the top of the existing anchor or deadman is at least 6 inches below final grade and the anchor or deadman will not be an obstruction to other construction.

The Contractor shall take care so reusable parts are not damaged by his operations. Any parts damaged in handling and placing shall be replaced by the Contractor. Unusable material shall be disposed of by the Contractor.

Surface areas disturbed during the removal operations shall be reestablished, as nearly as possible, to match the adjacent surfaces to remain.

#### 4. Method of Measurement.

A. Cable, Corrugated Beam or Box Beam Guide Railing. The quantity of guide railing measured for payment will be the number of feet measured along the axis of the railing and between its extreme outer limits as shown on the NYSDOT Standard Sheets or as directed by the Engineer. The quantity of shop curved guide railing shall be the number of feet measured along the axis of the curved railing. If the railing is anchored to a structure instead of an anchorage unit or end assembly, the railing will be measured up to the structure. Where curved corrugated beam guide railing is specifically called for on the contract plans or ordered in writing by the Engineer and no provision for such curved beam railing is included in the contract proposal, the quantity of railing measured for payment will be as

measured in the field an additional allowance of 33 1/3% of the curved lengths at a factor of 1.0 measured along the horizontal center line of the beam.

- B. Anchorage units, end assembly units and transitions between various guide railing will be measured by the actual number of units installed in accordance with the plans, NYSDOT detail sheets, manufacturer's drawings', manufacturer's directions and/or as directed by the Engineer.
- C. Resetting Guide Railing. The quantity of reset guide railing measured for payment will be the number of feet reset in accordance with the specifications, plans and as directed by the Engineer, including of anchorage units and end assemblies. If the guide railing is anchored to a structure instead of an anchorage unit or end assembly, measurement will be made up to the anchorage unit or end assembly.
- D. Resetting Anchorage Unit Assemblies and End Assemblies for Guide Railing. This work shall be measured by the number of anchorage units and/or end assemblies reset in accordance with the requirements of the contract documents and in a manner approved by the Engineer.

5. Basis of Payment.

- A. Guide Railing and Terminal Sections; Various Types. The unit price bid per foot for the above work shall include the cost of all labor, equipment and material necessary to complete the work, including the cost of any repairs required, and the costs of bending any rail element to the required curvature. Payment for guide rail shall include the unit price bid and the field measured quantity. When posts are driven through asphalt concrete or bituminous treated material, any repairs to damage paved or treated areas shall be at the Contractor's expense. Progress payments will be made when the metal railing is erected in the position and manner indicated on the NYSDOT Standard Sheets and in a manner approved by the Engineer, exclusive of bituminous repair and final alignment. Payment will be made, at the unit price bid, for 90% of the measured quantity erected. The balance of the quantity erected will be paid for upon proper repair to the bituminous surfaces and alignment of the metal railing to the specified tolerances.
- B. End Assembly, End Anchorage Units and Transitions for Guide Railing. The unit price bid for each end assembly, end anchorage unit or transition shall include the cost of furnishing all labor, materials and equipment necessary to complete the work, including the necessary concrete, excavation, backfill, reflectorization, object markers when required at driveways and vehicle openings, and spring cable assembly (compensating device) and/or steel turnbuckle cable end assembly required for cable guide rail.

- C. Resetting; Removing and/or Disposing of Guide Railing. The unit price bid per foot for the above work items shall include the cost of furnishing all labor, equipment and materials necessary to complete the work. Any materials damaged due to Contractor's operation shall be replaced by him and the cost shall be included in the price bid for this item.

Payment for resetting guide rail shall include the unit price bid multiplied by the linear feet measured, as well as that posts required to reduce the post spacing from the original post spacing shall be included under the same unit price bid item.

Progress payments for resetting guide rail will be made as follows:

25% of the unit price bid for the quantity of guide rail removed and disposed in accordance with the provisions of 111-3.C Resetting Guide Railing.

65% of the unit price bid for the measured quantity of guide railing cleaned and reset in accordance with the provisions of 111-3.C.

The balance of the unit price bid for the quantity of the guide railing will be paid upon repair to the bituminous surfaces damaged by the resetting operations.

- D. Resetting; Removing and/or Disposing of Anchorage Unit and/or End Assemblies for Guide Railing. The unit price bid for each of these items shall include the cost of furnishing all labor, equipment and material necessary to complete the work including excavation and backfill. If the Contractor elects to install new concrete anchors, in lieu of removing and resetting the existing ones, the cost of furnishing and installing the new anchor as well as the cost for necessary adjustments to the existing one shall be included in the price bid for these items.

Progress payments for resetting anchorage units and/or end assemblies for guide railing will be made as follows:

1. 25% of the unit price bid for the quantity of anchorage unit assemblies and/or end assemblies removed and stored in accordance with the provisions of §606-3.12 Resetting Anchorage Unit Assemblies and End Section Assemblies for Guide Railing and Median Barrier.
2. 65% of the unit price bid for the quantity of anchorage unit assemblies and/or end assemblies cleaned and reset in accordance with the provisions of §606-3.12 Resetting Anchorage Unit Assemblies and End Section Assemblies for Guide Railing and Median Barrier.
3. The balance of the unit bid price for the quantity of anchorage units assemblies reset upon the reestablishment of surface areas disturbed.

<u>Item No.</u>	<u>Item</u>	<u>Pay Unit</u>
111B.01	Box Beam Guide Railing	L.F.
111B.02	Box Beam Guide Railing End Assembly	EA
111C.01	Corrugated Guide Railing	L.F.
111C.02	Corrugated Guide Railing End Assembly	EA
111RC.01	Removing and Resetting and/or Disposing Guide Railing	L.F.
111RC.02	Removing and Resetting and/or Disposing Guide Railing (New Posts)	L.F.
111RA	Removing and Resetting Anchorage Unit and/or End Assemblies	E.A.

ITEM 121A – TOPSOIL FURNISHED AND PLACED

1. Description. The work covered by the item consists of furnishing and placing topsoil at locations and to depths shown on the plans or as directed by the Engineer.
2. Materials. Topsoil shall conform to the material requirements of New York State Department of Transportation Standard Specification Section 713-01 (Topsoil), except that composted sewage sludge shall not be utilized to amend topsoil. The Contractor shall submit current NYSDOT source approval and certification that topsoil supplied shall meet the above requirements.
3. Construction Details.
  - A. Preparation of Subgrade. The Contractor shall complete sub grading within the areas to be covered by topsoil by bringing the surface of the subgrade to the lines and grades as shown on the plans or as ordered by the Engineer. Except where otherwise required or indicated, the Contractor shall remove enough material to allow a four-inch (6”) minimum depth of topsoil to be placed. The Contractor shall scarify or till the surface of the subsoil before the topsoil is placed to permit bonding the topsoil layer with the subsoil. Equipment shall pass in such a manner that depressions and ridges shall be parallel to the contours. Tillage shall be accomplished by discing, harrowing, raking or by other approved methods.
  - B. Handling Topsoil. Topsoil shall not be delivered or placed in a frozen or muddy condition.
  - C. Placing Topsoil. Topsoil shall be placed and spread over the area directed or shown on the plans and uniformly compacted with a light hand roller so that the completed work shall conform to the lines, thickness and grades shown on the plans. After the topsoil is spread and before it is compacted, all large stiff clods, rocks, roots or other foreign matter over one inch (1”) in greatest dimension shall be cleared and disposed of by the Contractor as approved so that the finished surfaces will be acceptable for subsequent work of seeding, planting or mulching. Any subsequent settlement or displacement of the topsoil shall be restored to an acceptable condition at the Contractor’s expense.
4. Method of Measurement. Topsoil furnished and placed shall be measured in square yards of surface area after it has been acceptably placed within the limits shown on the drawings. No measurement for payment will be made for topsoil outside the limits. However, the contractor is still responsible to restore any disturbed areas outside the limits.

5. Basis of Payment. Topsoil furnished and placed will be paid for at the unit price bid per square yard of topsoil acceptably furnished and placed, which payment shall constitute full compensation for all labor, materials, equipment and incidentals necessary to complete the work as specified. Restoration of settled or displaced topsoil to a satisfactory condition shall be done by the Contractor without additional compensation.

ITEM 123 - SEEDING

1. Description. The work covered by this item consists of ground preparation, furnishing and application of fertilizer, seed, and mulch, on areas shown on the plans or as ordered by the Engineer. Work covered also includes care during construction as specified herein.
2. Materials.

Fertilizer shall be a complete, partially organic, commercial 10-6-4 fertilizer, containing at least 10% nitrogen, 6% available phosphorous, and 4% potash.

Seed shall be fresh, recleaned, and of the latest crop year, and shall conform to Federal and State standards. Each type of grass in the mixture shall meet or exceed the minimum percentage of purity and germination listed for that type of grass with a maximum weed content of 0.1%. The seed mixture for this project shall be:

<u>% by Weight</u>	<u>Variety</u>	<u>Purity %</u>	<u>Germination</u>
60	Kentucky Blue Grass	85	80
20	Red Fescue	97	80
20	Turf Type Perennial Rye	92	90

A turf grass specialist may submit variations for the Engineer's consideration. Use of variations is subject to the Engineer's approval.

All seed shall be delivered to the site in standard size, unopened bags of the supplier, showing the weight, mixture, supplier's name, and guaranteed analysis.

The process of spraying grass seeds, water, fertilizer and mulch (hydro-seeding) shall be utilized, unless otherwise authorized by the Engineer. Presoaking, spraying of materials and watering after spraying shall be in strict accordance with the supplier's instructions. Instructions shall be submitted to the Engineer for approval. All materials, application rates, protection, care and maintenance shall be in conformance with this specification; the mulch shall be a biodegradable organic material such as wood fiber.

Placement of fertilizer, seed, and mulch by hand spreading methods may be authorized for very small areas and minor touch-up work at the sole discretion of the Engineer. Where hand seeding is authorized, mulch shall be oat, wheat, or rye straw, free from noxious weeds.

3. Construction Details.
  - A. Season. The contractor is advised to perform seeding during the periods of May 1 to June 15, or August 15 to October 1; however, the work may be performed at

any season of the year at the option and full responsibility of the contractor, unless otherwise directed by the Engineer. The contractor shall notify the Engineer at least 48 hours in advance of the time he intends to begin sowing seed, and shall not proceed with such work until permission to do so has been obtained. When conditions of high winds, excessive moisture or ice are such that satisfactory results are not likely to be obtained for any stage of the work, the Engineer will stop the work. The work shall be resumed with the Engineer's approval when the desired results are likely to be obtained or when approved corrective measures and procedures are adopted.

- B. Ground Preparation. Areas receiving topsoil application shall be prepared in accordance with Item 121A. All areas to be seeded shall be maintained at approved grades, and irregularities which form low places which will hold water shall be eliminated.
- C. Fertilizer Application. The fertilizer shall be uniformly spread at the rate of 25 pounds per 1000 square feet. Where hand spreading methods are authorized, fertilizer shall be incorporated to the depth of two inches below the finished grades immediately after spreading, unless otherwise specified.
- D. Seeding. Just before seeding, the areas to be seeded shall be loosened to a depth of one (1) inch and raked to true lines, free from ridges and depressions which will hold water. All sticks, stones, roots, or other objectionable materials, which might interfere with the formation of the fine seed bed, shall be removed from the soil. The seed mixture specified shall be applied at a rate of not less than five (5) pounds per 1000 square feet. Seeding is to be done in dry or moderately dry soil at times when wind velocity does not exceed five miles per hour. Upon completion of seeding, where hand spreading methods are authorized, the area shall be raked lightly and rolled with a light hand roller, then given an initial watering at an application rate of 150 gallons per 1000 square feet.
- E. Mulching. Immediately after seeding and rolling, where hand spreading methods are authorized, mulch shall be spread uniformly in a continuous blanket to a loose depth of about one inch. The mulch may be spread by hand or machinery.
- F. Care During Construction. The contractor shall care for the seeded and mulched areas to assure a full even stand of grass until final acceptance of the project. Such care shall consist of providing protection against traffic by approved warning signs or barricades, and repairing of any areas damaged following the seeding or mulching operations due to wind, water, fire or other causes. Such damaged areas shall be repaired to reestablish the condition and grade of the area prior to seeding and shall then be reseeded and remulched as specified herein. The contractor shall keep seeded areas mowed until acceptance of the contract by cutting to a height of three inches when growth reaches six inches.

- G. Liability. A satisfactory stand of grass, as determined by the Engineer, shall be required. A satisfactory stand of grass shall consist of a full, even vegetative cover over the seeded area. The cover shall consist principally of the grasses and legumes specified and show evidence of the specified fertilization. Inspection to determine if a satisfactory stand of grass has been produced shall be made prior to acceptance of the contract at a time determined by the Engineer.

On areas where a satisfactory uniform stand of grass has not been produced, the contractor shall satisfactorily perform the necessary operations of seed bed preparation, fertilizing at one-half rate, seeding at full rate, and mulching, as ordered by the Engineer, during the next seeding season as approved.

4. Method of Measurement. Seeding shall be measured in square yards of surface area on which a satisfactory stand of grass has been produced within the limits shown on the drawings. No measurement for payment will be made for topsoil outside the limits. However, the contractor is still responsible to restore any disturbed areas outside the limits.
5. Basis of Payment. Seeding will be paid for at the unit price bid per square yard, which payment shall constitute full compensation for furnishing all labor, materials, equipment, and incidentals necessary to complete and care for the work as specified.

ITEM 126 - GEOTEXTILE

1. Description. Under this item, the Contractor shall furnish and place Geotextile for separation and stabilization between subgrade and new subbase or at any locations, and in the manner shown on the plans or as ordered by the Engineer.
2. Materials.
  - A. Geotextile shall be type C80NW (Non-woven), as manufactured by Contech Construction Products, Inc., or approved equivalent. Material shall be in close conformance with the following:

Values <sup>1</sup> Property	Test Method	Minimum Average Roll Value	
<b>Physical</b>			
Weight	ASTM D4533	6.5 Oz. /S.Y.	
Thickness	ASTM D5199	70	mils
<b>Mechanical</b>			
Grab Tensile Strength	ASTM D4632	205	lbs.
Grab Elongation	ASTM D4632	50%	
Puncture Strength	ASTM D4833	110	lbs.
Mullen Burst	ASTM D3786	350	psi
Trapezoidal Tear	ASTM D4533	80	lbs.
<b>Hydraulic</b>			
Apparent Opening Size (AOS)	ASTM D4751	80 US	Std.
Permittivity	ASTM D4491	Sieve	
Permeability	ASTM D4491	sec <sup>-1</sup>	
Water Flow Rate	ASTM D4491	.28 cm/sec.	
		95	gpm/ft. <sup>2</sup>
<b>Endurance</b>			
UV Resistance (% retained after 500 hours)	ASTM D4355	70%	

<sup>1</sup> Values shown are in weaker principal direction. Minimum average rolls values are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.

- B. Geotextile shall be a non-woven material composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative

position. The geotextile shall be inert to biological degradation and to chemical environments normally found in soils.

- C. Geotextile shall meet the requirements for a Class 1 Stabilization geotextile in conformance with AASHTO M288.

3. Construction Details.

- A. Installation shall be in accordance with manufacturer's recommendations and as ordered by the Engineer.
- B. The Geotextile shall be protected from exposure to sunlight during transport and storage. After placement, the geotextile shall not be left uncovered for more than two (2) hours.
- C. The installation site shall be prepared by clearing, grubbing, and excavation or filling the area to the design grade. This includes removal of topsoil and vegetation.
- D. Soft spots and unsuitable areas will be identified during site preparation or subsequent proof rolling. These areas shall be repaired as ordered by the Engineer.
- E. The geotextile shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic. Adjacent geotextile rolls shall be overlapped or sewn. Overlaps shall be in the direction of travel. Sewn seams shall be lapped a minimum of four inches (4") and double sewn. The thread used to sew the seam shall be nylon or polypropylene. Overlapped seams shall have a minimum overlap of eighteen inches (18"), except where placed under water the overlap shall be a minimum of three feet (3').
- F. On curves the geotextile may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and held in place by pins, staples, or piles of fill or rock.
- G. Prior to covering, the geotextile shall be inspected to ensure that the geotextile has not been damaged (i.e., holes, tears, rips) during installation. The inspection shall be done by the Engineer or the Engineer's representative. Damaged geotextiles shall be repaired immediately. Cover the damaged area with a geotextile patch which extends three feet (3') beyond the perimeter of the tear or damage.
- H. The subbase shall be placed by end dumping onto the geotextile from the edge of the geotextile, or over previously placed subbase aggregate. Construction vehicles shall not be allowed directly on the geotextile. The subbase shall be placed such that at least the minimum specified lift thickness shall be between the geotextile and equipment tires or tracks at all times. Turning of vehicles shall not be permitted on the first lift above the geotextile.
- I. Geotextile for bedding and slope protection shall be placed and anchored on a prepared surface approved by the Engineer. The geotextile shall be laid loosely, but in intimate contact with the soil that placement of the overlying materials will not stretch or tear the Geotextile. Where the Geotextile is placed above water, the backfill placement shall begin at the toe and proceed up the slope. Where

Geotextile is placed under water, the long dimension shall be placed parallel to the direction of flow. Successive Geotextile sheets shall be overlapped so that the upstream sheet is placed over the downstream sheet.

Rip-rap, Dry rip-rap (Heavy), Dry rip-rap (Medium) or Dry Stackable rip-rap shall not be dropped onto the Geotextile from a height greater than 1 foot. Slope protection and smaller sizes of stone filling shall not be dropped onto the Geotextile from a height exceeding 3 feet.

- J. Geotextile for drainage shall be placed to conform loosely to the shape of the trench. The Geotextile shall be installed as shown on the plans or as ordered by the Engineer
- 4. Method of measurement. The quantity of geotextile will be the number of square yards computed from the payment lines shown on the plans or from payment lines established in writing by the Engineer. Measurement will not be made for geotextile used for repairs or overlaps.
- 5. Basis of Payment. The unit price bid per square yard for this item shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

## ITEM 200 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS

1. Description. This work shall consist of the removal and disposal of all structures, in accordance with the provisions of these specifications and includes surrounding materials within the project limits as directed by the engineer.
2. Construction Details.
  - A. General: Before any structure with utilities thereon is disposed of, the utilities shall be disconnected and removed by their respective owners. The contractor shall notify the utility owners, in writing, in advance of any work so they may discontinue services.  
The contractor will be required to repair or replace in kind, at his own expense and as directed by the engineer, sidewalks, curbs and roadway damaged by his operations and which will be required for public traffic during the life of and at the completion of the contract.
  - B. Dust Control: Provisions shall be made at demolition site to control the amount of airborne dust resulting from demolition operations by wetting the debris and other materials and the immediate work area with appropriate spraying agents or other means acceptable to the engineer.
  - C. Maintenance/Protection of Pedestrian/Vehicular Traffic: The contractor shall, for the duration of the contract, maintain and keep passable, free from debris, snow and ice, all public walkways and roadway adjacent to the project site.
  - D. Disposal of Waste Materials: Disposal of all waste materials shall be subject to the approval of the engineer.
  - E. Removing Existing Structure: All steel, concrete and incidentals removed, except as noted on the plans or in the proposal, shall become the property of the contractor and shall be removed from the work site by the contractor. All concrete and paving materials shall be removed from the structure and disposed of by the contractor in a manner approved by the engineer.
3. Method of Measurement
  - A. Removing Existing Structure: The contractor shall be paid the lump sum price bid for removing existing structure and surrounding materials as shown on the plans.

4. Method of Measurement and Basis of Payment

- A. Removing Existing Structures: The linear feet bid for the structure covered under this item shall cover all labor, materials, tools, machinery, including all excavation necessary to satisfactorily complete the work.

ITEM 200PS – PUMP STATION/WET WELL DEMOLITION

1. Description. Under this item, the contractor shall demolish the existing Stokes Avenue Pump Station/Wet Well and remove all debris from the site.
2. Construction Details. Prior to demolishing the pump station, the contractor shall remove and dispose of all mechanical and electrical equipment from the building. The existing sensors and junction box shall be delivered to the City of Binghamton.

The pump station/wet well shall be removed to at least one foot below finished grade and the foundation filled with compacted backfill. Existing pump station materials and contents of the pump station shall not be used as backfill.

3. Disposal. Unless designated otherwise on the plans, all material removed under this section shall become the property of the contractor and shall be removed from the contract site. It shall be disposed of at a New York State Department of Environmental Conservation permitted landfill, or at a site where the contractor has written permission of the owner to dispose of the material. A copy of the written permission shall be furnished to the Engineer. Under no circumstances shall disposal be made in a live or intermittent stream, wet land, swamp, or other body of water.
4. Basis of Payment. The lump sum price bid for this item shall include the cost of furnishing all labor and equipment necessary to complete the work, and the cost of disposal of materials.

## ITEM 201PS – PUMP STATION

1. General. This item includes all work including furnishing and installing a fabricated storm pump station. The work shall include, but not be limited to, furnishing all materials, equipment, including pumps, fabricated wet well and ballard, pump controls, electrical equipment and all incidentals, including electrical work to complete and install a working pump station. Electrical work to be in accordance with these specifications.

2. Materials and Equipment.

A. Performance Requirements. The contractor shall furnish 3, and install 2, factory assembled non-clog pumps at the location shown on the contract drawings with one complete spare. The contractor shall include all labor, materials, equipment, incidentals and ancillary components to make a complete system. The equipment shall be manufactured and assembled in North America using domestically produced parts and installed in accordance with the instructions of the manufacturer and the Contract Drawings.

B. Submersible Pump(s)

1. Design pumping unit for the following operation requirements:

Rated Capacity	8000 GPM Total	(2) (4000 GPM per pump)
Total Dynamic Head (TDH)	92.2 Feet	
Impeller Diameter	450 MM	
Maximum HP Requirement	130 HP	
Maximum Speed	1180 RPM	
Minimum Pump Efficiency	60%	

2. The pumps shall be submersible, centrifugal, non-clogging sewage pumps, capable of handling raw, unscreened sewage. The pumps shall be capable of operating continuously in submersed condition without adverse effects due to heat generation. Pumping units which utilize re-circulation of the pumped media for cooling purposes or provide connections for external cooling water shall not be considered equal or acceptable. O-ring sealing shall be provided between the motor unit and volute to prevent external leakage. Discharge flange shall be 12-inch standard, drilled for Class 125 FF Pattern. Pumps shall be Pumpex, Model 304 F-CE 5450 or an approved equal.

C. Pump Construction.

1. The motor housing and volute shall be made of gray cast iron, ASTM A48 (Class 30 B, with appropriate coatings to protect the pump from corrosive properties of the materials being pumped. All bolts and nuts

shall be ASTM AISI 316 stainless steel. The volute case shall be 12 inches.

2. Impellers shall be of non-clogging channel type of gray cast iron material, ASTM A48 Class 30 B, and shall be dynamically balanced, slip fit and keyed to the shaft. The impeller shall be capable of handling solids, fibrous materials, sludge, and other items normally found in raw wastewater.
3. The shaft shall be of ASTM A29 1045 steel and be completely sealed off from the pumped liquid. The shaft shall have a minimum overhang length from lower bearings to impeller cap nut. Radial deflection and shaft distortion shall not exceed 2/1000" at the lower shaft seal.
4. The pump shall rotate on three permanently lubricated ball bearings. The lower bearings for axial and radial forces shall consist of two angular contact ball bearings with a minimum B10 life of 60,000 hrs. at the best efficiency point; while the upper bearing for radial forces shall consist of a single row deep groove ball bearing.
5. The shaft sealing system shall consist of tandem mounted mechanical seals. The shaft sealing system shall run in an oil bath. The lower, primary seal shall consist of one stationary silicon carbide ring and one positively driven (rotating) silicon carbide ring; while the upper seal between the motor and the oil housing shall consist of one stationary stainless steel ring and one positively driven rotating carbon ring. Each interface shall be held in place by its own independent spring system.
6. The wear ring shall be a replaceable cast iron ring of sufficient size for long life.
7. The pump motor shall be housed in an air filled, water-tight casing with Class F insulation (rated for 310°F) and a 1.15 service factor. The stator shall be heat shrunk fit into the stator housing, precluding the need for pins or other fastening methods. Built in motor protection shall consist of one bimetallic micro switch in each phase of the winding. Motors shall be 130 HP, 1180 RPM, Power Factor 0.85 NEMA Code H. Motors shall be non-overloading throughout the entire pump operating range.
8. The cable entry water seal shall not require epoxies, silicones or other secondary sealing systems.
9. The pump motor cable shall be heavy duty type suitable for submersible pump applications.

10. All mated surfaces shall be machine and fitted with O-rings for water-tight sealing.
11. Motor shall be 3 phase, 460 volts, 60Hz, 6 Pole operation with a minimum of .85 power factor. The operating condition of the pump shall not exceed the nameplate rating of the motor or utilize the motor's service factor at any location on the pump-operating curve.

D. Installation.

1. Wet pit installation: When lowered on its guide rail system consisting of two guide rails, each pumping unit shall be automatically and firmly connected to a discharge connection bracket permanently mounted on the wet-well bottom. There shall be no need for personnel to enter the wet-well for any reason. No portion of the pump shall rest on the sump floor.

E. Power Cords.

1. Motor power cords shall be SO, SOW, or SOW-A4 conductor of proper length to suit installation. Sensor cords shall be 18/5 SOW/SOWA 5 conductor of proper length to suit installation. Each cable shall be provided with a green ground wire to be grounded in accordance with local and national electric codes.
2. Cable entry system shall be triple sealed. The power and control conductor shall be single strand sealed with epoxy potting compound and then clamped into place with a rubber seal bushing to seal outer jacket against leakage and to provide for strain relief. Potting compound shall prevent wicking of water into motor if the cable jacket becomes damaged. Cords shall withstand a pull of 300 pounds without loosening or losing integrity to meet UL requirements. A third sealing area shall be provided by a terminal board to separate cable entry from motor chamber.

F. Lift Out Rail System.

1. Each pump shall be supplied with a complete lift-out rail system consisting of a ductile iron discharge base and top rail support guides and guide support brackets. No fabricated steel parts shall be used. The lift-out assembly shall permit easy removal and installation of the pump without the necessity of personnel entering the wet well. All exposed fasteners shall be 300 series stainless steel.
2. A guide plate and adjustable guide bar shall fasten to the top of the pump to insure proper alignment and support of the pump.

3. The discharge base shall bolt directly to the wet well floor. All cast iron parts shall be coated with corrosion resistant baked on epoxy paint.
4. The rail system shall utilize two 2-inch schedule 40 galvanized steel pipes to guide the pump from the surface of the discharge base connection. The weight of the pump shall bear solely on the discharge base and not on the guide rails. Rail systems which require the pump to be supported by legs, which might interfere with the flow of solids in the pump suction, will not be considered equal. The guide rails shall be securely fastened to the inside face of the wet well with an upper guide bracket. The guide bracket shall be constructed of cast iron or stainless steel. Fabricated or galvanized steel will not be accepted. An adequate length of ¼ inch welded link galvanized steel lifting chain shall be supplied for removing the pump and shall include intermediate lifting rings for ease of pump removal. The chain shall be a minimum of 20 feet in length. The chain shall attach to the pump with a fabricated stainless steel lifting bail.
5. Lift-out assembly shall be FE Myers SRA-66 or approved equal.

G. Precast Catch Basin

1. The basin shall be 12' x 9' inside diameter with a depth of 168"± as shown on the contract drawings. The basin shall be built of concrete and precast reinforced concrete units. If precast concrete units are used, drawing stamped by a licensed professional engineer that the units are designed and built to withstand all loadings must be provided. Precast units shall conform to all ASTM standards.

H. Materials

1. The concrete shall develop a minimum 28-day compressive strength of 4000 psi and shall conform to the requirements of Class A concrete of the New York State Department of Transportation Standard Specifications.
2. Precast reinforced concrete manhole tops shall conform to the requirements of ASTM C-478-72, mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.
3. The contractor shall apply two coats of waterproofing on exterior and interior surfaces including underside of cover using Koppers Co. Super Service Black, or approved equal. If precast, the coating shall be applied at the factory.

4. Install premium O-ring gasket joint and bitumastic pipe joint compound on all riser joint sections.
5. Bottom of basin shall have a smooth troweled surface for meeting support casting.
6. The interior surface shall be free of cracks with a smooth finish.
7. The basin casting shall be suitable for highway H2O loading, and shall be Neenah Casting R 6663 OH, or approved equal.

I. Controls

1. A NEMA 3R steel control panel, minimum of 14 gauge, shall be furnished with the pumping units. The enclosure shall be a dead front design with a aluminum full inner door. The panel shall be for 460 volt/3 phase, 4 wire incoming power. All pilot lights and switches shall be inner door mounted. The panel shall include the following principal features:
  - a. Molded case main circuit breaker interlocked with inner door
  - b. Individual branch circuit breakers for each pump
  - c. Control circuit breakers for control power and receptacle
  - d. Three phase lightning arrestor on incoming power
  - e. Relays for four float operation; all pumps off, lead pump on, and lag pump on, high alarm, low alarm.

J. Construction Methods

1. The contractor shall install the pump station and controls in accordance with all manufacturer's recommendations. A factor representative shall be available to answer all questions on installation and shall inspect the installation and give written documentation that the pump station was installed properly.

K. Method of Measurement and Basis of Payment

1. The items associated with the Stokes Avenue Pump Station shall not be measured separately for payment. The basis of payment shall be lump sum. The lump sum price bid shall include all labor, materials and

equipment, including pumps, pump rails, controls and control panel, piping, pump basin, excavation and backfill of pump station, and incidentals necessary to furnish and install the complete and workable pump station. The lump sum price shall also include all electrical work and equipment.

Note: The limit of piping to be included in the pump station item shall include all ductile iron pipe, ductile iron reducers, ductile iron bends and ductile iron wyes, to the interconnection with the 16-inch PVC force main.

## ITEM 201PS – PUMP STATION

1. General. This item includes all work including furnishing and installing a complete and fully operational storm water pumping station. The work shall include, but not be limited to, furnishing all materials, equipment, including pumps with all appurtenances, precast wet well, pump controls, electrical equipment, electric service and all incidentals, including electrical work to complete and install a working pump station. The pump control system shall be furnished under section and by the pump supplier for a coordinated assembly and sole source responsibility and warranty. Electrical work to be in accordance with these specifications.
  
2. Submittals
  - A. Data to be submitted:
    1. The Contractor shall submit pump curves for the units which he proposes to supply, showing Total Dynamic Head, Pump Efficiency, Brake Horsepower, Power Input to Electric Drive Motor of Pumping Unit for the various conditions under which the units are to operate along with descriptive data and specifications describing in detail the construction of the complete units.
  
  - B. Dimensional Data:
    1. The successful bidder shall submit to the Engineer for approval, shop drawings, showing all weights and dimensions necessary for the installation of foundations, anchor bolts, piping and valve connections.
  
3. Materials and Equipment.
  - A. Performance Requirements
    1. The contractor shall furnish (3) and install (2), factory assembled non-clog pumps at the location shown on the contract drawings. The contractor shall include all labor, materials, equipment, incidentals and ancillary components to make a complete system. Submersible pumps shall be manufactured by Wilo-EMU of Thomasville, Georgia or pre-approved equal. Any pump manufacturer, other than specified, proposing to offer the following equipment must submit sufficient information to the Engineer to determine, at least 5 days prior to the advertised bid date, that the equipment complies with the requirements of the Contract Documents. Contractors and manufacturers are advised that a manufacturer named as an approved supplier is not excused from meeting all of the technical and performance requirements of this specification. The pre-bid qualification

package shall include complete pump performance data, evidence of compliance with the installation experience requirements of this Section.

**B. Pump Performance**

1. Each pump shall be capable of the following performance:

**Primary Duty Point Flow (GPM): 1,000 GPM**

Total dynamic head at rating point (T.D.H):	10 FT TDH
Secondary Duty Point Flow (gallons per minute):	1,300 GPM
Total dynamic head at duty point (T.D.H):	7.5 FT TDH
Minimum Shutoff Head:	19.5 FEET
Minimum Hydraulic Efficiency at rating point:	49%
Minimum Free Passage:	3.0"
Maximum motor HP:	6.2 HP
Maximum motor speed (RPM):	1140 RPM

The pumps shall be submersible, centrifugal, non-clogging sewage pumps, capable of handling raw, unscreened sewage and storm water. The pumps shall be capable of operating continuously in submersed or unsubmerged condition without overheating or any adverse effects due to heat generation. Pumping units which utilize re-circulation of the pumped media for cooling purposes or provide connections for external cooling water shall not be considered equal or acceptable. O-ring sealing shall be provided between the motor unit and volute to prevent external leakage. Discharge flange shall be 8-inch standard, drilled for Class 125 FF Pattern. Pumps shall be Wilo-EMU, model FA20.78D, 6.2 HP, 1140 RPM, FK17.1-6/16K closed loop cooled, oil filled motor.

**C. Volute**

1. The volute shall be constructed of ASTM A48 minimum Class 40B cast iron (GG25) capable of prolonged resistance to raw sewage.
2. Suction and discharge flanges shall be 125# and meet ANSI standard B16.1.
3. All nuts, bolts, washers, and other fastening devices supplied with the pumps shall be stainless steel.
4. All mating surfaces requiring a watertight seal shall be machined and fitted with Buna-n O-rings. Paper gaskets are not acceptable.

#### D. Impeller

1. Pump impellers shall be of the solids handling three vane non-clog type. The impeller vane shall be smooth, finished throughout, and shall be free from sharp edges.
2. Pump impellers shall be manufactured from ASTM A48 Class 40B cast iron (GG25).
3. Impellers shall be key driven and securely held to the shaft by a streamlined impeller washer and bolt assembly specifically designed to reduce friction in the suction eye of the impeller. The arrangement shall be such that the impeller cannot unscrew or be loosened by torque from either forward or reverse rotation. Designs based on threaded connection between pump shaft and impeller will not be considered.
4. The impeller shall be capable of passing a 3 inch solid non-deformable sphere through the bottom inlet and out between the two shrouds. Designs which cannot pass a sphere through the impeller or rely on deforming, cutting or chopping solid materials shall not be acceptable.

#### E. Wear Rings

1. The impeller shall be provided with an AISI 329 (1.4462) duplex stainless steel wear ring which is drive fitted to the suction eye of the impeller. The impeller wear ring shall be hardened to a Brinell hardness of 200-250.
2. The casing shall be provided with an AISI 304 (1.4308) stainless steel wear ring which is drive fitted to the bottom suction inlet. The volute wear ring shall be hardened to a Brinell hardness of 275-325.

#### 4. Motors

##### A. Submersible Motors

1. Each pump shall be furnished with a squirrel cage, induction motor enclosed in a watertight housing suitable for use and compatible with all variable frequency drive systems. Input voltage shall be 208 volt, three phase.

2. The motor shall be suitable for dry pit or wet pit installation under full load conditions. Motors shall be certified for variable frequency drive systems without de-rating the motor output power. The motors shall be capable of installation in either the wet pit or dry pit installation without adding or removing any items to the motor's interior or exterior.
3. The motors shall be oil-filled with moisture resistant NEMA Class F insulation and Class H slot liners and constructed to NEMA B design standards. The copper wound stator shall be triple dipped in epoxy enamel and baked to withstand a temperature of 155 degrees Centigrade as defined in NEMA Standard MG-1. Each winding phase or layer shall be laced with type H glass lined paper. The use of cable ties to restrain windings shall not be allowed. The rotor shall be statically and dynamically balanced after fabrication. The rotor shall utilize aluminum amortisseur bars and short circuit rings. The constructed motor shall be certified for continuous duty with a service factor of 1.15 and shall be non-overloading over the entire range of the impeller.
4. Motors shall be capable of sustaining 15 starts per hour (unlimited starts with VFD) at a minimum ambient temperature of 40°C.
5. Motors shall be capable of uninterrupted operation with a voltage drop of 10%.
6. The power cables entering the motor housing shall connect to individual terminal pins, which separates the incoming service from the pump motor.
7. The motor shall be cooled via the internally circulated oil by means of a pump/motor shaft mounted oil circulation impeller. The oil/coolant impeller shall be mounted above the upper mechanical seal. Systems that utilize a coolant impeller mounted between the upper and lower mechanical seals shall not be acceptable. The oil circulating through the pump shall provide positive oil lubrication to all the bearings in the pump. The motor/pump oil circulation impeller shall cause the oil to move through and around the stator windings and motor rotor from which it picks up heat. This heat is then directed into the motor heat exchanger which transfers the heat to the pumped liquid. The heat exchanger shall be located below the sealing chamber. It shall be provided with a labyrinth design channel system such that a minimum of 85% of the heat generated by the motor must be conducted through the heat exchanger to the pumped liquid. Cooling systems requiring a separate, clean water source or that circulates the pumped sewage through a cooling jacket will not be accepted.

8. Thermal switches shall be furnished to monitor stator temperatures. The stator shall be equipped with two (2) thermal switches, embedded in the end coils of the stator and spaced directly across from each other in the stator. Thermal switches shall automatically de-energize the motor when its temperature exceeds a preset limit as recommended by the manufacturer.
9. The pump manufacturer's nameplates shall be engraved or stamped on stainless steel and fastened to the motor casing with stainless steel screws or drive pins.

B. Shafts

1. Pump shafts shall be AISI 420 (1.4021) stainless steel. Carbon steel shafts or shafts with sleeves of any type are not acceptable. The shaft shall be one piece construction without joints or stubs attached.
2. Multiple row lower bearings for axial/radial thrust and a single row upper bearing for radial thrust shall support the motor/pump shafts. Bearings shall be sized to provide a minimum L-10 life of 50,000 hours anywhere on the flow versus head curve. Thrust bearings shall be restrained from thrust in both directions. Designs that do not protect the pump/motor from thrust in reverse directions shall not be acceptable.
3. All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection. The distance from the lower bearing to the hub of the impeller shall not exceed 1.940 times the shaft diameter when the shaft diameter is measured at the lowest bearing.
4. The oil contained and circulated in the motor shall lubricate all pump/motor bearings. Grease lubricated bearings shall not be provided or acceptable.
5. Minimum shaft diameter shall be 1.38 to 1 inches at the lowest bearing.

C. Mechanical Seals

1. Each pump shall be provided with a tandem mechanical seal with the seal housing and spring system constructed of 316 stainless steel. Both upper and lower seal faces shall be silicon carbide versus silicon carbide.
2. The seal shall be mounted in a separate and isolated seal chamber. The seal chamber shall be filled with non-conductive lubricating oil as recommended by the manufacturer.

3. A moisture sensor shall be furnished to sense seal failure for each pump. This sensor shall be wired to the Pump Control Panel and shall activate an alarm light upon seal failure. The sensor probe shall be mounted in the seal chamber and shall be of the conductive type, sensing moisture intrusion above the lower seal, but below the upper seal. Designs which sense seal failure above the upper seal through the use of a float switch are not acceptable.

D. Power and Control Cables:

1. Power and control cables shall be furnished in lengths to run contiguously from the pump to the pump control panel as shown on the Contract Drawings and as specified herein. Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be provided to confirm that all strands of each conductor is terminated properly. Termination shall be coordinated with the connection to the Pump Control Panel.
2. Cables shall be of the "SO" type and shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The cables shall enter the pump through a heavy duty entry assembly which shall be provided with an external clamp assembly to protect against tension once secured providing a strain relief function as part of standard construction.
3. The cables for each pump shall pass through the strain relief component and then through a series of stainless steel disks and Buna-n grommet that is sandwiched between the disks to control compression of the grommet. These components shall work to compress the cable jacket by the inner diameter of the grommet while the outer diameter of the grommet seals against the inside surface of the cable entry chamber in the top of the motor.

5. Removal System

A. General Description

1. The removal system shall consist of a discharge base elbow that mounts in the bottom of the wet pit, a replaceable pump coupling, guide pipes and supports and hardware as required for a complete and operational system. Connections to piping shall be standard ANSI flanges.

B. Discharge Base Elbow

1. The ASTM A48 Class 30B or higher cast iron discharge base elbow shall be provided to support the full weight of the submersible pump in the installation and provide a leak proof connection in which the pump coupling mates using a conformed Buna-N seal which is held in place by the combined weight of the cantilevered pump and motor. The hydraulic pressure generated while the pump is in operation also aids the sealing. The discharge base shall be provided with guide pipe retention lugs.

#### C. Pump Coupling

1. The pump coupling shall be close grained gray cast iron construction. The coupling shall be located between the pump discharge flange and the vertical face of the discharge base. The purpose of the coupling shall be to allow use of a standard ANSI drilled pump-casing flange on the pump. The coupling acts as the intermediate part between the pump and the discharge base. The coupling vertical face is designed to seal against the vertical face of the discharge base using a replaceable Buna-N elastomeric compressible one piece seal that acts as both the discharge face seal and the gasket between the coupling and the pump flange. Wet pit installation designs which utilize the flat face of the pump flange to seal against the discharge base are not allowed.

#### D. Guide Rails

1. 304 stainless steel, schedule 40 guide rails supported by upper and intermediate brackets (if required) of 316 stainless steel shall guide each pump. The guide rails shall consist of standard dimension schedule 40 piping with a minimum diameter of 1-1/2" and a maximum diameter of 4" as shown on the contract drawings. The guide rails shall be supported by a 316 upper guide rail bracket that will be mounted in the opening of the access cover to support and guide the pump/motor into and out of the wet well. Intermediate guide rail brackets will be provided for all installations deeper than 20 ft.

#### E. Lifting Device

1. Each pump shall be supplied with a proof type lifting chain of 316 Stainless Steel, rated for 3 times the installed pump and coupling weight. The manufacturer shall provide information on recommended testing parameters that shall keep the lifting system capable of service for the life of the station. Recommendations shall be in written form and shall be discussed during startup training for the installation.

6. Shop Painting

- A. Primer and Finish Paint - Shop apply to all exterior ferrous surfaces of the pump and motor a single coat of two component varnish that is green in color. Coating shall be resistant to storm water and sewage of normal pH and contain no more than 3.5 pounds per gallon of VOCs.
- B. Surface Preparation - Prepare all surfaces to receive coating system. Surfaces must be free from dust, grease, rust, scale, and other coatings.
- C. Special Coatings - Shop apply to impeller surfaces and the interior of the pump volute. Shop apply to exterior and interior surfaces of elbow
1. Minimum solids by volume: 97%
  2. Type: Solvent-free ceramic coating, impregnated with aluminum oxides
  3. Total Dry Film Thickness: 400 microns (15.7 mils) minimum
  4. Minimum Adhesion: 14 Newtons per square millimeter (2,030 psi) per ISO 4624.
  5. Minimum Hardness: 110 on Buchholz Indentation scale
  6. Resistance: Level 1 (continuous duty) for sewage with pH of 6-11, Level 1 for saltwater, Level 3 (not recommended) for 10% hydrochloric acid.

7. Execution

Warranty

- A. The pumps and motors will be covered by a five (5) year manufacturer's warranty that shall comprise the following terms: The initial year from start-up of the equipment shall be covered 100% for parts and labor. The following years 2 through 5 shall be covered 50% for parts and labor. This warranty shall not be limited by hours of running time or operation from variable speed drives.

8. Pump Controls

- A. A NEMA 3R steel duplex control panel, minimum of 14 gauge, shall be furnished with the pumping units. The enclosure shall be a dead front design with an aluminum full inner door. The panel shall be for 120/208 volt/3 phase incoming power. All pilot lights and switches shall be inner door mounted. Three phase lightning arrestor shall be provided on incoming power. The panel shall include the following principal features:

- B. System Operation: Each pump shall be operated via a 3-position Hand-Off-Auto selector switch. In hand position, pump operation shall start the pump and pump out the contents of the wet well. In auto position, the lead and lag pump operation and high water alarm indication shall be based upon the status of the control floats located in the wet well. Opening of the 'off' float shall stop operation of all pumps and alternate to the next available pump. Adjustable 'on' delay for the lag pump to prevent both pumps from starting simultaneously.
- C. Circuit breaker and appurtenances be unsuitable for to maintain proper operation of the equipment. Provide a 3-pole 65kAIC Interrupt rated Main Circuit Breaker Disconnect with direct mount rotary operator handle. The operator shall have the provision to be padlocked. Individual branch circuit breakers for each pump. The circuit breaker shall have a minimum interrupt rating of 10 kAIC.
- D. Magnetic Starter: The magnetic starter shall include a IEC rated contactor with a minimum mechanical life of 3,000,000 operations. The magnetic starter shall include an overload relay with is IEC rated, ambient temperature compensated and bimetallic. The overload relay shall be capable of being set in either a manual or automatic reset mode. In the manual mode, only the operator shall accomplish a reset. Overload relays shall be Class 10 type.
- E. Alternator: The control panel shall include an alternating circuit, which alternately switches the lead pump when the on-off cycle is completed. The alternator shall be solid state, 8 pin design with lead selector switch.
- F. Provide 120 VAC control power. A pilot light shall indicate control power is 'on.
- G. Provide all necessary relays to interface with the station control system and pump control monitoring. Control Relays: All control relays shall be 2PDT or 4PDT, 10A rated contacts, 120VAC coil, clear dust covers, encapsulated coils. Relay shall have an indicator light and lockable test capability
- H. A seal leakage circuit shall be provided to alert to water in the motor seal housing. When water is detected in the seal chamber a liquid level relay shall be energized and illuminate a pilot light on the enclosure door. The relay shall be 8-pin design, 120 VAC input power with 4.7 to 100 Kohm probe sensitivity (adjustable).
- I. Motor Over-Temperature Circuit: In the event the motor winding temperature exceeds the set point of the motor Klixons, the system shall shut down the motor and render it unavailable. A pilot light shall be illuminated. A reset pushbutton shall be provided to manually reset the circuit.
- J. Hour Meters: A 5 digit non-resettable hour meter shall be provided for each pump.
- K. Anti-condensation Heater: Provide a 200 watt minimum fan heater with built-in thermostat to prevent condensation. The fan heater shall provide a minimum of 20 CFM airflow and have built-in auto/on switch and thermostat.
- L. Receptacle: Provide on the inner door a GFCI type, 20A rated receptacle with

circuit breaker. The circuit breaker shall have a minimum interrupt rating of 10 kAIC.

- M. All pilot lights and switches shall be oil tight, 22mm devices. Pilot lights shall use superbright LED lamps with a chrome metal bezel. Lens color shall be: green – running, red – fault or alarm, white – control power
- N. All nameplates shall be engraved on lamacoid material providing black lettering on a white background or white lettering on a black background. Lettering shall be no smaller than 1/8 of an inch in height.
- O. Dry remote contacts shall be provided to indicate motor overload, seal failure, high motor temperature and high water level.
- P. All field terminations shall be made on compression type terminal blocks labeled according to wire number, separate terminal strips shall be provided for AC and DC signals. A minimum of 20% spare terminals shall be provided.
- Q. Wiring to door mounted components shall be neatly bundled wiring harnesses protected by plastic spiral wire wrap when crossing door hinge. Wiring harnesses shall have adequate stress loops and be fastened at both sides of hinge crossing.
- R. Wiring: Color coded to NEC requirements; black power wiring, red numbered control wiring, white numbered neutral wiring, green ground wiring and blue DC power wiring.
- S. All panel wiring shall be properly labeled with Brady type labels at both ends of the wire.
- T. Control panel shall meet the latest UL requirements as an assembly and carry a sticker showing compliance with UL 508A.
- U. Control Floats: Pump operation shall be through the use of float controls suspended in the wet well from a stainless steel float bracket. The control floats shall be SPDT switch design and shall be free from mercury. The switch shall have a pilot duty rating of 10 amps at 250 VAC. The control floats shall be specifically designed for wastewater service with a tear drop design. The float shall be constructed of polypropylene material housing, EPDM gland and PVC cable. The float shall be internally weighted. The control float shall be supplied with sufficient cable to reach the pump control panel without splices or a junction box. The float rack shall be constructed of stainless steel and be complete with cord grips for mounting the control floats. Two spare floats shall be included.

Control logic shall include:

- High water level alarm
- Lag pump on
- Lead pump on
- All pumps off/alternate lead

## 9. Field Quality Control

### A. Field Testing:

1. After the installation of the pumps, controls and all appurtenances, and when construction of other units of the pump station will permit, each complete pumping unit will be subject to field tests as specified herein under actual operating conditions.
2. The field tests shall be made by the Contractor under the direct supervision of a qualified factory trained engineer, and in the presence of, and as directed by the Engineer. The Contractor shall provide, calibrate and install all temporary gauges and meters, shall make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field tests.
3. The pump manufacturer shall demonstrate that each pump furnished shall pass a minimum 3 inch non-deformable sphere through a field test of the pump impeller clearance. The test shall be a static test with the pump in an OFF status and disconnected from the electrical power service. With the pump held aloft by its chain to the pump station hoist or crane, the pump manufacturer's field technician shall place a hard nominal 3 inch sphere into the pump discharge and through turning the impeller by hand; demonstrate the solids passage through the sphere exiting the bottom pump suction.

Should the pump not pass the free passage test, then the equipment shall be rejected and no compensation for the equipment shall be allowed until the equipment is replaced with equipment that passes the free passage test and is compliant with the contract specifications.

4. The field tests shall determine the head, discharge flow and overall efficiency characteristics of each pumping unit and in addition, shall demonstrate that under all conditions of operation each unit:
  - Has not been damaged by transportation or installation.
  - Has been properly installed.
  - Has no mechanical defect.
  - Is in proper alignment.
  - Has been properly connected.
  - Is free of overheating of any parts.
  - Is free of all-objectionable vibration and noise.
  - Is free of overloading of any parts.

10. Factory Field Service

- A. Submit a report of each visit by the Manufacturer's representative to provide technical assistance during installation and start-up
- B. Prior to being admitted to the project site, the manufacturer or their representative shall have completed an OSHA 10-Hour Construction Safety and Health course and shall provide a valid certificate.
- C. A factory-trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of one visit, minimum 8 hours On-Site for each visit, to the Site. The visit shall be for checking the completed installation, start-up and training of the system. Manufacturer's representative shall test operate the system in the presence of the ENGINEER and verify that the equipment conforms to the requirements.
- D. All costs, including travel, lodging, meals and incidentals, for all visits shall be at no additional cost to the OWNER.
- E. Reports, in writing, shall be provided to the engineer by the service technician on his findings, actions and recommendations. The report shall include the following minimum items: pump model and serial number, motor data, megger readings for each pump motor, system voltage, motor running current, hour meter readings and any deficiencies. A final certification from the supplier of the pump system shall be provided to the engineer upon its successful start-up and proper operation.
- F. The time specified shall require at least two trips to the project site. One trip for supervision during the installation of the units and one trip for operator training.

11. Precast Concrete Basin

- A. The basin shall be 10'-5" x 6'-6" overall diameter with a depth of 9.42'± as shown on the contract drawings. The basin shall be built of concrete and precast reinforced concrete units. If precast concrete units are used, drawing stamped by a licensed professional engineer that the units are designed and built to withstand all loadings must be provided. Precast units shall conform to all ASTM standards.
- B. The concrete shall develop a minimum 28-day compressive strength of 4000 psi and shall conform to the requirements of Class A concrete of the New York State Department of Transportation Standard Specifications.
- C. Precast reinforced concrete manhole tops shall conform to the requirements of ASTM C-478-72, mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

- D. The contractor shall apply two coats of waterproofing on exterior and interior surfaces including underside of cover using Koppers Co. Super Service Black, or approved equal. If precast, the coating shall be applied at the factory.
- E. Install premium O-ring gasket joint and bitumastic pipe joint compound on all riser joint sections.
- F. Bottom of basin shall have a smooth troweled surface for meeting support casting.
- G. The interior surface shall be free of cracks with a smooth finish.
- H. The basin casting shall be suitable for highway H20 loading, and shall be a Neenah Casting R6663-JH, or approved equal.

12. Construction Method

- A. The contractor shall install the pump station and controls in accordance with all manufacturer's recommendations. A factory representative shall be available to answer all questions on installation and shall inspect the installation and give written documentation that the pump station was installed properly.

13. Method of Measurement and Basis of Payment

- A. The items associated with the Jarvis Street Pump Station shall not be measured separately for payment. The basis of payment shall be lump sum. The lump sum price bid shall include all labor, materials and equipment, including pumps, pump rails, controls and control panel, piping, pump basin, excavation and backfill of pump station, and incidentals necessary to furnish and install the complete and workable pump station. The lump sum price shall also include all electrical work and equipment.

Note: The limit of piping to be included in the pump station item shall include all ductile iron pipe, ductile iron reducers, ductile iron bends and ductile iron wyes, to the interconnection with the 10-inch PVC force main.

ITEM 202 – PRECAST MANHOLE

202A	4.0' DIAMETER	202E	8.0' DIAMETER
202B	5.0' DIAMETER	202F	10.5' DIAMETER
202C	6.0' DIAMETER	202G	8'x6' RECTANGULAR
202D	7.0' DIAMETER	202H	12'x6' RECTANGULAR
		202P	12'x12' POLYGON MANHOLE

1. Description. Under this item, the Contractor shall build manholes as shown on the plans or as directed by the Engineer. They shall be built of concrete and precast reinforced concrete units.
2. Materials. The concrete shall develop a minimum 28-day compressive strength of 4000 psi and shall conform to the requirements of Class A concrete of the State of New York Department of Transportation specifications.

Precast reinforced concrete manhole risers and tops shall conform to the requirements of A.S.T.M. C-478-782; mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

Precast structures must be certified by a licensed engineer to be capable of handling H-20 design loading.

Sanitary sewer manholes shall be supplied, by manufacturer, with a poured concrete invert. Changes in pipe direction, (greater than or less than 180°), shall have a poured concrete sweep invert. Refer to detail on standard manhole detail sheet.

The Contractor shall apply two coats of waterproofing on exterior surfaces below grade of sanitary sewer manholes (Koppers Co. Super Service Black, or approved equal).

A-Lok rubber gasket (or approved equal) shall be cast integrally into all sanitary sewer main openings at the time of manufacture. Z-Lok rubber gasket (or approved equal) shall be used on all PVC storm sewer and catchbasin connections. Gasket shall conform to A.S.T.M. C-443 and A.S.T.M. C-923. Appropriate pipe entry pieces meeting the manufacturer's recommendations shall be utilized.

Z-Lok gaskets may be omitted from PVC storm sewer and catchbasin connections, provided that pipe is first softened with pipe solvent, then thoroughly coated with sand, prior to sealing the connection. Where gaskets are not required, the connection shall be sealed with non-shrink grout or "concrete repair material" appearing on the NYSDOT Materials Approved List for items 701-05 or 701-04, respectively. Seal shall be watertight.

Manhole frame and lid shall be supplied by the City of Binghamton, Department of Water/Sewer. Contractor shall pick up castings at #1 Broome Street, Binghamton,

New York. Castings to be transported to the construction site and installed as shown on the manhole detail sheet. Arrangements shall be made with the Water/Sewer Department and a twenty four hour notice shall be given prior to picking up castings.

3. Method of Measurement and Basis of Payment. The unit price bid for each manhole shall be considered to have a depth of 6 feet from pipe invert to top of casting. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No separate payment will be made for concrete, cement, reinforcement, steps, crushed stone, excavation or backfill.

## ITEM 202 – PRECAST MANHOLE

1. Description. Under this item, the Contractor shall build manholes as shown on the plans or as directed by the Engineer. They shall be built of concrete and precast reinforced concrete units.
2. Materials. The concrete shall develop a minimum 28-day compressive strength of 4000 psi and shall conform to the requirements of Class A concrete of the State of New York Department of Transportation specifications.

Precast reinforced concrete manhole risers and tops shall conform to the requirements of A.S.T.M. C-478-782; mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

Precast structures must be certified by a licensed engineer to be capable of handling H-20 design loading.

Sanitary sewer manholes shall be supplied, by manufacturer, with a poured concrete invert. Changes in pipe direction, (greater than or less than 180°), shall have a poured concrete sweep invert. Refer to detail on standard manhole detail sheet.

The Contractor shall apply two coats of waterproofing on exterior surfaces below grade of sanitary sewer manholes (Koppers Co. Super Service Black, or approved equal).

A-Lok rubber gasket (or approved equal) shall be cast integrally into all sanitary sewer main openings at the time of manufacture. Z-Lok rubber gasket (or approved equal) shall be used on all PVC storm sewer and catchbasin connections. Gasket shall conform to A.S.T.M. C-443 and A.S.T.M. C-923. Appropriate pipe entry pieces meeting the manufacturer's recommendations shall be utilized.

Z-Lok gaskets may be omitted from PVC storm sewer and catchbasin connections, provided that pipe is first softened with pipe solvent, then thoroughly coated with sand, prior to sealing the connection. Where gaskets are not required, the connection shall be sealed with non-shrink grout or "concrete repair material" appearing on the NYSDOT Materials Approved List for items 701-05 or 701-04, respectively. Seal shall be watertight.

Castings shall conform to A.S.T.M. A-48-83 Class 35, and shall be Neenah castings R-1713, or approved equal.

Lids shall be as follows:

**STORM:** Solid Platen Lid, Type C, reg. Seat, GI Class 35, O\* perma-grip, 1 open pick hole, lettered "STORM".

SANITARY: Solid Platen Lid, Type B, T-Seal, 2F PK, AC, GI Class 35, lettered "SANITARY".

3. Method of Measurement and Basis of Payment. The unit price bid for each manhole shall be considered to have a depth of 6 feet from pipe invert to top of casting. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No separate payment will be made for frames and covers, concrete, cement, reinforcement, steps, crushed stone, excavation or backfill

ITEM 202SB – REPAIR MANHOLE TOP SLAB

1. Description. Under this item, the Contractor shall repair the manhole top slab as shown on the plans or as directed by the Engineer. The existing slab cover is to be removed and disposed of by the contractor.
2. Materials. The slab cover shall be rebuilt of 4000 psi. concrete, or precast cover slabs, in accordance with the details shown in the plans or as specified by the Engineer. If precast concrete slab units are used, drawings stamped by a licensed professional engineer that the slab units are designed and built to withstand all loading must be provided. Precast units shall conform to all ASTM standards. The slab shall be suitable for highway H20 loading.

Steel reinforcement, as indicated on the plans, shall conform to the requirements of Item 556.0201 of the State Specifications (Grade 60). No separate payment will be made for steel reinforcement and the cost shall be included in the price bid for this item.

3. Construction Details. The existing concrete slab shall be removed and disposed of by the contractor. All debris shall be removed from the manhole and at no time shall flow be obstructed within the manhole. Existing steel plates being used to support the slab shall be returned to the City of Binghamton Sewer Department.
4. Method of Measurement and Basis of Payment. The lump sum bid price to be paid for shall include necessary excavation and the furnishing of all labor, equipment, materials, and incidentals necessary to complete the work to the satisfaction of the Engineer in Charge.

ITEM 202WT - PRECAST MANHOLE WITH WATERTIGHT FRAME AND LID

1. Description. Under this item, the Contractor shall build manholes as shown on the plans or as directed by the Engineer. They shall be built of concrete and precast reinforced concrete units.
2. Materials. The concrete used shall develop a minimum 28-day compressive strength of 4000 psi and shall conform to the requirements of Class A concrete of the State of New York Department of Transportation specifications.

Precast reinforced concrete manhole risers and tops shall conform to the requirements of A.S.T.M. C-478-782; mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

When PVC pipe is utilized, A-Lok rubber gasket (or approved equal) shall be cast integrally into all sewer main openings at the time of manufacture. Z-Lok rubber gasket (or approved equal) shall be used on all catchbasin connections. Gasket shall conform to A.S.T.M. C-443 and A.S.T.M. C-923.

Castings shall conform to A.S.T.M. A-48-83 Class 30, and shall be Neenah castings R-1755-, Type C lid, or approved equal.

3. Method of Measurement and Basis of Payment. The unit price bid for each manhole shall be considered to have a depth of 6 feet from pipe invert to top of casting. The price bid shall include the cost of furnishing all labor, materials and equipment necessary to complete the work. No separate payment will be made for frames and covers, concrete, cement, reinforcement, steps, crushed stone, excavation and backfill.

ITEM 202X – EXTRA DEPTH OF MANHOLE

1. Description. Under this item, the Contractor shall build the structures to the depth shown on the plans or as directed by the Engineer.
2. Materials. The specific material for the extra depth construction shall be as indicated on the plans.
3. Method of Measurement. For such increase in depth in excess of 6 feet as shown on the plans or as directed, the Contractor shall be paid the price bid for each foot of such extra depth.
4. Basis of Payment. The unit price bid for each foot of extra depth shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No separate payment will be made for frames and covers, concrete, block, brick, cement or reinforcement, steps, excavation or backfill.

Item	Description		Pay Unit
202X-A	Extra Depth of Manhole	4' 0" Diameter	L.F.
202X-B	Extra Depth of Manhole	5' 0" Diameter	L.F.
202X-C	Extra Depth of Manhole	6' 0" Diameter	L.F.
202X-D	Extra Depth of Manhole	7' 0" Diameter	L.F.
202X-E	Extra Depth of Manhole	8' 0" Diameter	L.F.
202X-F	Extra Depth of Manhole	10' .5" Diameter	L.F.
202X-G	Extra Depth of Manhole	8'x6' Rectangular	L.F.
202X-H	Extra Depth of Manhole	12'x6' Rectangular	L.F.

ITEM 202Z – REMOVE EXISTING MANHOLE

1. Description. Under this item, the Contractor shall remove the existing manhole and fill the remaining void with well-compacted granular fill.
2. Construction Details. The Contractor shall remove the existing casting and store it until it is picked up by the City Sewer Department, or use it as ordered by the Engineer within the project. The structure opening shall be filled with gravel in 8-inch lifts and compacted thoroughly.
3. Basis of Payment. Payment will be made at the unit price bid for removal of each structure and shall include the cost of furnishing all labor, materials necessary to complete the work. No extra payment will be made for excavation or backfill. No payment will be made under Item 202A when a new manhole is to be built directly in the same location as an existing drainage structure.

ITEM 204A – PRECAST CATCHBASIN

1. Description. Under this item, the Contractor shall build catchbasins as shown on the plans, or as directed by the Engineer. They shall be built of concrete and precast concrete. The details of design of these structures and specific materials used in their construction shall be as indicated on the plans, or as approved by the Engineer.
2. Materials. All concrete shall develop a minimum 28-day compressive strength of 4000 P.S.I. and shall conform to the requirements of Class A concrete of the State of New York Department of Transportation.

Precast structures must be certified by a licensed engineer to be capable of handling H-20 design loading.

Metal used in the manufacture of castings shall conform to A.S.T.M. 1448-83 Class 35B for Gray Iron.

Z-LOK rubber gasket (or approved equal) shall be used on catchbasin connections. Gasket shall conform to ASTM C-443 and ASTM C-923. Z-Lok gaskets may be omitted from PVC storm sewer and catchbasin connections, provided that pipe is first softened with pipe solvent, then thoroughly coated with sand, prior to sealing the connection. Where gaskets are not required, the connection shall be sealed with non-shrink grout or “concrete repair material” appearing on the NYSDOT Materials Approved List for items 701-05 or 701-04, respectively. Seal shall be watertight.

Mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

Catchbasin trap shall be as detailed on the plans.

3. Method of Measurement and Basis of Payment. The unit price bid for each structure shall be considered to have a standard depth as indicated on the details from structure invert to top of grate. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, including excavations and backfill. No separate payment will be made for frame, grates, traps, hoods, flaps, concrete or reinforcement, or crushed stone.

Payment for work under this section will be on the following items, if and when they appear on the itemized proposal:

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
204A	Precast Catchbasin	Each
204BT	Precast Catchbasin Type "C" Grate	Each

ITEM 204BT – PRECAST CATCHBASIN, TYPE ‘C’ GRATE

1. Description. Under this item, the Contractor shall build catchbasins as shown on the plans, or as directed by the Engineer. They shall be built of concrete and precast concrete. The details of design of these structures and specific materials used in their construction shall be as indicated on the plans, or as approved by the Engineer.
2. Materials. All concrete shall develop a minimum 28-day compressive strength of 4000 PSI and shall conform to the requirements of Class ‘A’ concrete of the New York State Department of Transportation Standard Specifications.

Precast structures must be certified by a licensed engineer to be capable of handling H-20 design loading.

Metal used in the manufacture of castings shall conform to ASTM 1448-83 Class 35B for Gray Iron.

Z-LOK rubber gasket (or approved equal) shall be used on catchbasin connections. Gaskets shall conform to ASTM C-443 and ASTM C-923. Z-Lok gaskets may be omitted from PVC storm sewer and catchbasin connections, provided that pipe is first softened with pipe solvent, then thoroughly coated with sand, prior to sealing the connection. Where gaskets are not required, the connection shall be sealed with non-shrink grout or “concrete repair material” appearing on the NYSDOT Materials Approved List for items 701-05 or 701-04, respectively. Seal shall be watertight.

Mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

Catchbasin trap shall be Neenah R-37-1-10 (or approved equal). Trap hooks shall be installed in accordance with the manufacturer’s specifications.

3. Method of Measurement and Basis of Payment. The unit price bid for each structure shall be considered to have a standard depth as indicated on the details from structure invert to top of grate. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, including excavations and backfill. No separate payment will be made from frame, grates, traps, hoods, flaps, concrete or reinforcement, or crushed stone.

ITEM 204R - REPAIRING CATCHBASINS, INLETS

1. Description. Under this item, the Contractor shall repair catchbasins and inlets as shown on the plans or as directed by the Engineer. Repairing shall only be necessary when the poor condition of the structure exists more than six inches below the top of the actual structure.
2. Materials. The structures shall be rebuilt of 3500P.S.I. concrete, concrete manhole blocks, concrete brick, eccentric cones and cover slabs, in accordance with the details shown in the plans or as specified by the Engineer. The existing frames, covers, gratings, etc., shall be used in the repairing of these structures unless specified otherwise by the Engineer.
3. Construction Details. All work shall be done in a workmanlike manner by competent masons.
4. Method of Measurement and Basis of Payment. The unit quantity to be paid for shall be the number of linear feet of masonry actually incorporated in the repairing of these structures and shall be measured from the top of the structure to the depth of where new work actually started. The price bid shall include necessary excavation and the furnishing of all labor, equipment, materials, and incidentals necessary to complete the work, except as follows:
  - A. New frames, covers, gratings, etc., as ordered by the Engineer, will be paid for under their respective items.
  - B. Old castings will be considered the property of the City of Binghamton, New York. Castings considered to be reusable will be transported to the City of Binghamton, New York, Department of Public Works, as directed by the Engineer. Other castings not deemed reusable by the Engineer shall be removed from the site and disposed of in a lawful manner by the Contractor.

### ITEM 204V - PRECAST CATCHBASIN

1. Description. Under this item, the Contractor shall build catchbasins as shown on the plans, or as directed by the Engineer. They shall be built of concrete and precast concrete. The details of design of these structures and specific materials used in their construction shall be as indicated on the plans, or as approved by the Engineer.
2. Materials. All concrete used shall develop a minimum 28-day compressive strength of 4000 p.s.i. and shall conform to the requirements for Class A concrete of the State of New York Department of Transportation Specifications.

Precast structures must be certified by a licensed engineer to be capable of handling H-20 design loading.

Metal used in the manufacture of castings shall conform to ASTM 1448-83 Class 35B for Gray Iron.

Z-Lok rubber gasket (or approved equal) shall be used on catchbasin connections. Gasket shall conform to ASTM C-443 and ASTM C-923. Z-Lok gaskets may be omitted from PVC storm sewer and catchbasin connections, provided that pipe is first softened with pipe solvent, then thoroughly coated with sand, prior to sealing the connection. Where gaskets are not required, the connection shall be sealed with non-shrink grout or "concrete repair material" appearing on the NYSDOT Materials Approved List for items 701-05 or 701-04, respectively. Seal shall be watertight.

204V precast catchbasin shall be Binghamton Precast Model No. 2436, *or approved equal*. Casting, cover, and curb box shall be Syracuse Casting Model No. 2616, Type 1 or Type 2 Grate, *or approved equal*.

Mortar shall consist of one part masonry cement and two parts mortar sand mixed to a stiff, plastic consistency showing no signs of free water.

3. Method of Measurement and Basis of Payment. The unit price bid for each structure shall be considered to have a standard depth from structure invert to top of grate. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, including excavations, and backfill. No separate payment will be made for frame, grates, traps, hoods, flaps, concrete, or reinforcement, or crushed stone.

ITEM 204Z - REMOVE EXISTING CATCHBASINS

1. Description. Under this item, the Contractor shall remove the existing catchbasin and fill the remaining void with well-compacted granular fill.
2. Construction Details. The Contractor shall remove the existing casting and store it until it is picked up by the City Sewer Department, or use it as ordered by the Engineer within the project. The catchbasin opening shall be filled with gravel in 8-inch lifts and compacted thoroughly.
3. Basis of Payment. Payment will be made at the unit price bid for removal of each structure and shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No extra payment will be made for excavation or backfill

ITEM 207M - MECHANICAL PLUG  
ITEM 207M-1 - SANITARY SEWER  
ITEM 207M-2 - WATER MAIN

1. Description. Under this item, the Contractor shall excavate to expose existing pipes, plug the pipes as described below, and backfill the excavation site. This item shall be used for plugging existing water mains that are active and under pressure, and designated sewer pipe, so that removal is possible for cleaning of the pipe.
2. Materials and Construction Details.
  - A. Sewer Pipes. The Contractor shall supply a water-tight, mechanical plug of the size required in the plans.
  - B. Water Main. The Contractor shall supply mechanical joint plugs, with a pressure rating of 250 psi, of the size required to stop any future flow of water. Thrust blocks and/or restraining joints shall be used as required and paid for under this item.
  - C. Excavation and Backfill – shall be done in accordance with the specifications for Item 5 – Trench Excavation.
3. Basis of Payment. Payment will be made at the unit price bid for the plugging of each pipe according to the plans and specifications. The unit price bid shall include the cost of plugging both sides of any cut at a given location including all excavation, labor, materials and equipment necessary. No payment shall be made under this item when trench excavation and backfill has been paid for under Item 5, i.e., when a pipe to be plugged is located in the same trench as excavation for a proposed new water main.

ITEM 207 – PLUG PIPE

1. Description. Under this item, the Contractor shall excavate to expose existing pipes, plug the pipes as described below, and backfill the excavation site. This item shall be used for plugging of both existing sewer lines and water mains.
2. Materials and Construction Details.
  - A. Sewer Pipes – the contractor shall plug the existing sewer pipes with Grade A concrete blocks or concrete bricks conforming to ASTM C-55 set in mortar. Mortar shall consist of one part masonry cement and two parts mortar sand, mixed to a stiff, plastic consistency showing no signs of free water. All voids between bricks and the wall of the pipe shall be filled with mortar so that no water can pass through the pipe.
  - B. Water Mains – the contractor shall properly cut or disconnect at the joint existing cast iron water main pipe at the locations shown so that cast iron plugs or caps of the appropriate size may be inserted to stop any future flow of water. Where thrust from water pressure is a factor, either restraining joint plugs or thrust blocking may be used. Both sides of the cut in the abandoned pipe must be plugged at each location.
  - C. Excavation and Backfill – shall be done in accordance with the specifications for Item 5 – Trench Excavation.
3. Basis of Payment. Payment will be made at the unit price bid for the plugging of each pipe according to the plans and specifications. The unit price bid shall include the cost of plugging both sides of any cut at a given location, including all excavation and backfill, labor, materials, and equipment necessary. No payment shall be for trench excavation and backfill when a pipe to be plugged is located in the same trench as excavated for a proposed new pipe.

ITEM 209 - SEDIMENT & EROSION CONTROL

1. General. This work shall consist of furnishing, installing, maintaining, and removing temporary erosion and sediment control measures as shown on the contract documents or as ordered by the Engineer during the life of the contract to control soil erosion sediment and water pollution.

This work shall be coordinated with any permanent erosion and sediment control features specified elsewhere in the contract documents to assure effective and continuous soil erosion, sediment and water pollution control throughout the construction and post construction period.

A. Section Includes:

1. Installation of sedimentation and erosion control barriers.
2. Installation of erosion control fabric.
3. Anchoring topsoil and granular fill stockpiles with straw mulch and ringing with sediment barriers.
4. Protection of catchbasins with sediment barriers or catchbasin sediment trap.
5. Inspection of all erosion measures after each rainfall and at least daily during prolonged rainfall.
6. Repairing immediately any failed sedimentation and erosion control device.
7. Removing and disposing sediment deposits in a manner that does not result in additional erosion or pollution.
8. Removal of sediment barriers or catchbasin sediment traps after completion of contraction and permanent stabilization of erosion.
9. Installation of Turbidity Curtains.

B. Performance Requirements:

1. Observe government policy established by United States Environmental Protection Agency (USEPA) Memorandum 78-1 and Federal NPDES.
2. Observe requirements set forth by the Federal Highway Administration Task Force 25.
3. Conform all erosion and sedimentation control measures to "New York Guidelines for Urban Erosion and Sediment Control" published by USDA Soil Conservation Service.
4. Conform all erosion and sediment control measures to the New York State Storm Water Management Design Manual.
5. Conform all erosion and sedimentation control measures of the State of New York requirements SPDES (GP-83-06) and (SWPPP).

6. Temporary erosion and sediment control measures shall be installed as the first step in construction and shall not be removed until permanent cover is completely established and stabilized.
7. The Contractor will be required to submit a Storm Water Pollution Control Plan showing how the Contractor plans to implement the sediment and erosion control measures. The plan shall be approved by the City Engineer, prior to start of any work.
8. The Contractor is to obtain the New York State Department of Environmental Conservation Sediment and Erosion Control Measures Manual. All sediment and erosion control measures shall conform to the plans and details used in this manual.

C. Storm Water Pollution Prevention Plans (SWPPP) and Schedule:

1. Taking into account specific constraints or other criteria outlines herein, the Contractor shall prepare a detailed schedule which sets forth his program of operations to effectively control erosion and sediment-runoff at all times during construction and during the one-year guarantee period following completion of the work.
  - a. Four copies of the schedule shall be submitted to the Engineer for review.
  - b. At least one copy shall be kept at the project site at all times, and shall be made available for examination by authorized representatives of the regulatory agencies having jurisdiction over the project and the public.

The Storm Water Pollution Prevention Plans shall clearly state how each affected watercourse, catchbasin or storm sewer inlet will be protected from silt or laden runoff for the duration of the contract. Either a sediment barrier or a catchbasin sediment trap shall be utilized in each case, unless the contract proposes an alternate method of protection.

- c. The Storm Water Pollution Prevention Plans and schedule shall be arranged so as to include:
  1. Chronological completion dates for each temporary (and permanent) measure for controlling erosion and sediment.
  2. Location, type and purpose for each temporary measure to be undertaken.

3. Dates when those temporary measures will be removed.

2. Material and Products

- A. Materials:

1. Straw Bales - Shall be securely tied and measure 14-inches by 18-inches by 30-inches long or greater. Loose or broken bales will not be accepted.
    2. Silt Fence
      - a. Propex - Silt stop, Mirafit 100X or equal meeting the physical and mechanical requirement of FHA Task Force 25 specification guide for temporary silt fence.
      - b. Silt fence shall be constructed using fence posts and wire fence or prefabricated units in accordance with New York guidelines for urban and sediment control.
    3. Stakes and Fasteners
      - a. Shall be two #3 rebar or two 2" x 2" hardwood stakes for each hay/straw bale or sediment trap, minimum length 3-feet.
      - b. Posts for silt fence shall be wood, or synthetic posts may be used. Softwood post shall be 1½" x 3½" x 48"; hardwood post shall be at least 2" x 2" x 48".
    4. Erosion Control Fabric shall be North American Green Type S75, or Jute Mesh conforming to New York State Department of Transportation Item 713-07, or approved equal.
    5. Catchbasin Sediment Traps shall be siltsack - Atlantic Construction Fabrics or approved equal.
    6. Crushed stone or gravel shall have a thickness of not less than 6" of coarse aggregate material meeting the gradation requirements of size designation #1 or #2 on Table 703-4 of the New York state Standard Specifications dated May 1, 2008
    7. Turbidity Curtain shall be a pre-assembled system, including a geotextile, flotation system, bottom weight, and anchoring and securing mechanism. If assembled in panels, it shall include a secure mechanism for joining panels together.

Geotextiles shall conform to New York State Department of Transportation Item 737-01F Anchorage lines shall be provided of sufficient strength to support the curtain and maintain it in position under normally expected conditions. End anchors shall be provided, with intermediate anchor points (for stakes or anchors) such that unanchored spans do not exceed 100 feet, sufficient to maintain the turbidity curtain in place.

B. Products:

1. Sediment Barriers shall be straw bales or silt fences that will prevent migration of silts and sediment to receiving waters.
2. Seeding and Mulch shall be in accordance with requirements of Item 123-Seeding.

3. Execution

A. General Requirements:

1. The contract drawings do not show all of the necessary control measures to prevent erosion and sedimentation.
  - a. The drawing only shows several techniques such as: straw bales, silt fence details, sediment traps. There are a number of control techniques discussed in this section.
  - b. It is the Contractor's responsibility to design, implement and maintain erosion and sedimentation control measures which effectively prevent accelerated erosion and sedimentation.
2. Earthmoving activities shall be conducted in such a manner as to prevent accelerated erosion and sedimentation.
3. All erosion and sedimentation control measures shall be inspected by the Contractor daily and immediately after periods of rainfall.
  - a. Repair and/or maintenance of sedimentation and erosion control measures will be made as soon as needed.
  - b. The Contractor will be held responsible for the implementation and maintenance of all control measures on this site.
4. Land disturbance shall be kept to a minimum.

- a. Restabilization will be scheduled immediately after any disturbance.
5. Silt fences or straw bales will be installed along the toe of all critical cut and fill slopes.
6. Catchbasins will be protected with silt fences, straw bales or sediment traps throughout the construction sequence and until all disturbed areas are stabilized.
7. Erosion and sedimentation control measures will be installed prior to all construction activities.
8. Sediment removal from control structures shall be the responsibility of the Contractor.
  - a. Sediment shall be disposed of in a manner which is consistent with overall intent of the Storm Water Pollution Prevention Plans and which does not result in additional erosion.
9. The erosion and sedimentation control measures described herein are intended as a general guide for the Contractor.
  - a. It is the Contractor's responsibility to provide any and all work necessary to prevent erosion of soil from the construction site and to provide silt fences, straw bales or other control measures as the need arises during construction.
  - b. If the Contractor's Storm Water Pollution Prevention Plan identifies needed erosion control measures, which are not listed as pay items herein, the Contractor shall submit a request for change order.
10. Remove all sedimentation and erosion control barriers after completion of construction and permanent stabilization of erosion.

B, Silt Fence

1. Excavate at proposed location of silt fence
2. Posts shall be driven into the ground
3. Geotextile and any mesh support (if applicable) shall be placed on the upstream side of the posts. Mesh shall be placed between the geotextile and the posts.
4. The geotextile shall be fastened to each post in no less than 4 locations.

The mesh support shall be fastened to each post at the top, bottom, and two additional evenly spaced locations.

5. Any geotextile or mesh splices necessary for fence erection shall be continuous between two post sections.
6. Geotextile at the bottom of the fence shall be buried in a trench to a depth of 6". The trench shall be back filled with the excavated soil and the soil compacted by tamping.

#### C. Sediment Barriers

1. Sediment barriers shall be used at storm drain inlets; across minor swales and ditches; and at other applications where the structure is of a temporary nature and structural strength is not required. Installation shall be in accordance with the standard details.
  - a. Sediment barriers are temporary berms, diversions, or other barriers that are constructed to retain sediment on-site by retarding and filtering storm runoff. Silt fence or straw bales may be used at the Contractor's option.
2. Recommended Materials and Dimensions
  - a. Straw Bales
    1. Bales should be bound with twine.
    2. Bales should be anchored to the ground with fence posts, wood pickets, or #3 rebar. Two anchors per bale are required.
    3. Bales shall be installed so that runoff cannot escape freely under the bales.
    4. Height - 1.5 feet.  
Width - 1.5 to 3.0 feet.  
Cross Sectional Area Required per Tributary Acre-  
50 square feet.

#### D. Erosion Control Fabric

1. Erosion control fabric shall be used on slopes greater than 10 percent or as ordered by the Engineer. Prior to installation of the erosion control fabric, the underlying layer is to be graded as shown on the drawings.
2. Jute mesh shall be placed without stretching on the freshly prepared surface so that it lays loosely on the soil and in contact with the soil at all points and then rolled or tamped firmly into the soil surface. The upper end of each roll of jute mesh shall be turned down and buried to a depth of

6-inches with the soil firmly tamped against it. Check slots shall be constructed at 50-foot intervals unless otherwise approved. The construction procedure shall consist of placing a fold of jute mesh 6-inches vertically into the ground and tamping soil firmly against it. Jute mesh shall be placed so that all edges shall have a minimum overlap of 6-inches. The ends of rolls shall be placed with the upgrade section on top. Jute mesh shall be held tightly to the soil by staples or wooden pegs driven firmly into the ground. Staples or wooden pegs shall be spaced not more than 3-feet apart along the sides of the jute mesh and at the centerline of drainage ways, and not more than 1-foot apart at roll ends, check slots and other critical areas as determined by the Engineer. Other approved erosion control fabric shall be placed, stapled or pegged as per manufacturer's specifications. Areas of jute mesh and other erosion control materials shall be seeded in accordance with Item 123, except that mulching shall be as directed or approved.

E. Temporary Seeding and Mulch

1. The placement of temporary seeding and mulch shall be performed on disturbed areas where the earthmoving activities will be ceased for a period of more than 45 days and where stockpiles may produce silt laden runoff. No payment shall be made for this item.
  - a. The seeding and mulch shall provide short-term rapid cover for the control of surface runoff and erosion, until permanent vegetation can be established or earthmoving activities can resume. Placement shall be in accordance with Item 123.

F. Sediment Trap

1. Temporary sediment traps shall be used at catchbasin inlets and constructed as detailed in the contract documents. The Contractor shall inspect the sediment trap after each storm event, or at the end of each week. At the time of inspection the Contractor shall:
  - a. Repair the sediment trap as necessary due to water or other damage.
  - b. Remove any sediment deposits which exceed one-half of the design capacity, whichever is less. All sediment deposits shall be disposed of under this item.
2. After the surface area draining into the sediment trap has been stabilized, the Contractor shall remove the installation (accumulated sediment, etc.)

which shall become the property of the Contractor and shall be removed from the site.

3. Stone/block catchbasin barrier inlet protection shall be placed where shown on the plans or as directed by the Engineer in Charge and constructed in accordance with the standard sheets.

G. Turbidity Curtain

1. Systems Requirements.

- a. The curtain height shall provide sufficient slack to allow the top of the curtain to rise to the maximum expected high-water level.
- b. The bottom edge of the curtain shall have a weight system capable of holding the bottom of the curtain down and conforming to the water body, so as to prohibit escape of turbid water under the curtain.
- c. If constructed in panels, panels shall be connected in such a manner as to prevent suspended particles passing through joints. Load lines shall be connected so as to develop the full strength of the line across the joint.
- d. Floatation material shall be arranged so as to be flexible and to provide continuous support.
- e. The floatation and curtain top shall be such as to provide a minimum of 4" of freeboard along the entire length of the curtain, to prohibit escape of turbid water over the top.

2. Installation

- a. The turbidity curtain shall be installed according to the New York State Department of Transportation Standard Sheet 209-6 and the manufacturer's instructions. It shall be placed as close to the site of disturbance as possible without interfering with construction activity.
- b. The fully assembled turbidity curtain shall be prepared for installation by being furled and tied at intervals of 5 feet for the length of the curtain. It shall be placed and secured in the furled condition, then released to allow the bottom edge to sink.

- c. Turbidity curtain shall be placed as nearly as possible parallel to current flow. It shall not be deployed across a flowing water course.
- d. The ends of the installation shall be anchored securely well up the bank. Intermediate anchors of a type and number sufficient of a type and number sufficient to hold the curtain in place under expected conditions shall be placed, and firmly fastened to the top of the curtain assembly. Maximum spacing between anchorage points shall not exceed 100’.

### 3. Inspection and Maintenance

- a. The turbidity curtain shall be inspected daily, with additional monitoring of performance during storms or significant flow events.
- b. Any visible plume of cloudy water passing beyond the curtain from the enclosed construction area shall constitute inadequate performance of the turbidity curtain. The Contractor shall immediately modify, adjust, or repair any portion of the turbidity curtain to correct inadequate performance.
- c. The turbidity curtain shall remain in place until the protected construction activities have ceased and there is no visible contrast between the water being contained and the water body being protected.

### 4. Removal

- a. The turbidity curtain shall be removed in such a way so as to minimize release of sediment.
- b. Sediment behind the curtain may be removed before removal of the curtain, if directed by the Engineer. If so, any resulting turbidity must be allowed to settle before removal proceeds.

### H. Special Conditions

- 1. Prohibited Construction Practices include, but shall not be limited to the following:
  - a. Dumping of spoil material into any stream corridor, any wetlands, any surface waters or at unspecified locations, even with permission of the property owner.

- b. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridors, any wetlands or any surface waters.
  - c. Pumping of silt-laden water from trenches or other excavations into any surface waters, any stream corridors or any wetlands.
  - d. Damaging vegetation adjacent to or outside of the access road or the right-of-way.
  - e. Disposal of trees, brush and other debris in any stream corridors, any wetlands, any surface water or at unspecified locations.
  - f. Permanent or unspecified alteration of the flow line of the stream.
  - g. Open burning of construction project debris.
  - h. During construction, no wet or fresh concrete or leachate shall be allowed to escape into the waters of new York State nor shall washing from concrete trucks, mixers, or other devices be allowed to enter any waters.
2. Defective Devices. Any erosion and sediment control devices which become damaged, clogged or otherwise non-functional shall be immediately replaced by the Contractor, without additional compensation.
3. Adjustment.
- a. If the planned measures do not result in effective control of erosion and sediment runoff to the satisfaction of the regulatory agencies having jurisdiction over the project, the Contractor shall immediately adjust his program and/or institute additional measures so as to eliminate excessive erosion and sediment runoff.
  - b. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor.
  - c. The Contractor shall be required to pay all fines, penalties, etc. assessed against the City of Binghamton, which are a result of the Contractor's non-compliance with this specification.

#### 4. Method of Measurement and Basis of Payment

##### A. General.

1. Where the work to be performed is not attributed to the Contractor's negligence, carelessness or failure to install temporary or permanent controls in accordance with the soil erosion and sediment control plans or as directed by the Engineer, the method of measurement and basis of payment will be as stated herein.

The unit price bid for all work items shall include the cost of furnishing all labor, equipment, and materials necessary to satisfactorily complete and maintain the work shown on the plans or ordered to be performed within the work limit by the Engineer. The price bid will be paid after installation. Contract retainage shall not be paid until the area is permanently stabilized and the temporary control measure is removed.

Temporary control measures that are made necessary by the Contractor's negligence, carelessness or failure to install permanent controls as a part of the work as scheduled or as shown on the plans, shall be ordered by the Engineer to be accomplished and performed by the Contractor at his own expense.

In case of repeated failures on the part of the Contractor to control erosion, pollution and/or siltation, the Engineer reserves the right to employ outside assistance or to use City forces to provide the necessary corrective measures. Such incurred direct costs plus project engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.

On those areas selected by the Contractor outside of the work limits, which include but are not necessarily limited to, borrow pits, haul roads, disposal areas, and storage, maintenance, and batching areas, the temporary control work shall be the responsibility of the Contractor and shall be performed at his expense. No payment will be made under §209 for this work.

##### B. Sediment Barriers

1. The unit price bid per linear foot shall include the cost of furnishing all labor, equipment, and materials necessary to satisfactorily install, maintain, dispose of surplus excavated material and remove the sediment barrier. Any repair or replacement of damaged or defective sediment barrier shall be done at no additional cost to the City.

C. Erosion Control Fabric

1. The unit price bid per square yard shall include the cost of all labor, materials, equipment and incidentals necessary to complete and care for the work, as specified.

D. Catchbasin Sediment Trap – Stone/Block Barrier

1. The unit price bid for each shall include the cost of all labor, equipment, and materials necessary to satisfactorily install, maintain, dispose of surplus excavated material and remove the sediment trap.
2. Payment for work under this specification will be limited to the following items if and when they appear on the itemized proposal.

E. Turbidity Curtain

1. The work will be measured in feet, measured to the nearest whole foot, the turbidity curtain satisfactorily installed or reinstalled.
2. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including redirection barrier and the cost of removal associated with the removal of accumulated sediment.

<u>Item No.</u>	<u>Item</u>	<u>Pay Unit</u>
209-1	Sediment Barriers	L.F.
209-3	Erosion Control Fabric	S.Y.
209-4	Catchbasin Sediment Trap	Each
209-5	Stone/Block Barrier	Each
209-6	Turbidity Curtain	L.F.

ITEM 210 – DUCTILE IRON WATER MAIN, CLASS 52 CEMENT LINED

1. Description. Under this item, the Contractor shall furnish and install ductile iron water main pipe complete with fittings and megalug restraining joints as indicated on the plans or as ordered by the Engineer.
  
2. Applicable Specifications. The following specifications and standards, of the issues listed below but referred hereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:
  - A. American National Standards Institute (ANSI) Standards
 

A21.10	Grey-Iron and Ductile Iron Fittings, 2-inch to 48-inch for Water and other Liquids.
A21.11	Rubber Gasket Joint for Cast-Iron and Ductile Iron Pressure Pipe and Fittings
A21.51	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or other Liquids
  
  - B. American Water Works Association (AWWA) Standards:
 

C219	Bolted Couplings
C600	Installation of Cast Iron Water Lines
C651	Disinfecting Water Mains
  
  - C. Federal Specifications
 

0-C-114	Calcium Hypochlorite and Chlorinated Lime
0-S-5-2	Sodium Hypochlorite
BB-C-120	Chlorine

All specifications listed above shall be year of latest revision.

3. Materials.
  - A. All pipe and accessories shall be new and unused. The pipe shall be ductile iron, thickness Class 52, conforming to ANSI Standard A21.11 and A21.51. In addition, the pipe shall be furnished with push-on joints for 24-inch and less diameter pipes, and mechanical joints for pipe larger than 24-inch diameter. Pipe and fittings shall be furnished with cement mortar lining conforming to ANSI Standard A21.4. Pipe shall be supplied in nominal 18-foot lengths. Bronze wedges (2 each) shall be used at each slip joint as directed by the Engineer.
  
  - B. Specials and Fittings: Specials and fittings shall be cast or ductile iron, Rated for 250 psi with a Class 125 bolt pattern, conforming to ANSI Standard A21.10.

Joints shall be mechanical conforming to ANSI Standard A21.11 provided with sufficient quantities of accessories and assembled in strict accordance with the recommendations of the manufacturer, as interpreted by the Engineer. Rubber gaskets shall be used for all mechanical joints. Specials and fittings shall be cement-lined in accordance with ANSI A21.4.

Ductile iron mechanical joint restraint shall be incorporated into the design of the mechanical joint follower gland. The restraint shall be Series 1100 (ductile iron/mechanical joint) or Series 1700 (ductile iron/push-on) as manufactured by EBAA Iron or approved equal. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The mechanical joint restraint shall be able to deflect up to 3 degrees for sizes 12" and less; 2 degrees for 14" and 16" sizes and 1-½ degrees for sizes 18" through 24".

Megalug joint restraints shall be installed following all manufacturer's installation procedures. Joints to be used at all horizontal bends, valves, reducers, dead ends, fire hydrant laterals, vertical offsets, and tees. Restraints to be used on each joint of the fitting. Install a full length of pipe on each side of fittings. If a nipple is required, install nipple a full length of pipe away from fitting, or the joints at the nipple shall require restraints.

Concrete thrust blocks shall be required on all plugs and behind tapping valves and sleeves.

The joint restraint ring and its wedging components shall be cast from grade 60-42-10 ductile iron conforming to ASTM A536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. The mechanical joint restraint and wedging components shall be domestically cast within the United States; foreign manufacture will not be acceptable or products from manufacturers with less than 10 years of field experience will not be acceptable.

Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges and to draw up the follower gland uniformly around the pipe. The mechanical joint restraints shall have a rated working pressure of 350 PSI in sizes 16" and smaller and 250 PSI for sizes from 18" through 48". The mechanical joint restraints shall be listed by Underwriters Laboratories up through 24" in size and approved by Factory Mutual up through 12" size.

- C. Bolted Couplings: couplings shall be of the "Stab Fit" type, allowing installation without dismantling. Couplings shall be of the "Wide Range" type, allowing connection of different material pipe. Couplings shall be built in accordance with

AWWA Standard C219, with a minimum working pressure of 230 psi. Bolts shall be either stainless steel or zinc plated and coated with Rislant Nylon 11. Other metal parts shall be coated with either Rislant Nylon 11 or a high-grade corrosion resistant epoxy coating. Acceptable products are as follows:

1. Dresser Style 262 "HYMAX" Couplings by Dresser Co.
2. "Maxifit" Couplings by Viking Johnson Co.
3. An approved equivalent.

- D. Pipe Hangers, Support, Sleeves and Accessories: hangers will support a minimum load of 750 pounds and also will not work loose by rapid and repeated oscillation or mechanical vibration. Power activated tools shall be of the low velocity, controlled penetration type. Hanger rods shall be height adjustable clevis type, mild, low carbon steel, fully threaded or threaded at each end, with two (2) removable nuts at each end for the positioning rod and hanger, and locking each in place.

Space hanger or supports for horizontal piping on maximum centers of twelve feet (12') for the three-inch (3") pipe. Reduce hanger spacing and if necessary provide intermediate supports where necessary. Rod size for pipe hanger single rod to be 7/8-inch diameter.

For directional changes: Install a hanger close to the point of change of all horizontal pipe runs.

Paint all black steel or iron pipe hangers, rods, inserts, brackets and accessories for supporting piping systems with an approved rust preventative paint. Paint black steel hanger rods, threaded on the job site, with red lead or zinc chromite immediately after installation.

Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.

Pipe sleeves shall be Schedule 40. Steel pipe sleeve to be sealed at opening with waterstop cement.

- E. Inspection and Testing: All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications under which the material is manufactured.

The Contractor shall furnish the Engineer with documentation from the manufacturer certifying that the materials meet the above requirements and that all specified tests were completed at the foundry.

4. Installation. The Contractor shall install and be responsible for the location of pipe, pipe hangers, pipe supports, sleeves and accessories required by the work. Render the annular space, between bare and insulated piping and sleeve by packing the space between the pipe and sleeve with segmented rubber seals. Install sleeves of length as required so as to be equal in length to thickness of wall or floor. Hangers and supports for horizontal piping shall not exceed twelve feet.

Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four (4) nuts are required for each rod, two at upper hanger and two at hanger.

Support vertical risers of piping system, by means of heavy duty hangers installed close to base of pipe risers, and by distance between clamps not to exceed twenty-five feet (25'), unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate provisions for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.

Concrete thrust blocks shall be used to restrain all plugs and at tapping valve/sleeves.

Thrust blocks shall be constructed in accordance with the details shown on the plans or as ordered by the Engineer. Rods, clamps, and other fittings shall be as specified on the plans and payment will be included in the price bid for ductile iron water mains. In the event that joints must be made to existing bell and spigot pipes, hydrants or valves, such joints shall be lead joints (or approved alternatives) made in accordance with American Water Works Association Standards.

5. Leakage Tests. After the water mains and all appurtenances have been installed they shall be given a hydrostatic pressure test of 50 psi greater than the anticipated working pressure, but not less than 100 psi. The test shall last at least one hour. The Contractor shall prepare a written log of pressure tests stating the locations tested and results. He shall deliver a copy to the Engineer or his representative at the end of each day of testing.

Leakage shall not exceed 25 US gallons per 24 hours per mile per inch of nominal diameter. No adjustments of the allowable leakage will be made because of the length of pipe or number of joints used.

Should leakage exceed the specified limits, the Contractor shall locate and repair the leaks and re-test the line until it meets the specified limits. The contractor shall furnish all material, labor and equipment necessary to test lines, including pumps, gauges and water. He shall make provisions to bleed the pressure off slowly after the test has been completed.

6. Sterilization. After the water main and all appurtenances have been installed and have been satisfactorily pressure tested, they shall be sterilized.

Sterilization shall be accomplished as described below, or by the Continuous Feed Method System described in AWWA C601. The amount of chlorine applied shall provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced to the water lines and distribution system in a manner approved by the Engineer. Use of tablets will not be permitted. The lines shall be thoroughly flushed before introduction of the chlorinating materials. After a contact period of not less than 24 hours, the system shall be flushed with clean water until the residual chlorine content is no greater than 0.5 parts per million greater than the water being used for flushing. All valves in the lines being sterilized shall be opened and closed several times during the contact period. After flushing, samples of water shall be taken from each section of main and an analysis made to determine the purity of the water. Testing for purity shall be by a laboratory approved by the New York State Department of Health for the analysis of potable water. Any section of the main not meeting the New York State Department of Health standard for purity shall be re-chlorinated and tested until acceptable. The results of the tests shall be given to the Engineer. All costs for water purity tests shall be paid by the Contractor. The City of Binghamton will provide water for sterilization and flushing at connections to existing supply lines.

7. Method of Measurement. The length to be paid for under this item shall be the measurement along the centerlines of the various sizes of pipe furnished and installed, from center of fitting to center of fitting.
8. Basis of Payment. Payment will be made for mains at the contract unit price per linear foot for the various sizes of pipe. The thrust blocks, tie rods, mechanical joint restraints, and fittings, complete in place. Payment shall include the furnishing and installation of all hangers, supports, sleeves, coring and accessories necessary to complete the work.

Payment for work under this section will be on the following items if, and when they appear on the itemized proposal.

Item	Description	Pay Unit
210-6	6-Inch Ductile Iron Water Main	L.F.
210-8	8-Inch Ductile Iron Water Main	L.F.
210-12	12-Inch Ductile Iron Water Main	L.F.
210-16	16-Inch Ductile Iron Water Main	L.F.
210-24	24-Inch Ductile Iron Water Main	L.F.
210-24A	24-Inch Ductile Iron Sanitary Sewer	L.F.

ITEM 210 - WATER MAIN

1. Description. Under this item, the Contractor shall furnish and install water main pipe complete with fittings and megalug restraining joints as indicated on the plans or as ordered by the Engineer.
2. Applicable Specifications. The following specifications and standards of the issues listed below, but referred hereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

The following materials are acceptable for use for water mains:

A. Ductile Iron Water Pipe - Pressure Class

1. Materials - Ductile iron water pipe, fitting and encasement shall conform to the requirements of the following: See Table 1 for Pressure Class

**TABLE 1 Standard Dimensions and Weights of Push-On Joint Ductile-Iron Pipe\***

Pipe Size <i>in.</i>	Pressure Class	Thickness <i>in.</i>	OD <i>in.</i>	Weight of Barrel per Foot <i>lb</i>	Weight of Bell‡ <i>lb</i>	18-ft Laying Length		20-ft. Laying Length	
						Weight Per Length§ <i>lb</i>	Average Weight per Foot** <i>lb</i>	Weight per Length§ <i>lb</i>	Average Weight per Foot** <i>lb</i>
3	350	0.25	3.96	8.9	7.0	165	9.3	185	9.2
4	350	0.25	4.80	10.9	9.0	205	11.4	225	11.3
6	350	0.25	6.90	16.0	11.0	300	16.6	330	16.6
8	350	0.25	9.05	21.1	17.0	395	22.0	440	22.0
10	350	0.26	11.10	27.1	24.0	510	28.4	565	28.3
12	350	0.28	13.20	34.8	29.0	655	36.4	725	36.3
14	250	0.28	15.30	40.4	45.0	770	42.9	855	42.7
	300	0.30	15.30	43.3	45.0	825	45.8	910	45.6
	350	0.31	15.30	44.7	45.0	850	47.2	940	47.0
16	250	0.30	17.40	49.3	54.0	940	52.3	1,040	52.0
	300	0.32	17.40	52.5	54.0	1,000	55.5	1,105	55.2
	350	0.34	17.40	55.8	54.0	1,060	58.8	1,170	58.5
18	250	0.31	19.50	57.2	59.0	1,090	60.5	1,205	60.2
	300	0.34	19.50	62.6	59.0	1,185	65.9	1,310	65.6
	350	0.36	19.50	66.2	59.0	1,250	69.5	1,385	69.2
20	250	0.33	21.60	67.5	74.0	1,290	71.6	1,425	71.2
	300	0.36	21.60	73.5	74.0	1,395	77.6	1,545	77.2
	350	0.38	21.60	77.5	74.0	1,470	81.6	1,625	81.2
24	200	0.33	25.80	80.8	95.0	1,550	86.1	1,710	85.6

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	250	0.37	25.80	90.5	95.0	1,725	95.8	1,905	95.3
	300	0.40	25.80	97.7	95.0	1,855	103.0	2,050	102.5
	350	0.43	25.80	104.9	95.0	1,985	110.2	2,195	109.7
30	150	0.34	32.00	103.5	139.0	2,000	111.2	2,210	110.5
	200	0.38	32.00	115.5	139.0	2,220	123.2	2,450	122.5
	250	0.42	32.00	127.5	139.0	2,435	135.2	2,690	134.5
	300	0.45	32.00	136.5	139.0	2,595	144.2	2,870	143.5
	350	0.49	32.00	148.4	139.0	2,810	156.1	3,105	155.3

Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water:	AWWA C104 / ANSI A21.4
Ductile Iron and Gray Iron Fittings:	AWWA C110 / ANSI A21.10
Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings:	AWWA C111 / ANSI A21.11
Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges:	AWWA C115 / ANSI A21.15
Thickness Design of Ductile-Iron Pipe (See Table I)	AWWA C150 / ANSI A21.50
Ductile-Iron Pipe, Centrifugally Cast, for Water:	AWWA C151 / ANSI A21.51
Ductile-Iron Compact Fittings for Water Service:	AWWA C153 / ANSI A21.53

American Water Works Association (AWWA) Standards:

- C219 Bolted Couplings
- C600 Installation of Cast Iron Water Lines
- C651 Disinfecting Water Mains

Federal Specifications:

- 0-C-114 Calcium Hypochlorite and Chlorinated Lime
- 0-S-5-2 Sodium Hypochlorite
- BB-C-120 Chlorine

3. Pipe shall be furnished with push-on joints for 24" and less diameter pipes, and mechanical joints for pipe larger than 24" diameter. Pipe and fittings shall be furnished with cement mortar lining.

Pipe shall be supplied in nominal 18 or 20 foot lengths. Bronze wedges (2 each) shall be used at each slip joint as directed by the Engineer.

4. Special fittings: Specials and fittings shall be cast or ductile iron, Rated for 250 psi with a Class 125 bolt pattern, conforming to ANSI Standard A21.10. Joints shall be mechanical conforming to ANSI Standard A21.11 provided with sufficient quantities of accessories and assembled in strict accordance with the recommendations of the manufacturer, as interpreted by the Engineer. Rubber gaskets shall be used for all mechanical joints. Specials and fittings shall be cement-lined in accordance with ANSI A21.4.

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Ductile iron mechanical joint restraint shall be incorporated into the design of the mechanical joint follower gland. The restraint shall be Series 1100 (ductile iron/mechanical joint) or Series 1700 (ductile iron/push-on) as manufactured by EBAA Iron or approved equal. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-outs as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The mechanical joint restraint shall be able to deflect up to 3 degrees for sizes 12" and less; 2 degrees for 14" and 16" sizes and 1-1/2 degrees for sizes 18" through 24".

Megalug joint restraints shall be installed following all manufacturer's installation procedures. Joints to be used at all horizontal bends, valves, reducers, dead-ends, fire hydrant laterals, vertical offsets, and tees. Restraints are to be used on each joint of the fitting. Install a full length of pipe on each side of fittings. If a nipple is required, install nipples a full length of pipe away from fitting, or the joints at the nipple shall require restraints.

Concrete thrust blocks shall be required on all plugs and behind tapping valves and sleeves.

The joint restraint ring and its wedging components shall be cast from grade 60-42-10 ductile iron conforming to ASTM A536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 360 BHN. Dimensions of the gland shall be such that it can be used with standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. The mechanical joint restraint and wedging components shall be domestically cast within the United States; foreign manufactures will not be acceptable or products from manufactures with less than 10 year of field experience will not be acceptable.

Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges and to draw up the follower gland uniformly around the pipe. The mechanical joint restraints shall have a rated working pressure of 350 psi in sizes 16" and smaller and 250 psi for sizes from 18" through 48". The mechanical joint restrains shall be listed by Underwriters Laboratories up through 24" in size and approved by Factory Mutual up through 12" size.

5. Bolted Couplings: Couplings shall be of the "Stab Fit" type, allowing installation without dismantling. Couplings shall be of the "Wide Range" type, allowing connection of different material pipe. Couplings shall be built in accordance with AWWA Standard C219, with a minimum working pressure of 230 psi. Bolts shall be either stainless steel or zinc plated and coated with Rislun Nylon 11. Other metal parts shall be coated with either Rislun Nylon 11 or a high-grade corrosion resistant epoxy coating. Acceptable products area as follows:

- A, Dresser Syte 262 "HYMAX" Couplings by Dresser Co.  
 "Maxifit" Couplings by Viking Johnson Co.  
 An approved equivalent
6. Basis of Acceptance: Ductile iron water pipe and fittings will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification for iron fittings shall list a fitting description, quantity, care fitting weight and source (AWWA Standard C110, C153 or manufacturer, if a fitting is not listed in either standard). The certification shall accompany the material delivered to the project site.

### **Unplasticized Polyvinyl Chloride Water Pipe Fittings and For PVC Pipe**

Materials: Plastic water pipe shall conform to the requirements of the following:

Pressure Class 150-DR18	
Polyvinyl Chloride (PVC) Pressure Pipe for Water Distribution:	AWWA C900
Polyvinyl Chloride (PVC) Pressure Pipe for Water Transmission and Distribution:	AWWA C905
Polyethylene Water Pipe for Water Distribution and Transmission:	AWWA C906
PVC Self-Tapping Saddle Tees for Use on PVC Pipe:	AWWA C908
Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe:	AWWA C909

### **American Society for Testing and Materials (ASTM) Standards:**

Standard Specifications for PVC Compounds:	ASTM D1784
Sustained Pressure Test:	ASTM D1598
	ASTM D2241
	ASTM D1599
Gasketed Joint:	ASTM D3139
Joint Gasket:	ASTM F477

### **American Water Works Association (AWWA) Standards:**

Pipe and Couplings:	UL 1285
Disinfecting Water Mains:	C651
	CSA CAN 3-B37.3
Calcium Hypochlorite and Chlorinated Lime:	0-C-114
Sodium Hypochlorite:	0-S-5-2
Chlorine:	BB-C-120
	NSF Standard 14
	NSF Standard 61
Coated Tracing Wire:	Provide Electrical Connectivity

All specifications listed above shall be year of latest revision.

1. All pipe and accessories shall be new and unused. The pipe shall be unplasticized polyvinyl chloride, thickness Class 12454-B, conforming to AWWA C900. In addition, the pipe shall be furnished with joints and gaskets. Pipe shall be supplied in nominal 20-foot lengths.
2. Special Fittings. Special fittings shall be cast iron, Class 250, conforming to ANSI Standard A21.10. Joints shall be mechanical conforming to ANSI Standard A21.11 provided with sufficient quantities of accessories and assembled in strict accordance with the recommendations of the manufacturer, as interpreted by the Engineer. Rubber gaskets shall be used for all mechanical joints. Appurtenances shall be supported by a concrete cradle or concrete block. Weight shall not be carried by PVC pipe. Connections to be made using elastomeric gasket.

PVC mechanical joint restraint shall be incorporated into the design of the mechanical joint follower gland. The restraint shall be Series 1600 (PVC/Push-On Joint) as manufactured by EBAA Iron, or approved equal. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The mechanical joint restraint shall be able to deflect up to 3 degrees for sizes 12" and less, 2 degrees for 14" and 16" sizes; and 1-1/2 degrees for sizes 18" through 24".

Megalug joint restraints shall be installed following all manufacturer's installation procedures. Joints to be used at all horizontal bends, valves, reducers, dead ends, fire hydrant laterals, vertical offsets, and tees. Restraints to be used on each joint of the fitting. Install a full length of pipe on each side of fittings. If nipple is required, install nipple a full length of pipe away from fitting, or the joints at the nipple shall require restraints.

Concrete thrust blocks shall be required on all plugs and behind tapping valves and sleeves. The joint restraint ring and its wedging components shall be cast from grade 60-42-10 ductile iron conforming to ASTM A536-84.

The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. The mechanical joint restraint and wedging components shall be domestically cast within the United States; foreign manufacturers will not be acceptable or products from manufacturers with less than 10 years of field experience will not be acceptable.

Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges and to draw up the follower gland uniformly around the pipe. The mechanical

joint restraints shall have a rated working pressure of 350 psi in sizes 16" and smaller, and 250 psi for sizes from 18" through 48". The mechanical joint restraints shall be listed by Underwriters Laboratories up through 24" in size and approved by Factory Mutual up through 12" size.

3. Bolted Couplings. Couplings shall be of the "Stab Fit" type, allowing installation without dismantling. Couplings shall be of the "Wide Range" type, allowing connection of different material pipe. Couplings shall be built in accordance with AWWA Standard C219, with a minimum working pressure of 230 psi. Other metal parts shall be coated with either Rislant Nylon 11 or a high-grade corrosion resistant epoxy coating. Acceptable products are as follows:
  - A. Dresser Style "HYMAX" couplings by Dresser Co.
  - B. "Maxifit" couplings by Viking Johnson Co.
  - C. An approved equivalent
4. Basis of Acceptance. Plastic water pipe and fittings will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The City reserves the right to sample and test this material subsequent to delivery at the project site.

3. Inspection and Testing. All pipe and fittings shall be inspected and tested at the manufacturing plant as required by the standard specifications under which the material is manufactured. The Contractor shall furnish the Engineer with documentation from the manufacturer certifying that the materials meet the above requirements and that all specified tests were completed at the plant.
4. General Construction.
  - A. Construction Details. Pipe shall be placed in accordance with these specifications, the plans, and applicable standard sheets. Pipe shall be installed in accordance with the manufacturer's recommendations. All pipes shall be laid true to line and grade and shall have a full, firm, and even bearing. Excavation, bedding and backfilling shall be in accordance with their respective items. Backfilling around pipe shall be done in such a way that deformation is kept to a minimum. This can be accomplished by backfilling and compacting sides of pipe equally before compacting top of pipe.
  - B. Pipe Hangers, Support, Sleeves and Accessories. Hangers will support a minimum load of 750 pounds and also will not work loose by rapid and repeated oscillation or mechanical vibration. Power activated tools shall be of the low velocity, controlled penetration type. Hanger rods shall be height adjustable clevis type, mild, low carbon steel, fully threaded or threaded at each ends, with

two (2) removable nuts at each end for the positioning rod and hanger, and locking each in place.

Space hanger or supports for horizontal piping on maximum centers of twelve feet (12') for the three-inch (3") pipe. Reduce hanger spacing and, if necessary, provide intermediate supports where necessary. Rod size for pipe hanger single rod to be 7/8-inch diameter.

For directional changes, install a hanger close to the point of change of all horizontal pipe runs.

Paint all black steel or iron pipe hangers, rods, inserts, brackets and accessories for supporting piping systems with an approved rust preventative paint. Paint black steel hanger rods, threaded on the job site, with red lead or zinc chromite immediately after installation.

Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.

Pipe sleeves shall be Schedule 40. Steel pipe sleeve to be sealed at opening with waterstop cement.

- C. Installation. The Contractor shall install and be responsible for the location of pipe, pipe supports, sleeves and accessories required by the work. Render the annular space, between bare and insulated piping and sleeve by packing the space between the pipe and sleeve with segmented rubber seals. Install sleeves of length as required so as to be equal in length to thickness of wall or floor.
1. Concrete thrust blocks shall be used to restrain all plugs at tapping valve/sleeves.  
Thrust blocks shall be constructed in accordance with the details shown on the plans or as ordered by the Engineer. Rods, clamps and other fittings shall be as specified on the plans and payment will be included in the price bid for water mains. In the event that joints must be made to existing bell and spigot pipes, hydrants or valves, such joints shall be lead joints or approved alternatives made in accordance with American Water Works Association standards.
  2. Plastic water pipe shall be installed with a coated tracing wire placed full length above the pipe to facilitate location. A portion of the wire shall be stripped and firmly connected to valves, hydrants, corporation stop and curb stops to provide electrical connectivity.
- D. Bedding. Water main pipe shall be installed with bedding providing uniform longitudinal support under the pipe. Backfill shall be worked under pipe to

provide haunching. Initial backfill material shall be placed to a minimum depth of 6" over top of pipe. Initial pipe embedment material shall be compacted and inspected by Engineer prior to placement of final backfill material.

Pipe embedment material shall be free of frozen lumps and debris. Ductile Iron Water Main bedding shall be Item 2X-1. PVC Water Main bedding shall be Item 2X-1A.

E. Leakage Tests. Refer to Allowable Leakage Table - Table 2.

After the water mains and all appurtenances have been installed, the new system shall be given a hydrostatic pressure test of 1.5 times the normal operating pressure or 150 psi whichever is greater. The test shall last at least one hour. The Contractor shall prepare a written log of pressure tests stating the locations tested and results. The Contractor shall deliver a copy to the Engineer or his representative at the end of each day of testing.

No adjustments of the allowable leakage will be made because of the length of pipe or number of joints used.

Should leakage exceed the specified limits, the Contractor shall locate and repair the leaks and re-test the line until it meets the specified limits. The Contractor shall furnish all material, labor, and equipment necessary to test lines, including pumps, gauges and water. The Contractor shall make provisions to bleed the pressure off slowly after the test has been completed.

**Table 2 - HYDROSTATIC TESTING ALLOWANCE PER 1,000 FT. OF PIPELINE -**  
**gph†**

Avg. Test Pressure <i>psi</i>	Nominal Pipe Diameter - <i>in.</i>											
	3	4	6	8	10	12	14	16	18	20	24	30
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90
275	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38
200	0.32	0.42	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76

\* If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.

F. Sterilization. After the water main and all appurtenances have been installed and have been satisfactorily pressure tested, they shall be sterilized.

Sterilization shall be accomplished as described below, or by the continuous Feed Method System described in AWWA C601. The amount of chlorine applied shall provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced to the water lines and distribution system in a manner approved by the Engineer. Use of tablets will not be permitted. The lines shall be thoroughly flushed before introduction of the chlorinating materials. After a contact period of not less than 24-hours, the system shall be flushed with clean water until the residual chlorine content is no greater than 0.5 parts per million greater than the water being used for flushing. All valves in the lines being sterilized shall be opened and closed several times during the contact period.

Bacteriological Tests. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main and an analysis made to determine the purity of the water. At least one set of samples shall be collected from every 1000 ft. of the new water main, plus one set from the end of the line and at least one set from each branch. Testing for purity shall be by a laboratory approved by the New York State Department of Health standard for purity.

Redisinfection. If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the new water main may be reflashed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be rechlorinated by the continuous feed or slug method until satisfactory results are obtained.

The results of the tests shall be given to the Engineer. All costs for water purity tests shall be paid by the Contractor. The City of Binghamton will provide water for sterilization and flushing at connections to existing supply lines.

5. Method of Measurement. The length to be paid for under this item shall be the measurement along the centerlines of the various sizes of pipe furnished and installed, from center of fitting to center of fitting.
6. Basis of Payment. Payment will be made for mains at the contract unit price per linear foot for various sizes of pipe. The thrust blocks, tie rods, mechanical joint restraints, and fittings, complete in place, shall be included. Payment shall include the furnishing and installation of all hangers, supports, sleeves, coring and accessories necessary to complete the work.

Payment for work under this specification will be on the following items if and when they appear on the itemized proposal.

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
210-4	4-Inch Water Main	L.F.
210-6	6-Inch Water Main	L.F.
210-8	8-Inch Water Main	L.F.
210-10	10-Inch Water Main	L.F.
210-12	12-Inch Water Main	L.F.
210-16	16-Inch Water Main	L.F.
210-24	24-Inch Water Main	L.F.

ITEM 210PR – PRESSURE REDUCING PIT

1. Description. Under this item, the Contractor shall install a pressure reducing valve pit with necessary pressure reducing valves, piping and fittings, gate valves, air release valve, two (2) 1-inch taps with 1-inch valve, and manhole casting, as shown on the plans or as called for in these specifications. Pressure reducing valve pit shall be built of concrete and precast concrete.
2. Materials.
  - A. Pressure reducing valve pit shall have a compressive strength of 4000 psi and shall conform to the requirements of the New York State Department of Transportation Standard Specifications for Class A concrete. “O” ring joints shall meet ASTM Specification No. 443.
  - B. Gate valves shall be resilient seated gate valves, mechanical joint, iron bodied, bronze mounted valves with non-rising stems and hand wheel operated. Valves shall be opened by turning clockwise. Valves shall have a minimum working pressure of 250 psi. All resilient seated gate valves shall conform to AWWA Standard C509, with “O” ring stem seals.
  - C. Pressure reducing valves shall be hydraulically operated by means of a double-chambered diaphragm actuator. It shall have a wide y-pattern body with low head loss and high resistance to cavitation.

The main valve shall incorporate two pressure chambers, which shall be separated and sealed from each other by means of a flexible nylon fabric reinforced neoprene rubber diaphragm. The lower chamber shall be internally connected to the downstream pressure and incorporate an internal spring. The valve shall have a single removable seat and resilient rubber disc contained on 3½ sides. The valve shall have a V-port throttling port to avoid chatter during low flows. The valve stem shall be center guided by a central “O” ring sealed bearing assembly within an intermediate separating partition. All necessary maintenance operations and repairs shall be possible without having to remove the main valve body from the line. The valve shall have no external packing glands or stuffing boxes. The actuator assembly shall have the capability of being easily removed from the valve body as one complete assembled unit.

The main valve material shall be cast iron ASTM A-126 with flange ends conforming to ANSI B16.1, class 250. The valves shall be coated with a factory applied, oven baked, fusion bonded coating.

The valve shall maintain a constant preset downstream pressure regardless of fluctuations in upstream pressure or flow rate. The pressure reducing pilot shall be a direct acting, adjustable spring-loaded normally open diaphragm valve which closes when downstream pressure exceeds the spring setting. The 2-inch valve

shall be factory set at 35 pounds; the 6-inch valve shall be factory set at 30 pounds. The pilot shall be of bronze construction with stainless steel trim and shall have an adjustable range of 7-200 psi. The valves shall be OCV, or equivalent.

- D. Heavy duty square watertight manhole frame and cover for pressure reducing pit shall be Syracuse Castings Corp. No. 1591, Type 1, or approved Equal.
  - E. The Contractor shall furnish and set an air release valve as shown on the plans. The air release valve shall be one inch in size, APCO Model 143C or equal.
  - F. Four-inch (4") drainage piping shall be SDR-35 PVC.
3. Construction Details. Pressure reducing pit, piping, gate valves, pressure reducing valves, air release valve, and pipe supports shall be installed in accordance with the manufacturer's specifications and instructions, and shall meet all applicable AWWA standards.
4. Method of Measurement. The measurement for payment for the pressure reducing pit shall be for each one completed and installed.
5. Basis of Payment. The unit price bid for this item shall include all labor, equipment, and materials necessary to install the pressure reducing valve pit with sump, watertight manhole casting and cover, 2-inch and 6-inch pressure reducing valves, 2-inch and 6-inch gate valves, 2-inch and 6-inch ductile iron water mains, two (2) 1-inch taps with 1-inch valve, and an air release valve. Sub-base bedding shall be paid for under its respective item.

ITEM 210PVC – PVC WATER MAIN

1. Description. Under this item, the Contractor shall furnish and install unplasticized polyvinyl chloride water main pipe complete with fittings and megalug restraining joints as indicated on the plans or as ordered by the Engineer.
2. Applicable Specifications. The following specifications and standards, of the issues listed below but referred hereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

A. American Society for Testing and Materials (ASTM) Standards:

ASTM D1784                      Standard Specifications for PVC compounds

ASTM D1598  
ASTM D2241 }                      Sustained Pressure Test  
ASTM D1599

ASTM D3139                      Gasketed Joint  
ASTM F477

B. American Water Works Association (AWWA) Standards:

C-900                                      PVC Pressure Pipe  
UL 1285                                  Pipe and Couplings  
C651                                        Disinfecting Water Mains

C. Federal Specifications

0-C-114                                  Calcium Hypochlorite and Chlorinated Lime  
0-S-5-2                                  Sodium Hypochlorite  
BB-C-120                                Chlorine  
NSF Stand 14                            NSF Stand 16

All specifications listed above shall be year of latest revision.

3. Materials.

- A. All pipe and accessories shall be new and unused. The pipe shall be unplasticized polyvinyl chloride, thickness Class 12454-B, conforming to AWWA C900. In addition, the pipe shall be furnished with joints and gasket. Pipe shall be supplied in nominal 20-foot lengths.
- B. Specials and Fittings: Specials and fittings shall be cast iron, Class 250, conforming to ANSI Standard A21.10. Joints shall be mechanical conforming to ANSI Standard A21.11 provided with sufficient quantities of accessories and

**1<sup>ST</sup> EDITION**

assembled in strict accordance with the recommendations of the manufacturer, as interpreted by the Engineer. Rubber gaskets shall be used for all mechanical joints. Appurtenances shall be supported by a concrete cradle or concrete block. Weight shall not be carried by PVC pipe. Connections to be made using elastomeric gasket.

PVC mechanical joint restraint shall be incorporated into the design of the mechanical joint follower gland. The restraint shall be Series 1600 (PVC/Push-on Joint) as manufactured by EBAA Iron or approved equal. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The mechanical joint restraint shall be able to deflect up to 3 degrees for sizes 12-inch and less; 2 degrees for 14-inch and 16-inch sizes; and 1½ degrees for sizes 18-inch through 24-inch.

Megalug joint restraints shall be installed following all manufacturer's installation procedures. Joints to be used at all horizontal bends, valves, reducers, dead ends, fire hydrant laterals, vertical offsets, and tees. Restraints to be used on each joint of the fitting. Install a full length of pipe on each side of fittings. If a nipple is required, install nipple a full length of pipe away from fitting, or the joints at the nipple shall require restraints.

Concrete thrust blocks shall be required on all plugs and behind tapping valves and sleeves. The joint restraint ring and its wedging components shall be cast from grade 60-42-10 ductile iron conforming to ASTM A536-84.

The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. The mechanical joint restraint and wedging components shall be domestically cast within the United States; foreign manufacture will not be acceptable or products from manufacturers with less than 10 years of field experience will not be acceptable.

Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges and to draw up the follower gland uniformly around the pipe. The mechanical joint restraints shall have a rated working pressure of 350 psi in sizes 16-inch and smaller, and 250 psi for sizes from 18-inch through 48-inch. The mechanical joint restraints shall be listed by Underwriters Laboratories up through 24-inch in size and approved by Factory Mutual up through 12-inch size.

- C. Bolted Couplings: Couplings shall be of the "Stab Fit" type, allowing installation without dismantling. Couplings shall be of the "Wide Range" type, allowing connection of different material pipe. Couplings shall be built in accordance with AWWA Standard C219, with a minimum working pressure of 230 psi. Other

metal parts shall be coated with either Rislan Nylon 11 or a high-grade corrosion resistant epoxy coating. Acceptable products are as follows:

1. Dresser Style “HYMAX” Couplings by Dresser Co.
  2. “Maxifit” couplings by Viking Johnson Co.
  3. An approved equivalent
4. Construction Details. Pipe shall be placed in accordance with these specifications, the plans, and applicable standard sheets. Pipe shall be installed in accordance with the manufacturer’s recommendations. All pipe shall be laid true to line and grade and shall have a full, firm, and even bearing. Excavation, bedding and backfilling shall be in accordance with their respective items. Backfilling around pipe shall be done in such a way that deformation is kept to a minimum. This can be accomplished by backfilling and compacting sides of pipe equally before compacting top of pipe.
5. Inspection and Testing. All pipe and fittings shall be inspected and tested at the manufacturing plant as required by the standard specifications under which the material is manufactured. The Contractor shall furnish the Engineer with documentation from the manufacturer certifying that the materials meet the above requirements and that all specified tests were completed at the plant.
6. Installation. The Contractor shall install and be responsible for the location of pipe, pipe supports, sleeves and accessories required by the work. Render the annular space, between bare and insulated piping and sleeve by packing the space between the pipe and sleeve with segmented rubber seals. Install sleeves of length as required so as to be equal in length to thickness of wall or floor.

Concrete thrust blocks shall be used to restrain all plugs at tapping valve/sleeves.

Thrust blocks shall be constructed in accordance with the details shown on the plans or as ordered by the Engineer. Rods, clamps, and other fittings shall be as specified on the plans and payment will be included in the price bid for PVC water mains. In the event that joints must be made to existing bell and spigot pipes, hydrants or valves, such joints shall be lead joints or approved alternatives made in accordance with American Water works Association Standards.

7. Leakage Tests. After the water mains and all appurtenances have been installed they shall be given a hydrostatic pressure test of 50 psi greater than the anticipated working pressure, but not less than 100 psi. The test shall last at least one hour. The Contractor shall prepare a written log of pressure tests stating the locations tested and results. He shall deliver a copy to the Engineer or his representative at the end of each day of testing.

Leakage shall not exceed 25 US gallons per 24 hours per mile per inch of nominal diameter. No adjustments of the allowable leakage will be made because of the length of pipe or number of joints used.

Should leakage exceed the specified limits, the Contractor shall locate and repair the leaks and re-test the line until it meets the specified limits. The contractor shall furnish all material, labor and equipment necessary to test lines, including pumps, gauges and water. He shall make provisions to bleed the pressure off slowly after the test has been completed.

8. Sterilization. After the water main and all appurtenances have been installed and have been satisfactorily pressure tested, they shall be sterilized.

Sterilization shall be accomplished as described below, or by the continuous Feed Method System described in AWWA C601. The amount of chlorine applied shall provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced to the water lines and distribution system in a manner approved by the Engineer. Use of tablets will not be permitted. The lines shall be thoroughly flushed before introduction of the chlorinating materials. After a contact period of not less than 24 hours, the system shall be flushed with clean water until the residual chlorine content is no greater than 0.5 parts per million greater than the water being used for flushing. All valves in the lines being sterilized shall be opened and closed several times during the contact period. After flushing, samples of water shall be taken from each section of main and an analysis made to determine the purity of the water. Testing for purity shall be by a laboratory approved by the New York State Department of Health for the analysis of potable water. Any section of the main not meeting the New York State Department of Health standard for purity shall be re-chlorinated and tested until acceptable. The results of the tests shall be given to the Engineer. All costs for water purity tests shall be paid by the Contractor. The City of Binghamton will provide water for sterilization and flushing at connections to existing supply lines.

9. Method of Measurement. The length to be paid for under this item shall be the measurement along the centerlines of the various sizes of pipe furnished and installed, from center of fitting to center of fitting.
10. Basis of Payment. Payment will be made for mains at the contract unit price per linear foot for the various sizes of pipe. The thrust blocks, tie rods, mechanical joint restraints, and fittings, complete in place, shall be included. Payment shall include the furnishing and installation of all hangers, supports, sleeves, coring and accessories necessary to complete the work.

Payment for work under this section will be on the following items if and when they appear on the itemized proposal.

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
210PVC-2	6-Inch PVC Water Main DR14	L.F.
210PVC-6	8-Inch PVC Water Main DR14	L.F.
210PVC-8	8-Inch PVC Water Main DR14	L.F.

**1<sup>ST</sup> EDITION**

ITEM 210SS – DUCTILE IRON STORM SEWER, CLASS 50

1. Description. Under this item, the Contractor shall furnish and install ductile iron water main pipe complete with fittings and megalug restraining joints as indicated on the plans or as ordered by the Engineer.
2. Applicable Specifications. The following specifications and standards, of the issues listed below but referred hereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:
  - A. American National Standards Institute (ANSI) Standards
 

A21.10	Grey-Iron and Ductile Iron Fittings, 2-inch to 48-inch for Water and other Liquids.
A21.11	Rubber Gasket Joint for Cast-Iron and Ductile Iron Pressure Pipe and Fittings
A21.51	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or other Liquids
  - C. American Water Works Association (AWWA) Standards:
 

C219	Bolted Couplings
C600	Installation of Cast Iron Water Lines
C651	Disinfecting Water Mains
  - C. Federal Specifications
 

0-C-114	Calcium Hypochlorite and Chlorinated Lime
0-S-5-2	Sodium Hypochlorite
BB-C-120	Chlorine

All specifications listed above shall be year of latest revision.

4. Materials.
  - A. All pipe and accessories shall be new and unused. The pipe shall be ductile iron, thickness Class 52, conforming to ANSI Standard A21.11 and A21.51. In addition, the pipe shall be furnished with push-on joints for 24-inch and less diameter pipes, and mechanical joints for pipe larger than 24-inch diameter. Pipe and fittings shall be furnished with cement mortar lining conforming to ANSI Standard A21.4. Pipe shall be supplied in nominal 18-foot lengths. Bronze wedges (2 each) shall be used at each slip joint as directed by the Engineer.
  - B. Specials and Fittings: Specials and fittings shall be cast or ductile iron, Rated for 250 psi with a Class 125 bolt pattern, conforming to ANSI Standard A21.10.

Joints shall be mechanical conforming to ANSI Standard A21.11 provided with sufficient quantities of accessories and assembled in strict accordance with the recommendations of the manufacturer, as interpreted by the Engineer. Rubber gaskets shall be used for all mechanical joints. Specials and fittings shall be cement-lined in accordance with ANSI A21.4.

Ductile iron mechanical joint restraint shall be incorporated into the design of the mechanical joint follower gland. The restraint shall be Series 1100 (ductile iron/mechanical joint) or Series 1700 (ductile iron/push-on) as manufactured by EBAA Iron or approved equal. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The mechanical joint restraint shall be able to deflect up to 3 degrees for sizes 12" and less; 2 degrees for 14" and 16" sizes and 1-1/2 degrees for sizes 18" through 24".

Megalug joint restraints shall be installed following all manufacturer's installation procedures. Joints to be used at all horizontal bends, valves, reducers, dead ends, fire hydrant laterals, vertical offsets, and tees. Restraints to be used on each joint of the fitting. Install a full length of pipe on each side of fittings. If a nipple is required, install nipple a full length of pipe away from fitting, or the joints at the nipple shall require restraints.

Concrete thrust blocks shall be required on all plugs and behind tapping valves and sleeves.

The joint restraint ring and its wedging components shall be cast from grade 60-42-10 ductile iron conforming to ASTM A536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. The mechanical joint restraint and wedging components shall be domestically cast within the United States; foreign manufacture will not be acceptable or products from manufacturers with less than 10 years of field experience will not be acceptable.

Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges and to draw up the follower gland uniformly around the pipe. The mechanical joint restraints shall have a rated working pressure of 350 PSI in sizes 16" and smaller and 250 PSI for sizes from 18" through 48". The mechanical joint restraints shall be listed by Underwriters Laboratories up through 24" in size and approved by Factory Mutual up through 12" size.

- C. Bolted Couplings: couplings shall be of the "Stab Fit" type, allowing installation without dismantling. Couplings shall be of the "Wide Range" type, allowing connection of different material pipe. Couplings shall be built in accordance with AWWA Standard C219, with a minimum working pressure of 230 psi. Bolts

shall be either stainless steel or zinc plated and coated with Rislant Nylon 11. Other metal parts shall be coated with either Rislant Nylon 11 or a high-grade corrosion resistant epoxy coating. Acceptable products are as follows:

1. Dresser Style 262 "HYMAX" Couplings by Dresser Co.
2. "Maxifit" Couplings by Viking Johnson Co.
3. An approved equivalent.

- D. Pipe Hangers, Support, Sleeves and Accessories: hangers will support a minimum load of 750 pounds and also will not work loose by rapid and repeated oscillation or mechanical vibration. Power activated tools shall be of the low velocity, controlled penetration type. Hanger rods shall be height adjustable clevis type, mild, low carbon steel, fully threaded or threaded at each end, with two (2) removable nuts at each end for the positioning rod and hanger, and locking each in place.

Space hanger or supports for horizontal piping on maximum centers of twelve feet (12') for the three-inch (3") pipe. Reduce hanger spacing and if necessary provide intermediate supports where necessary. Rod size for pipe hanger single rod to be 7/8-inch diameter.

For directional changes: Install a hanger close to the point of change of all horizontal pipe runs.

Paint all black steel or iron pipe hangers, rods, inserts, brackets and accessories for supporting piping systems with an approved rust preventative paint. Paint black steel hanger rods, threaded on the job site, with red lead or zinc chromite immediately after installation.

Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.

Pipe sleeves shall be Schedule 40. Steel pipe sleeve to be sealed at opening with waterstop cement.

- E. Inspection and Testing: All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications under which the material is manufactured.

The Contractor shall furnish the Engineer with documentation from the manufacturer certifying that the materials meet the above requirements and that all specified tests were completed at the foundry.

4. Installation. The Contractor shall install and be responsible for the location of pipe, pipe hangers, pipe supports, sleeves and accessories required by the work. Render the annular space, between bare and insulated piping and sleeve by packing the space between the pipe and sleeve with segmented rubber seals. Install sleeves of length as required so as to

be equal in length to thickness of wall or floor. Hangers and supports for horizontal piping shall not exceed twelve feet.

Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four (4) nuts are required for each rod, two at upper hanger and two at hanger.

Support vertical risers of piping system, by means of heavy duty hangers installed close to base of pipe risers, and by distance between clamps not to exceed twenty-five feet (25'), unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate provisions for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.

Concrete thrust blocks shall be used to restrain all plugs and at tapping valve/sleeves.

Thrust blocks shall be constructed in accordance with the details shown on the plans or as ordered by the Engineer. Rods, clamps, and other fittings shall be as specified on the plans and payment will be included in the price bid for ductile iron water mains. In the event that joints must be made to existing bell and spigot pipes, hydrants or valves, such joints shall be lead joints (or approved alternatives) made in accordance with American Water Works Association Standards.

5. Leakage Tests. After the water mains and all appurtenances have been installed they shall be given a hydrostatic pressure test of 50 psi greater than the anticipated working pressure, but not less than 100 psi. The test shall last at least one hour. The Contractor shall prepare a written log of pressure tests stating the locations tested and results. He shall deliver a copy to the Engineer or his representative at the end of each day of testing.

Leakage shall not exceed 25 US gallons per 24 hours per mile per inch of nominal diameter. No adjustments of the allowable leakage will be made because of the length of pipe or number of joints used.

Should leakage exceed the specified limits, the Contractor shall locate and repair the leaks and re-test the line until it meets the specified limits. The contractor shall furnish all material, labor and equipment necessary to test lines, including pumps, gauges and water. He shall make provisions to bleed the pressure off slowly after the test has been completed.

6. Sterilization. After the water main and all appurtenances have been installed and have been satisfactorily pressure tested, they shall be sterilized.

Sterilization shall be accomplished as described below, or by the Continuous Feed Method System described in AWWA C601. The amount of chlorine applied shall provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced to the water lines and distribution system in a manner approved by the Engineer. Use of tablets will not be permitted. The lines shall be thoroughly flushed before introduction of the chlorinating materials. After a contact period of not less than 24 hours, the system shall be flushed with clean water until the residual chlorine content is no greater than 0.5 parts per million greater than the water being used for flushing. All valves in the lines being sterilized shall be opened and closed several times during the contact period. After flushing, samples of water shall be taken from each section of main and an analysis made to determine the purity of the water. Testing for purity shall be by a laboratory approved by the New York State Department of Health for the analysis of potable water. Any section of the main not meeting the New York State Department of Health standard for purity shall be re-chlorinated and tested until acceptable. The results of the tests shall be given to the Engineer. All costs for water purity tests shall be paid by the Contractor. The City of Binghamton will provide water for sterilization and flushing at connections to existing supply lines.

8. Method of Measurement. The length to be paid for under this item shall be the measurement along the centerlines of the various sizes of pipe furnished and installed, from center of fitting to center of fitting.
9. Basis of Payment. Payment will be made for mains at the contract unit price per linear foot for the various sizes of pipe. The thrust blocks, tie rods, mechanical joint restraints, and fittings, complete in place. Payment shall include the furnishing and installation of all hangers, supports, sleeves, coring and accessories necessary to complete the work.

Payment for work under this section will be on the following items if, and when they appear on the itemized proposal.

Item	Description	Pay Unit
210-6	6-Inch Ductile Iron Water Main	L.F.
210-8	8-Inch Ductile Iron Water Main	L.F.
210-12	12-Inch Ductile Iron Water Main	L.F.
210-16	16-Inch Ductile Iron Water Main	L.F.
210-24	24-Inch Ductile Iron Water Main	L.F.
210-24A	24-Inch Ductile Iron Sanitary Sewer	L.F.
210SS-42	42-Inch Ductile Iron Storm Sewer	L.F.

ITEM 210SS – DUCTILE IRON STORM SEWER, CLASS 50

1. Description. Under this item, the Contractor shall furnish and install ductile iron water main pipe complete with fittings and megalug restraining joints as indicated on the plans or as ordered by the Engineer.
2. Applicable Specifications. The following specifications and standards, of the issues listed below but referred hereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:
  - A. American National Standards Institute (ANSI) Standards
    1. Grey-Iron and Ductile Iron Fittings, 2-inch to 48-inch for Water and other Liquids.
    2. Rubber Gasket Joint for Cast-Iron and Ductile Iron Pressure Pipe and Fittings
    3. Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or other Liquids
  - B. American Water Works Association (AWWA) Standards:
    1. Bolted Couplings
    2. Installation of Cast Iron Water Lines
    3. Disinfecting Water Mains
  - C. Federal Specifications
    1. Calcium Hypochlorite and Chlorinated Lime
    2. Sodium Hypochlorite
    3. Chlorine

All specifications listed above shall be year of latest revision.

5. Materials.
  - A. All pipe and accessories shall be new and unused. The pipe shall be ductile iron, thickness Class 52, conforming to ANSI Standard A21.11 and A21.51. In addition, the pipe shall be furnished with push-on joints for 24-inch and less diameter pipes, and mechanical joints for pipe larger than 24-inch diameter. Pipe and fittings shall be furnished with cement mortar lining conforming to ANSI Standard A21.4. Pipe shall be supplied in nominal 18-foot lengths. Bronze wedges (2 each) shall be used at each slip joint as directed by the Engineer.
  - B. Specials and Fittings: Specials and fittings shall be cast or ductile iron, Rated for 250 psi with a Class 125 bolt pattern, conforming to ANSI Standard A21.10.

**1<sup>ST</sup> EDITION**

Joints shall be mechanical conforming to ANSI Standard A21.11 provided with sufficient quantities of accessories and assembled in strict accordance with the recommendations of the manufacturer, as interpreted by the Engineer. Rubber gaskets shall be used for all mechanical joints. Specials and fittings shall be cement-lined in accordance with ANSI A21.4.

Ductile iron mechanical joint restraint shall be incorporated into the design of the mechanical joint follower gland. The restraint shall be Series 1100 (ductile iron/mechanical joint) or Series 1700 (ductile iron/push-on) as manufactured by EBAA Iron or approved equal. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The mechanical joint restraint shall be able to deflect up to 3 degrees for sizes 12" and less; 2 degrees for 14" and 16" sizes and 1-1/2 degrees for sizes 18" through 24".

Megalug joint restraints shall be installed following all manufacturer's installation procedures. Joints to be used at all horizontal bends, valves, reducers, dead ends, fire hydrant laterals, vertical offsets, and tees. Restraints to be used on each joint of the fitting. Install a full length of pipe on each side of fittings. If a nipple is required, install nipple a full length of pipe away from fitting, or the joints at the nipple shall require restraints.

Concrete thrust blocks shall be required on all plugs and behind tapping valves and sleeves.

The joint restraint ring and its wedging components shall be cast from grade 60-42-10 ductile iron conforming to ASTM A536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. The mechanical joint restraint and wedging components shall be domestically cast within the United States; foreign manufacture will not be acceptable or products from manufacturers with less than 10 years of field experience will not be acceptable.

Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges and to draw up the follower gland uniformly around the pipe. The mechanical joint restraints shall have a rated working pressure of 350 PSI in sizes 16" and smaller and 250 PSI for sizes from 18" through 48". The

mechanical joint restraints shall be listed by Underwriters Laboratories up through 24" in size and approved by Factory Mutual up through 12" size.

- C. Bolted Couplings: couplings shall be of the "Stab Fit" type, allowing installation without dismantling. Couplings shall be of the "Wide Range" type, allowing connection of different material pipe. Couplings shall be built in accordance with AWWA Standard C219, with a minimum working pressure of 230 psi. Bolts shall be either stainless steel or zinc plated and coated with Rislant Nylon 11. Other metal parts shall be coated with either Rislant Nylon 11 or a high-grade corrosion resistant epoxy coating. Acceptable products are as follows:

1. Dresser Style 262 "HYMAX" Couplings by Dresser Co.
2. "Maxifit" Couplings by Viking Johnson Co.
3. An approved equivalent.

- D. Pipe Hangers, Support, Sleeves and Accessories: hangers will support a minimum load of 750 pounds and also will not work loose by rapid and repeated oscillation or mechanical vibration. Power activated tools shall be of the low velocity, controlled penetration type. Hanger rods shall be height adjustable clevis type, mild, low carbon steel, fully threaded or threaded at each end, with two (2) removable nuts at each end for the positioning rod and hanger, and locking each in place.

Space hanger or supports for horizontal piping on maximum centers of twelve feet (12') for the three-inch (3") pipe. Reduce hanger spacing and if necessary provide intermediate supports where necessary. Rod size for pipe hanger single rod to be 7/8-inch diameter.

For directional changes: Install a hanger close to the point of change of all horizontal pipe runs.

Paint all black steel or iron pipe hangers, rods, inserts, brackets and accessories for supporting piping systems with an approved rust preventative paint. Paint black steel hanger rods, threaded on the job site, with red lead or zinc chromite immediately after installation.

Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.

Pipe sleeves shall be Schedule 40. Steel pipe sleeve to be sealed at opening with waterstop cement.

- E. **Inspection and Testing:** All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications under which the material is manufactured.

The Contractor shall furnish the Engineer with documentation from the manufacturer certifying that the materials meet the above requirements and that all specified tests were completed at the foundry.

4. **Installation.** The Contractor shall install and be responsible for the location of pipe, pipe hangers, pipe supports, sleeves and accessories required by the work. Render the annular space, between bare and insulated piping and sleeve by packing the space between the pipe and sleeve with segmented rubber seals. Install sleeves of length as required so as to be equal in length to thickness of wall or floor. Hangers and supports for horizontal piping shall not exceed twelve feet.

Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four (4) nuts are required for each rod, two at upper hanger and two at hanger.

Support vertical risers of piping system, by means of heavy duty hangers installed close to base of pipe risers, and by distance between clamps not to exceed twenty-five feet (25'), unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate provisions for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.

Concrete thrust blocks shall be used to restrain all plugs and at tapping valve/sleeves.

Thrust blocks shall be constructed in accordance with the details shown on the plans or as ordered by the Engineer. Rods, clamps, and other fittings shall be as specified on the plans and payment will be included in the price bid for ductile iron water mains. In the event that joints must be made to existing bell and spigot pipes, hydrants or valves, such joints shall be lead joints (or approved alternatives) made in accordance with American Water Works Association Standards.

5. **Leakage Tests.** After the water mains and all appurtenances have been installed they shall be given a hydrostatic pressure test of 50 psi greater than the anticipated working pressure, but not less than 100 psi. The test shall last at least one hour. The Contractor shall prepare a written log of pressure tests stating the locations tested and results. He shall deliver a copy to the Engineer or his representative at the end of each day of testing.

Leakage shall not exceed 25 US gallons per 24 hours per mile per inch of nominal diameter. No adjustments of the allowable leakage will be made because of the length of pipe or number of joints used.

Should leakage exceed the specified limits, the Contractor shall locate and repair the leaks and re-test the line until it meets the specified limits. The contractor shall furnish all material, labor and equipment necessary to test lines, including pumps, gauges and water. He shall make provisions to bleed the pressure off slowly after the test has been completed.

6. Sterilization. After the water main and all appurtenances have been installed and have been satisfactorily pressure tested, they shall be sterilized.

Sterilization shall be accomplished as described below, or by the Continuous Feed Method System described in AWWA C601. The amount of chlorine applied shall provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced to the water lines and distribution system in a manner approved by the Engineer. Use of tablets will not be permitted. The lines shall be thoroughly flushed before introduction of the chlorinating materials. After a contact period of not less than 24 hours, the system shall be flushed with clean water until the residual chlorine content is no greater than 0.5 parts per million greater than the water being used for flushing. All valves in the lines being sterilized shall be opened and closed several times during the contact period. After flushing, samples of water shall be taken from each section of main and an analysis made to determine the purity of the water. Testing for purity shall be by a laboratory approved by the New York State Department of Health for the analysis of potable water. Any section of the main not meeting the New York State Department of Health standard for purity shall be re-chlorinated and tested until acceptable. The results of the tests shall be given to the Engineer. All costs for water purity tests shall be paid by the Contractor. The City of Binghamton will provide water for sterilization and flushing at connections to existing supply lines.

9. Method of Measurement. The length to be paid for under this item shall be the measurement along the centerlines of the various sizes of pipe furnished and installed, from center of fitting to center of fitting.
10. Basis of Payment. Payment will be made for mains at the contract unit price per linear foot for the various sizes of pipe. The thrust blocks, tie rods, mechanical joint restraints, and fittings, complete in place. Payment shall include the furnishing and installation of all hangers, supports, sleeves, coring and accessories necessary to complete the work.

Payment for work under this section will be on the following items if, and when they appear on the itemized proposal.

Item	Description	Pay Unit
210-6	6-Inch Ductile Iron Water Main	L.F.
210-8	8-Inch Ductile Iron Water Main	L.F.
210-12	12-Inch Ductile Iron Water Main	L.F.
210-16	16-Inch Ductile Iron Water Main	L.F.
210-24	24-Inch Ductile Iron Water Main	L.F.
210-24A	24-Inch Ductile Iron Sanitary Sewer	L.F.
210SS-42	42-Inch Ductile Iron Storm Sewer	L.F.

ITEM 211 – WATER SERVICE “K” COPPER TUBING

(Excavation and Backfill Included)

Item 211A – ¾-Inch Diameter

Item 211B – 1-Inch Diameter

Item 211C – 1-1/2-Inch Diameter

Item 211D – 2-Inch Diameter

1. Description. Under this item, the Contractor shall excavate for, furnish and install type “K” copper tubing water services as ordered by the Engineer.
2. Materials and Construction Details. Copper tubing shall be type “K”, heavy wall, intended for underground service Comply with ASTM B88. A minimum of five feet (5’) of cover shall be maintained over all new work. Old water service piping to be replaced shall become the property of the contractor and shall be removed by him from the work site. All joints and fittings in water services are to be compression type only.

Where existing water services are constructed of copper tubing and appear to be in good condition, they shall be relocated to avoid conflicts with the proposed new main in accordance with the specifications. In such cases, the existing corporation stop, curb shutoff valve, and couplings shall be used.

Existing water services which are constructed of a material other than copper tubing shall be completely replaced rather than relocated if they conflict with the proposed new main, or as ordered by the Engineer. Where water services are to be completely replaced, the new curb shutoff valves, corporation stops, and tapping into the main shall be furnished under Item 250 and Item 251.

The contractor shall exercise caution in all excavation made in the vicinity of water services shown on the plans. Water services damaged beyond actual physical point of relocation necessary for proposed new facilities shall be repaired at the contractor’s expense.

The contractor shall be responsible to prevent any debris or excavated material from entering the portion of existing water service that is not replaced. The contractor shall flush the section of water service replaced prior to connection at the curb shutoff. Any water service found to be clogged or any meter found inoperable due to debris shall be flushed at the meter at the contractor’s expense.

Interruptions in water service to property owners shall not exceed eight hours. If the contractor exceeds this limit, he shall provide temporary service in accordance with the provisions of Section 4D of Item 210.

3. Method of Measurement and Basis of Payment. The quantity to be paid for will be the number of linear feet of water service actually furnished and installed measured along the centerline of pipe. The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No extra payment will be made for trench excavation and backfill

ITEM 211 – WATER SERVICE TUBING

(Excavation and Backfill Included)

Item 211A – ¾-Inch Diameter

Item 211B – 1-Inch Diameter

Item 211C – 1-1/2-Inch Diameter

Item 211D – 2-Inch Diameter

1. Description. Under this item, the Contractor shall excavate for, furnish and install water services as ordered by the Engineer.
2. Materials. Water service tubing and fitting shall conform to one of the following types:
  - A. PE 3608 HDPE – (Copper Tubing Size – CTS)
    1. Copper Tube Size (CTS) HDPE, PC200 DR9, shall be polyethylene (PE) pressure pipe and tubing intended for underground service and shall comply with ASTM D2737 Standards. All joints and fittings in water services are to be joined with OD Mechanical fittings designed for pipe made to ASTM D2737 Standards. Stainless Steel stiffeners shall be furnished and installed when using OD Compression type fittings. Heat fusion shall be allowed for joining pipe. All personnel conducting fusions shall be experienced and follow the guidelines published by the pipe manufactures or by PPI in TR 33.
  - B. Type “K” Copper Tubing
    1. Copper tubing shall be type “K”, heavy wall, intended for underground service and shall comply with ASTM B88. A minimum of five feet (5’) of cover shall be maintained over all new work. Old water service piping to be replaced shall become the property of the contractor and shall be removed by him from the work site. All joints and fittings in water services are to be compression type only.
3. Construction Details. A minimum of five feet (5’) of cover shall be maintained over all new work. Pipe bedding shall be Item 2X-1A, Washed Crushed Stone, and shall conform to the city of Binghamton Standard detail Sheets. Old water service piping to be replaced shall become the property of the contractor and shall be removed by him from the work site. Where existing water services are constructed of copper tubing and appear to be in good condition, they shall be relocated to avoid conflicts with the proposed new main in accordance with the specifications. In such cases, the existing corporation stop, curb shutoff valve, and couplings shall be used.

Identification tape, which bears the name of the utility type, shall be placed in all trenches with utilities, in accordance with the standard details.

Existing water services which are constructed of a material other than copper tubing shall be completely replaced rather than relocated if they conflict with the proposed new main, or as ordered by the Engineer. Where water services are to be completely replaced, the new curb shutoff valves, corporation stops, and tapping into the main shall be furnished under Item 250 and Item 251.

The contractor shall exercise caution in all excavation made in the vicinity of water services shown on the plans. Water services damaged beyond actual physical point of relocation necessary for proposed new facilities shall be repaired at the contractor's expense.

The contractor shall be responsible to prevent any debris or excavated material from entering the portion of existing water service that is not replaced. The contractor shall flush the section of water service replaced prior to connection at the curb shutoff. Any water service found to be clogged or any meter found inoperable due to debris shall be flushed at the meter at the contractor's expense.

Interruptions in water service to property owners shall not exceed eight hours. If the contractor exceeds this limit, he shall provide temporary service in accordance with the provisions of Section 4D of Item 210.

4. Method of Measurement and Basis of Payment. The quantity to be paid for will be the number of linear feet of water service actually furnished and installed measured along the centerline of pipe. The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No extra payment will be made for trench excavation and backfill

ITEM 211K - CUT OFF EXISTING WATER SERVICE

1. Description. Under this item, the Contractor shall abandon existing water services that are not in use, as indicated on the plans or as ordered by the Engineer.
2. Materials. The materials for backfilling shall be the existing excavated material. If the Engineer deems said excavated material unsuitable, select granular fill shall be used and paid for under Item 2EFB.
3. Construction Details. The Contractor shall excavate the water main to existing water service corporation stops that are not connected to residential or commercial laterals. The Contractor shall turn off the corporation stop at the main, disconnect the piping away from the corporation stop, or he shall cut a section of pipe and remove it from the excavation. Cut sections of existing water services shall be plugged.
4. Method of Measurement and Basis of Payment. The unit price bid for each existing water service not in use and cut off at the water main corporation stop shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. Water services that are active and being replaced shall be paid for under their respective items.

ITEM 213 – METER AND BY-PASS PIT

1. Description. Under this Item, the Contractor shall build a reinforced concrete Meter and By-Pass Pit as shown on the plans, or as directed by the Engineer.
  
2. Materials. The concrete used shall develop a minimum 28 day compressive strength of 3500 P.S.I. and shall conform to the requirements of class A concrete of the State of New York, Department of Transportation Specifications.  
 Reinforcement shall meet the requirements of Section 556, “Reinforcing Steel for Concrete Structures”, contained in the New York State Department of Transportation standard specifications.  
 Ductile iron water main shall conform to the requirement of Item 210 contained in these specifications.  
 Galvanized Steel pipe shall conform to USA Standards A21-6 (AWWA C106), A21.7, A21.8 (AWWA C108) and A21.9 and a minimum strength of not less than 18/46.  
 The water meter shall be an 6” and 8” Diameter OMNI C<sup>2</sup> Meter with 2” and 4” Diameter By-Pass OMNI C<sup>2</sup> Meter as manufactured by Sensus or Equal. The Meter consists of two basic assemblies; the maincase and the measuring chamber. The maincase is Ductile Iron with an approved NSF epoxy coating. The meter measuring chamber shall have floating ball technology to allow for flows up to its rated maximum capacity without undue wear or accuracy degradation.  
 Gate valves shall conform to specifications of Item 220 contained in this section.  
  
 Watertight man hole cover shall be Neenah model No. R-1755E or approved equal.  
  
 Water pipe passing through pit walls shall be sleeved and sealed. Seals around pipe through walls shall be “Link Seal” by Thunderline Corporation or equal. Openings for sleeves in new work shall be formed in the pouring of concrete.
  
3. Construction Details. Excavation shall be of sufficient size and only of sufficient size to give suitable room for the proper construction of structure. Subgrade for concrete structure shall be undisturbed original earth; concrete structure shall be placed on 9” of well compacted crushed stone.  
 Backfill around structures shall be deposited in horizontal layers not more than one foot in thickness and shall be compacted to prevent settlement.  
 Forms shall be designed, constructed and maintained so as to insure that after removal of forms the finished concrete members will have true surfaces free of offset, waviness or bulges and will conform accurately to the indicated shapes, dimensions, lines, elevations and positions. Concrete pipe supports shall be placed and of the size required so to prevent any sagging of pipe. Casting shall be placed in full mortar beds. The Sump shall be constructed with a 2” Weep Hole extending to the crushed stone base.  
 Steel reinforcement shall be placed in the exact position shown on the plans or as ordered by the Engineer. In general, all reinforcement shall be placed and securely wired and supported before concrete is placed in any section. Unless otherwise indicated on the plans, splices which are permitted shall have a length of not less than 30 times the

nominal diameter of the bars. When bars are heated for bending, they shall not be heated to a higher temperature than that producing a dark cherry red color.

All water lines shall conform to section 210-6 contained in these specifications.

All gate valves shall be right handed valves and shall conform to section 220 contained in these specifications.

New Turbine Meters shall be installed according to manufacturer's recommendations.

4. Method of Measurement and Basis of Payment. The lump sum bid price for the construction of the By-Pass Pit shall include the cost of furnishing all labor, equipment, concrete, form work, excavation, reinforcement, ladder, casting, concrete pipe support, wall sleeves, gravel, water mains and By-Pass Piping, gate valves, meters and materials necessary to complete the work.

<b>ITEM</b>	<b>DESCRIPTION</b>	<b>UNIT</b>
213A	W/6" Meter & 2" By-Pass	Each
213B	W/8" Meter & 4" By-Pass	Each

**ITEM 214 – POTABLE WATER TUBING**

(Excavation and Backfill Included)

Item 214A – ¾-Inch Diameter

Item 214B – 1-Inch Diameter

Item 214C – 1-1/2-Inch Diameter

Item 214D – 2-Inch Diameter

1. **Description.** Under this item, the Contractor shall excavate for, furnish and install PE 3608 CTS HDPE tubing for water services as ordered by the Engineer.
2. **Materials.** Copper Tube Size (CTS) HDPE, PC200 DR9, shall be polyethylene (PE) pressure pipe and tubing intended for underground service and shall comply with ASTM D2737 Standards. All joints and fittings in water services are to be joined with OD Mechanical fittings designed for pipe made to ASTM D2737 Standards. Stainless Steel stiffeners shall be furnished and installed when using OD Compression type fittings. Heat fusion shall be allowed for joining pipe. All personnel conducting fusions shall be experienced and follow the guidelines published by the pipe manufactures or by PPI in TR 33.
3. **Construction Details.** A minimum of five feet (5') of cover shall be maintained over all new work. Pipe bedding shall be Item 2X-1A, Washed Crushed Stone, and shall conform to the city of Binghamton Standard detail Sheets. Old water service piping to be replaced shall become the property of the contractor and shall be removed by him from the work site. Where existing water services are constructed of copper tubing and appear to be in good condition, they shall be relocated to avoid conflicts with the proposed new main in accordance with the specifications. In such cases, the existing corporation stop, curb shutoff valve, and couplings shall be used.

Existing water services which are constructed of a material other than copper tubing shall be completely replaced rather than relocated if they conflict with the proposed new main, or as ordered by the Engineer. Where water services are to be completely replaced, the new curb shutoff valves, corporation stops, and tapping into the main shall be furnished under Item 250 and Item 251.

The contractor shall exercise caution in all excavation made in the vicinity of water services shown on the plans. Water services damaged beyond actual physical point of relocation necessary for proposed new facilities shall be repaired at the contractor's expense.

The contractor shall be responsible to prevent any debris or excavated material from entering the portion of existing water service that is not replaced. The contractor shall flush the section of water service replaced prior to connection at the curb shutoff. Any water service found to be clogged or any meter found inoperable due to debris shall be flushed at the meter at the contractor's expense.

Interruptions in water service to property owners shall not exceed eight hours. If the contractor exceeds this limit, he shall provide temporary service in accordance with the provisions of Section 4D of Item 210.

4. Method of Measurement and Basis of Payment. The quantity to be paid for will be the number of linear feet of water service actually furnished and installed measured along the centerline of pipe. The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No extra payment will be made for trench excavation and backfill

ITEM 220 - RESILIENT SEATED MECHANICAL VALVES

1. Description. Under this item, the Contractor shall install new resilient seated mechanical valves where indicated on the plans or ordered by the Engineer.
2. Materials. All resilient seated gate valves shall be mechanical joint, iron bodied, bronze mounted valves with non-rising stems and 2-inch operating nuts. Gate valves shall be designed for a minimum water working pressure of 150 psi and be tested at a hydraulic pressure equal to twice that. Gate valves shall be opened by turning clockwise. Each valve shall have the manufacturer's initials, pressure rating, and year of manufacture cast on the body.

All resilient seated mechanical gate valves shall conform to the American Water Works Association Standard C509 for gate valves with "O" ring stem seals.

3. Construction Details. Mechanical valves shall be set plumb in locations shown on the plans or as ordered by the Engineer. Valves shall have the interiors cleaned of all foreign matter before installation. The valve shall be inspected in both closed and open positions to insure that all parts are in working condition.
4. Method of Measurement. The number of mechanical valves of each size paid for under this item shall be the number of valves furnished and installed in accordance with the plans or as ordered by the Engineer.
5. Basis of Payment. The unit price bid shall include the cost of furnishing all labor, materials and equipment necessary to complete the work.

Payment for work under this section will be on the following items, if and when they appear on the itemized proposal:

<u>Item</u>	<u>DESCRIPTION</u>	<u>PAY UNIT</u>
220-2	2-Inch Gate Valve	Each
220-4	4-Inch Gate Valve	Each
220-6	6-Inch Gate Valve	Each
220-8	8-Inch Gate Valve	Each
220-10	10-Inch Gate Valve	Each

ITEM 220-12 – DOUBLE DISC SEATED GATE VALVES WITH BOX

1. Description. Under this item, the Contractor shall furnish and install Double Disc seated gate valves with valve boxes where indicated on the plans or ordered by the Engineer.
2. Materials. All Double Disc seated gate valves shall be mechanical joint, iron bodied, bronze mounted valves with non-rising stems and 2-inch operating nuts. Gate valves shall be designed for a minimum water working pressure of 150 PSI and be tested at a hydraulic pressure equal to twice that. Gate valves shall be opened by turning clockwise. Each valve shall have the manufacturer's initials, pressure rating, and year of manufacture cast on the body.

All resilient seated gate valves shall conform to the American Water Works Association Standard C509 for gate valves with "O" ring stem seals.

Valve boxes shall be the two piece extension type, made of cast iron. The boxes shall be of such length as will be adapted, without full extension, to the depth of cover over the pipe at the valve location.

3. Construction Details. Valves and valve boxes shall be set plumb in locations shown on the plans or as ordered by the Engineer. Earth fill shall be carefully tamped around each valve box. Valves shall have the interiors cleaned of all foreign matter before installation. The valve shall be inspected in both closed and open positions to insure that all parts are in working condition.
4. Method of Measurement. The number of valves of each size paid for under this item shall be the number of valves furnished and installed in accordance with the plans or as ordered by the Engineer.
5. Basis of Payment. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, including excavation and backfill.

ITEM 220Z – REMOVE EXISTING GATE VALVE

1. Description. Under this item, the Contractor shall remove the existing gate valve and fill the remaining void with well-compacted granular fill.
2. Construction Details. The Contractor shall remove the existing casting and store it until it is picked up by the City Water Department. The opening shall be filled with gravel in 8-inch lifts and compacted thoroughly.
3. Basis of Payment. Payment will be made at the unit price bid for removal of each structure and shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

ITEM 220Z (B) - REMOVE EXISTING GATE VALVE BOX

1. Description. Under this item, the Contractor shall remove the existing gate valve box and fill the remaining void with well-compacted granular fill.
2. Construction Details. The Contractor shall remove the existing gate valve box and legally dispose of it. The valve box opening shall be filled with gravel in 8-inch lifts and compacted thoroughly.
3. Basis of Payment. Payment will be made at the unit price bid for removal of each valve box and shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No extra payment will be made for excavation or backfill.

ITEM 221 – BRICK CASTINGS

1. Description. Under this item, the Contractor shall install new brick castings on water shutoffs, sewer cleanouts, etc., as ordered by the Engineer.
2. Materials. Casting frame and lid shall be supplied by the City of Binghamton, Department of Water/Sewer. Contractor shall pick up castings at #1 Broome Street, Binghamton, New York. Castings to be transported to the construction site and installed as shown on the brick casting detail sheet. Arrangements shall be made with the Water/Sewer Department and a twenty-four hour notice shall be given prior to picking up castings
3. Construction Details. Castings shall be set plumb in locations as ordered by the Engineer. Existing asphalt concrete shall be cut to accept new casting. Asphalt concrete products shall be carefully tamped around each casting.
4. Method of Measurement and Basis of Payment. The unit price bid per casting shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, including cutting of asphalt concrete base and/or binder and placement of new asphalt concrete around casting flange.

ITEM 225 – BUTTERFLY VALVE WITH BOX

1. Description. Under this item, the Contractor shall furnish and install new butterfly valve with valve boxes where indicated on the plans or as ordered by the Engineer.
2. Materials. The butterfly valve and its operator shall fully meet or exceed all requirements of the American Water Works Association Specification C-504 or latest revision thereof, and shall be similar to the Clow butterfly valve as manufactured by the Eddy-Iowa Division of the Clow Corporation, or an approved equal. In addition, valves shall meet the following criteria.

Valve Body – Shall be high strength cast iron ASTM A126 Class B or A48 Class 40.

Valve Shaft – Shall be one piece continuous through the upper body, disc and lower body of the valve and made of solid stainless steel.

Valve Disc – Shall be made of corrosion-resistant alloy cast or ductile iron, edged with stainless steel or bronze. The disc movement shall be 90° open to shut, with a stainless steel stop in the body to prevent the disc from rotating through the closed position.

Valve Seats – Shall be made of rubber and mounted in the valve body by means of both cement and screws. The seat shall be field adjustable and field replaceable without removal of disc or shaft.

Shaft Bearing and Seal – Shall be self-lubricating, non-corroding and be designed for a bearing pressure not exceeding 1/12 of the material compressive strength with a coefficient of friction not higher than .06. Two “O” ring “silt” seals shall be located inboard of the thrust bearings. Stem outer seals top and bottom shall be “O” ring type contained in a bronze cartridge and replaceable without disassembly of the valve.

Valve Operator – Shall be of the traveling nut type, permanently lubricated, sealed and gasketed for underground service and equipped with a two-inch operating nut. Valves shall open by turning clockwise, be capable of accepting input torque and overloads up to 450-ft.-lbs. at ends of travel without damage, and require approximately the following number of turns to operate: 12-inch valve – 36 turns; 16-inch valve – 48 turns; 24-inch valve – 90 turns. Valve operators shall be located in cast iron valve boxes of the two piece extension type with the work “water” on the cover.

General – All butterfly valves shall be designed for a minimum water working pressure of 150 psi and be tested at a hydraulic pressure equal to twice the working pressure. Both valve ends shall be mechanical joint and equipped with all necessary accessories.

3. Construction Details. Valves and valve boxes shall be set plumb in locations shown on the plans or as ordered by the Engineer. Earth fill shall be carefully tamped around each valve box. Valves shall have the interiors cleaned of all foreign matter before installation. The valve shall be inspected in both closed and open positions to insure that all parts are in working condition. All valves shall be tested and sterilized as specified in Item 210.

- 4. Method of Measurement. The number of valves of each size to be paid for under this item shall be the number of valves furnished and installed in accordance with the plans or as ordered by the Engineer.
- 5. Basis of Payment. The unit price bid shall include the cost of furnishing all labor, materials and equipment necessary to complete the work including excavation and backfill.

Payment for work under this section will be on the following items, if and when they appear in the itemized proposal.

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
225-8	8-Inch Butterfly Valve	Each
225-12	12-Inch Butterfly Valve	Each
225-16	16-Inch Butterfly Valve	Each
225-24	24-Inch Butterfly Valve	Each

ITEM 230 - HYDRANTS

1. Description. Under this item, the Contractor shall furnish and install new hydrants where indicated on the plans or as ordered by the Engineer.
2. Materials. Hydrants shall be designed, manufactured and tested in compliance with the latest edition of A.W.W.A. C502, "Standard for Dry-Barrel Fire Hydrants," as published by the American Water Works Association. Hydrants shall be traffic type with replaceable breakable unit immediately above the ground line. Hydrants shall have compression valves with a 4 ½" diameter minimum valve opening and a bronze seat ring. Hydrants shall be of a "Dry Top" design with O-ring seals. The valve shall open clockwise and direction shall be clearly marked at the top of the hydrant. Hydrants shall have two (2) 2½" hose outlets and one (1) 4" pump outlet, all with national standard threads. Acceptable models and manufacturers include:
  1. "Guardian K81D" as manufactured by ITT Kennedy Valve of Elmira, New York.
  2. "Patriot PT 8100" as manufactured by Troy Valve of Troy, Pennsylvania.
3. Construction Details. Hydrants shall be located in a manner to provide complete accessibility and protection from possible vehicle damage. All hydrants shall stand plumb with the pumper nozzle normal to the curb unless otherwise ordered by the Engineer. All hydrants shall conform to the established grade, with nozzles at least twelve (12) inches above ground. Hydrants shall be installed with a concrete thrust block and 1 cubic yard of crushed stone as shown on the typical hydrant details. Drain hole must be kept clear of concrete and/or crushed stone.
4. Method of Measurement. The number of hydrants paid for under this item shall be the number of hydrants furnished and installed in accordance with the plans or as ordered by the Engineer.
5. Basis of Payment. The unit price bid shall include the cost of furnishing all labor, materials and equipment necessary to satisfactorily complete the work including excavation, backfill, concrete and crushed stone.

ITEM 230E – HYDRANT EXTENSION

1. Description. Under this item, the contractor shall furnish and install hydrant extensions of the heights required to adjust existing hydrants to grade in locations as shown on the plans or as ordered by the Engineer.
2. Materials. Hydrant extensions shall be model K8150, as manufactured by Kennedy Valve Company, or approved equal. Extensions shall be equipped with traffic breakaway hardware and shall be available in 6-inch increments of height, up to 36 inches. Extensions shall be fully compatible with the Guardian hydrant (4 1/2" diameter valve opening), as manufactured by Kennedy Valve Company. Extensions shall include all necessary hardware for a complete installation.
3. Construction Details. Hydrant extensions shall be installed in conformance with manufacturer's instruction. Once installation is complete cycle hydrant to test for leaks or binding in the presence of inspector.
4. Method of Measurement. The length to be paid for under this item shall be the nominal extension length, measured to the nearest 1/2 linear foot of height.
5. Basis of Payment. Payment shall be made per linear foot (rounded to the nearest 1/2 foot) of hydrant extensions properly installed. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

ITEM 230Z - REMOVE EXISTING HYDRANT

1. Description. Under this item the Contractor shall remove existing hydrants according to the plans, or as ordered by the Engineer.
2. Construction Details. Existing hydrants shall be removed and the existing waterline feeding the hydrant shall be capped. The gate valve regulating the water to the hydrant shall be turned off by the Water Department before any work starts. The site shall be backfilled with suitable material as ordered by the Engineer.
3. Method of Measurement. The number of hydrants paid for under this item shall be the number of hydrants removed in accordance with the plans or as ordered by the Engineer.
4. Basis of Payment. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including excavation and backfill.

## ITEM 240 – TAPPING VALVE & SLEEVE WITH BOX

1. Description. Under this item, the Contractor shall furnish, assemble, and install new tapping valve and sleeve with valve box where indicated on the plans or as ordered by the Engineer.

Alternative option. Contractor may elect to have the City of Binghamton Water Department install tapping valves and sleeves at the City's current schedule. This option is subject to the availability of City work force and equipment. Tapping sleeves and gate valves shall have mechanical joint type ends and conform to the requirements of the American Water Works Association.

2. Materials. Tapping gate valves shall conform to all the requirements for Item 220, Gate Valve with Box, Class 150, with the following exceptions:

A: Tapping Gate Valves:

1. Inlet ends shall be made to attach properly to the tapping sleeve to assure correct alignment.
2. Seat opening of the valve is larger than nominal size to permit full diameter cut to be made.
3. The outlet end of mechanical joint type will allow drilling machine and equipment to attach directly to it.

Tapping sleeves and gate valves shall have mechanical joint type ends and conform to the requirements of the American Water Works Association.

B: Tapping Sleeves:

1. The tapping sleeve shall be split sleeve, drop-in bolt design and shall be manufactured of 304L (low carbon) stainless steel. The bolts, nuts and washers shall be heavy hex type 304 stainless steel, and shall be a rolled thread drop-in style, coated with an anti-galling compound. Sleeves with attached bolts are not acceptable.
2. The tapping sleeve shall have a class 125 outlet flange with drilling dimensions that fully comply with ANSI B16.1. The flange material shall be type 304 stainless steel (carbon steel or ductile iron flanges are not acceptable) and a gasket shall be attached on the outlet flange.
3. The tapping sleeve shall have a complete circle gasket on the interior of the shell and should provide a full 360 degree seal. The sleeve shall have a rated working pressure of 250 psi in size 4"-12" and 200 psi in sizes 14"-24".

4. The tapping sleeves welds shall be passivated, in addition to the entire sleeve, to maintain optimum corrosion resistance, in accordance with ASTM A380.
  5. The stainless steel tapping sleeves shall be Mueller H304SS series or approved equal.
3. Construction Details. For each tapping valve and sleeve, the Contractor will be responsible for furnishing and assembling the materials, and the actual tapping of new valve.
  4. Method of Measurement and Basis of Payment. The unit price bid for each tapping valve and sleeve with box shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including excavation and backfill.

Payment for work under this specification will be on the following items if and when they appear in the itemized proposal.

<u>Item</u>	<u>Description</u>	<u>Pay Unit</u>
240-6	6-Inch Tapping Valve & Sleeve	Each
240-8	8-Inch Tapping Valve & Sleeve	Each
240-10	10-Inch Tapping Valve & Sleeve	Each
240-12	12-Inch Tapping Valve & Sleeve	Each
240-16	16-Inch Tapping Valve & Sleeve	Each
240-24	24-Inch Tapping Valve & Sleeve	Each

ITEM 250 - CORPORATION STOP

Item 250A - ¾" Diameter

Item 250B - 1" Diameter

Item 250C - 1½" Diameter

Item 250D - 2" Diameter

1. Description. Under this item, the Contractor shall furnish all labor and materials for the installation of Corporation Stops as shown on the plans or as ordered by the Engineer.
2. Materials and Construction Details. Corporation stops shall be ¾-inch or 1-inch Mueller No. B-25008 or approved equal. Working pressure shall be 250 psi minimum.

Corporation stops shall be furnished and installed where water services are to be reconnected or completely replaced under Item 211. Water service taps for installation of corporation stops shall be made by the Contractor in approved manner at an angle of approximately 60° from the top center of the main. Size shall match existing service with a ¾-inch minimum.

3. Method of Measurement and Basis of Payment. The amount bid for this item shall be the cost of furnishing and installing each corporation stop with tap into the main. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, including the tapping of the water main.

ITEM 251 – CURB SHUTOFF VALVE, BALL TYPE

Item 251A – ¾-Inch Diameter

Item 251B – 1-Inch Diameter

Item 251C – 1½-Inch Diameter

Item 251D – 2-Inch Diameter

1. Description. Under this item, the contractor shall furnish all labor and materials for the installation of ball valve curb shutoffs as shown on the plans or as ordered by the Engineer.
2. Materials and Construction Details. Ball valve curb shutoffs shall consist of ¾-inch or 1-inch Mueller No. B25209 Ball Valve curb stop or approved equal with a Mueller No. H-10314 curb box with rod or approved equal. Curb box with rod for 1 ½” and 2” services shall be Mueller Buffalo Style No. GF0795E. Working pressure shall be 250 psi minimum.

Brick castings shall be used for the installation of curb boxes and shutoffs in driveway aprons or sidewalks. The Engineer or his representative shall determine if existing castings are to be reused.

Ball valve curb shutoffs shall be furnished and installed where water services are to be completely replaced as ordered by the Engineer.

3. Method of Measurement and Basis of Payment. The amount bid for this item shall be the cost of furnishing and installing each ball valve curb shutoff with curb box. The unit price bid shall include the cost of furnishing all labor, including the connections to existing water services, materials and equipment necessary to complete the work including replacement of brick castings.

ITEM 403.118902 – ASPHALT CONCRETE TYPE 1 BASE

1. Description. Under this item, the Contractor shall construct a one-course asphalt concrete pavement laid to conform to the required grade, thickness and cross-section shown on the plans or as ordered by the Engineer. This item shall also include the resurfacing of driveway approaches as well as all necessary leveling, patching and repair work as ordered by the Engineer.
2. Materials and Construction Details. Materials and construction details shall conform to the requirements of the New York State Department of Transportation Specifications dated May 1, 2008, with latest addenda. Section 403-3.13 of the specifications shall be modified by the insert included herein entitled, “Wedge Joints” (E.I. 98-020).

Construction of the base course asphalt concrete pavement shall not start until the Engineer has approved the compaction and cross-section of the sub-base. The Engineer shall be notified prior to construction of base course and the Engineer will approve or disapprove sub-base and inform the Contractor of deficiencies. The Contractor shall make corrections before the base course is constructed. Any base course constructed without sub-base approval from the Engineer will not be accepted and the Contractor will be paid only for materials used.

The Contractor shall utilize a fully automated paver in accordance with the specifications. Additionally, the paver must meet one of the following:

Have been approved by the NYS DOT for use on their projects within the last year. Approval form must be submitted as proof.

Have been inspected by an independent testing laboratory or qualified individual (as determined by the Engineer) and certified as fully in compliance with NYS DOT requirements. This inspection shall be performed at the Contractor’s own expense.

3. Method of Measurement. The quantity to be paid for under this item shall be the number of tons of compacted material in place to within the depths and within the limits as shown on the plans or as directed by the Engineer.
4. Basis of Payment. The unit price per ton for this item shall include the cost of furnishing all materials including the asphalt cement, the mixing, transporting, placing, rolling, and all labor and equipment necessary to complete the work.

ITEM 403.138902 – ASPHALT CONCRETE TYPE 3 BINDER COURSE

1. Description. Under this item, the Contractor shall construct a one-course asphalt concrete pavement laid to conform to the required grade, thickness and cross-section shown on the plans or as ordered by the Engineer. This item shall also include the resurfacing of driveway approaches as well as all necessary leveling, patching and repair work as ordered by the Engineer.
2. Materials and Construction Details. Materials and construction details shall conform to the requirements of the New York State Department of Transportation Specifications dated May 1, 2008, with latest addenda. Section 401-3.13 of the specifications shall be modified by the insert included herein entitled, “Wedge Joints,” (E.I. 98-020).

The Contractor shall utilize a fully automated paver in accordance with the specifications. Additionally, the paver must meet one of the following:

Have been approved by the NYS DOT for use on their projects within the last year. Approval form must be submitted as proof.

Have been inspected by an independent testing laboratory or qualified individual (as determined by the Engineer) and certified as fully in compliance with NYS DOT requirements. This inspection shall be performed at the Contractor’s expense.

3. Method of Measurement. The quantity to be paid for under this item shall be the number of tons of compacted material in place to within the depths and within the limits as shown on the plans or as directed by the Engineer.
4. Basis of Payment. The unit price per ton for this item shall include the cost of furnishing all materials including the asphalt cement, the mixing, transporting, placing, rolling, and all labor and equipment necessary to complete the work.

ITEM 403.178902– ASPHALT CONCRETE TYPE 6 TOP COURSE

1. Description. Under this item, the Contractor shall construct a one-course asphalt concrete pavement laid to conform to the required grade, thickness and cross-section shown on the plans or as ordered by the Engineer. This item shall also include the resurfacing of driveway approaches as well as all necessary leveling, patching and repair work as ordered by the Engineer.
2. Materials and Construction Details. Materials and construction details shall conform to the requirements of the New York State Department of Transportation Specifications dated May 1, 2008, with latest addenda. Section 401-3.13 of the specifications shall be modified by the insert included herein entitled, “Wedge Joint,” (E.I. 98-020).

Construction of the top course of asphalt concrete pavement shall not start until the Engineer has approved the compaction and cross-section of the base course asphalt concrete pavement. The Engineer shall be notified prior to construction of the top course and the Engineer will approve or disapprove base course and inform the Contractor of deficiencies. The Contractor shall make corrections before the top course is constructed. Any top course constructed without base course approval from the Engineer will not be accepted and the Contractor will be paid only for materials used.

The Contractor shall utilize a fully automated paver in accordance with the specifications. Additionally, the paver must meet one of the following:

- A. Have been approved by the NYS DOT for use on their projects within the last year. Approval form must be submitted as proof.
  - B. Have been inspected by an independent testing laboratory or qualified individual (as determined by the Engineer) and certified as fully in compliance with NYS DOT requirements. This inspection shall be performed at the contractor’s expense.
3. Method of Measurement. The quantity to be paid for under this item shall be the number of tons of compacted material in place to within the depths and within the limits as shown on the plans or as directed by the Engineer.
  4. Basis of Payment. The unit price per ton for this item shall include the cost of furnishing all materials including the asphalt cement, the mixing, transporting, placing, rolling, and all labor and equipment necessary to complete the work.

ITEM 403.198902– ASPHALT CONCRETE TYPE 7 TOP COURSE

1. Description. Under this item, the Contractor shall construct a one-course asphalt concrete pavement laid to conform to the required grade, thickness and cross-section shown on the plans or as ordered by the Engineer. This item shall also include the resurfacing of driveway approaches as well as all necessary leveling, patching and repair work as ordered by the Engineer.
2. Materials and Construction Details. Materials and construction details shall conform to the requirements of the New York State Department of Transportation Specifications dated May 1, 2008, with latest addenda. Section 401-3.13 of the specifications shall be modified by the insert included herein entitled, “Wedge Joint,” (E.I. 98-020).

Construction of the top course of asphalt concrete pavement shall not start until the Engineer has approved the compaction and cross-section of the base course asphalt concrete pavement. The Engineer shall be notified prior to construction of the top course and the Engineer will approve or disapprove base course and inform the Contractor of deficiencies. The Contractor shall make corrections before the top course is constructed. Any top course constructed without base course approval from the Engineer will not be accepted and the Contractor will be paid only for materials used.

The Contractor shall utilize a fully automated paver in accordance with the specifications. Additionally, the paver must meet one of the following:

Have been approved by the NYS DOT for use on their projects within the last year. Approval form must be submitted as proof.

Have been inspected by an independent testing laboratory or qualified individual (as determined by the Engineer) and certified as fully in compliance with NYS DOT requirements. This inspection shall be performed at the contractor’s expense.

3. Method of Measurement. The quantity to be paid for under this item shall be the number of tons of compacted material in place to within the depths and within the limits as shown on the plans or as directed by the Engineer.
4. Basis of Payment. The unit price per ton for this item shall include the cost of furnishing all materials including the asphalt cement, the mixing, transporting, placing, rolling, and all labor and equipment necessary to complete the work.

ITEM 404.00 – STREET PRINT

1. Description: The work shall consist of applying “Street Print™” pavement texturing or Street Print to an existing asphalt pavement as shown on the plans. The contractor doing this work shall be an authorized street print applicator and licensed by Integrated Paving Concepts Inc.
  
2. Material: The street print pattern used shall be random stone with a standard color applied. Color shall be determined prior to application. Two coats of StreetBond™ standard formulas. StreetBond™ Traffic Formula shall be utilized. The products used in the surfacing system shall meet the minimum physical and performance properties described within.
  - A. StreetBond™ Standard Formula: StreetBond™ Standard Formula shall be integrally-colored, cement modified, acrylic polymer surfacing product developed specifically for use over imprinted asphalt. One coat of StreetBond™ Standard Formula will provide a surface build between 10-15 mils.
  
  - B. StreetBond™ Traffic Formula: StreetBond™ Traffic Formula shall be integrally-colored, cement modified, acrylic polymer surfacing product with the following special characteristics: faster cure time (to allow for quicker return to service); thicker build (approx. 20 – 25 mils); and larger aggregate gradation. This product shall be designed for high traffic areas or where vehicular traffic cannot be for a period of not less than 24 hrs. Two coats of StreetBond™ Traffic Formula will provide a surface build between 20 – 25 mils.
  
  - C. StreetBond™ Sealer Concentrate: StreetBond™ Sealer Concentrate shall be a breathable, high quality acrylic polymer, clear sealer designed specifically for use with the “StreetBond™ Surfacing System”. When applied over either the StreetBond™ Standard Formula or StreetBond™ Traffic Formula, StreetBond™ Sealer Concentrate shall provide a breathable sealing membrane, which adds both durability and longevity to the StreetBond™ products. It shall be necessary to seal both StreetBond™ products with StreetBond™ Sealer Concentrate.
  
3. Installation: StreetPrint™ shall be applied on an approved subgrade and asphalt concrete pavement prepared by others. A representative of the Street Print application is to make a visual inspection during the Asphalt Concrete Top Course application to insure that the work is acceptable for the StreetPrint™ product. Any corrections needed for application of the StreetPrint™ shall be done at no cost to the city.
  - A. Surface Imprinting: The contractor shall follow procedures detailed in the latest revision of StreetPrint™ Application Procedures as issued by Integrated Paving Concepts Inc. The pattern shall be created in accordance with the design as agreed by the Owner or Owner’s representative. Patterning shall begin once the asphalt has reached its final density and while there is still sufficient heat in the

asphalt to permit imprinting. StreetPrint™ application personnel shall coordinate all surface imprinting operations with the paving contractor to assure quality and StreetPrint™ imprinting requirements are met.

- B. Surfacing System: The contractor shall apply the “StreetBond™ Surfacing System” as specified. The “StreetBond™ Surfacing System” should never be applied in temperatures below 45°F and rising, or when precipitation can be expected within 24 hours. Installation shall be in accordance with the latest revision of the StreetPrint™ Application Procedures as issued by Integrated Paving Concepts Inc. The StreetBond™ products shall be spray applied and broomed using a broom or brushes to cut in small crease where required. Once the StreetBond™ products are fully dried StreetBond™ Sealer Concentrate will be applied as a curing membrane. StreetBond™ Sealer Concentrate shall be tinted using the resin from the StreetBond™ products, spray applied and broomed into the surface. Care shall be taken to ensure that the entire surface is covered, including the imprinted surfaces. Sufficient masking shall be used to ensure that the surfacing products are applied only where specified.
4. Method of Measurement and Basis of Payment: The unit price bid per square foot shall include the cost of all labor, equipment and materials required to complete the work to the satisfaction of the Engineer.

ITEM 420 – ASPHALT PRICE ADJUSTMENT WITH FUEL ALLOWANCE

1. Description.
  - A. General. This section will provide for additional compensation to, or repayment by, the Contractor for increases or decreases in the price of asphalt throughout the life of the Contract. This adjustment will be computed within the prescribed conditions and in conformance with applicable procedures of the New York State Department of Transportation (NYS DOT).
  - B. Eligible Work. Price adjustments will be determined for the following eligible pay items:
 

All “asphalt concrete” items beginning with the numbers “403”.

No adjustment will be provided for any new work incorporated into the work by change order. In addition, work performed by the Contractor at his own expense will not be eligible for price adjustment.
2. Method of Computation
  - A. Asphalt Price adjustments will be based on the following formula:
 

Price Adjustment (Per Ton) = (Average Posted Price – Index Price) x Total % Asphalt plus Fuel Allowance
  - B. The Index Price, Average Posted Price, and Total percent Asphalt Plus Fuel, are defined as follows:
    1. Index Price. A fixed price per ton of asphalt. This price is used solely as a base from which to compute asphalt price adjustments. Its dollar amount for this contract is specified below:
 

The Index Price which shall apply to this contract shall be \$607.00 per ton. (August 2012)
    2. Average Posted Price. The average FOB terminal price for neat PG 64-22 binder, without anti-stripping agent, will be computed from the Bituminous Material Primary Source on the NYS DOT Materials Bureau Approved List of materials and Equipment for Use on New York State Department of Transportation Projects as determined by the NYS DOT on a regular basis.
 

The asphalt price adjustment will be based solely on the price changes for asphalt as determined by the above formulas. No consideration will be given to the situation where an individual supplier’s price exceeds the Average Posted Price.

3. Total % Asphalt Plus Fuel. The percentage of total allowable asphalt and fuel for each item is as follows:

Item #	Description	% Asphalt	Fuel Allowance+	Total % Asphalt plus Fuel Allowance
403.11	Type 1 Base	5.00	1	6.00
403.12	Type 2 Base	3.50	1	4.50
403.13	Type 3 Binder	5.50	1	6.50
403.15	Type 5 Shim	8.25	1	9.25
403.16				
.1701	Type 6, 6F Top	6.40	1	7.40
403.18				
.1901	Type 7, 7F Top	7.00	1	8.00

Bituminous materials not listed above may also be eligible for asphalt price adjustment using the conversion factor of a similar listed material with the same pay units. If an appropriate conversion factor is not listed, the Engineer shall be contacted to provide this information.

+Fuel Allowance represents allowance for energy (fuel, electricity, and natural gas) used in the production of asphalt. It is a cost associated with the product and not intended to represent any trucking or hauling product.

- C. Example. Item 403.16

Index Price = \$150.00

Average Posted Price = \$160.00

Total % Asphalt plus Fuel = 7.4%

$\$160.00 - \$150.00 \times 0.074 = \$0.74$  per ton.

- D. A positive Price Adjustment number shall be a credit to the contractor.
- E. A negative Price Adjustment number shall be a credit to the City.
- F. There will not be price adjustments unless the change amounts to more than \$.10 per ton from the original bid prices. In these instances prices will revert back to the original quoted prices.
- G. All price adjustments will be computed by calculator to three decimal places.
- H. Should these provisions result in a price structure which becomes unworkable, detrimental or injurious to the city or in prices which are not truly reflective of market conditions or which are deemed by the City Engineer to be unreasonable

or excessive, and no adjustment in price is mutually agreeable, the City Engineer reserves the sole right upon ten days written notice mailed to the contractor to terminate any contract resulting from this bid opening.

3. Materials. None specified.
4. Construction Details. None specified.
5. Method of Measurement. The lump sum shown in the proposal for these items shall be considered the price bid, although actual payment will be based on the work performed. The lump sum is not to be altered in any manner by the bidder. Should the amount shown be altered, the new figures will be disregarded and the original price will be used to determine the total amount bid for the contract.
6. Basis of Payment.
  - A. The actual price adjustments will be based on the methods of computation previously described in this specification. No adjustments, either positive or negative, will be made until the final payment.
  - B. The adjustment will be based on the quantity of eligible work placed and the Average Posted Price in effect at the time of placement. For the purpose of calculating price adjustments, the Average Posted Price will be updated on the twentieth of each month and will apply to eligible work performed on and after the first of the following month.
  - C. The Contractor shall, no later than the 10<sup>th</sup> of Each month, provide the Engineer with a listing of the quantity of asphalt placed in the previous month, along with anticipated price adjustments. Quantities and dates of placement shall be subject to review and approval by the City.
  - D. If the contract completion date is extended without the assessment of liquidated damages, price adjustments for items incorporated during such extensions shall be based on the appropriate updated Average Posted price.

If eligible items are placed after the scheduled contract completion date and during which time there are assessed liquidated damages, the Average Posted Price used to compute price adjustments shall not exceed, but may be less than the Average Posted Price in effect on the last contract completion date without assessed liquidated damages.

ITEM 510 – REGRADE MANHOLE, CATCHBASIN AND INLET CASTINGSITEM 511 – REGRADE WATER AND GAS CASTINGSITEM 512 – REGRADE LARGE CASTINGS

1. Description. Under this item, the Contractor shall regrade each casting as indicated or as directed by the Engineer. The castings shall be placed true to line and grade as shown on the plans or as directed by the Engineer.
2. Construction Details and Materials. The structure shall be regraded using a full ring of concrete brick embedded in a bed of mortar. A concrete ring embedded in mortar may be substituted for above.
3. Method of Measurement. For each casting altered as shown on the plans or as directed by the Engineer, the Contractor shall receive the unit price bid.
4. Basis of Payment. The unit price bid shall include the cost of furnishing all labor, materials and equipment necessary to complete the work including the breaking out and replacement of pavement. It shall also include the cost of new headstones if deemed necessary by the Engineer. If new castings are needed, they shall be paid for or furnished by the respective utility company, including the City of Binghamton, New York, Water Bureau. Other new castings as ordered by the Engineer will be paid for under their respective items.

**NOTE:** The Contractor shall notify the utility company if any of their castings are to be changed. The respective utility company shall then have the option of regrading their own castings according to the above specifications, or have the Contractor do the work, and then bill the utility company for work completed.

ITEM 606-2 CORRUGATED BEAM GUIDERAIL  
GUIDERAIL SHORT TERMINAL SECTION  
GUIDERAIL LONG TERMINAL SECTION

1. Description. Under these items the contractor shall install corrugated beam guiderail and its corresponding end treatments as specified by the plans and Section 606 of the Standard Specification for Construction Materials of the New York State Department of Transportation. This item shall conform to the New York State Department of Transportation Standard Sheet No. M606-6 for Corrugated Beam Guide- rails.
2. Materials. Materials for corrugated beam guiderail shall conform to the requirements of Section 710-20 of the Standard Specifications for Construction and Materials of the New York State Department of Transportation dated January 2, 1990 or later addendum.

Concrete for terminal section anchors shall have a minimum compressive strength of 3500 psi and be composed of Type 1A cement. Anchor bolts for terminal sections shall be of the size shown on the standard sheet and shall conform to the requirements of Section 723-60 of the aforementioned Standard specifications.

3. Construction Details. Posts for guiderail shall be set to the depths and spacings shown on the plans. Posts shall be driven by approved equipment that will leave them in their final position free of any distortion, burring, or any other damage. As an alternate, posts may be installed by auguring holes of the proper size, then backfilling and compacting material around the posts to the original grade. If the second method is used, backfill shall be compacted to the satisfaction of the Engineer, if unsuitable material is excavated, new material shall be provided at the contractor's expense for backfill. Wood guide posts shall be installed by the augured hole method described previously.

Concrete terminal anchors shall be excavated for to the approximate size shown on the New York State Department of Transportation Standard Sheet. Concrete shall be poured against undisturbed ground except the top six inches which shall be formed. Anchor bolts of the size and number shown on the plans shall be installed at the time of the pour to align with the guiderail. Precast units may be used.

4. Method of Measurement. The quantity of the guide railing to be paid for under this item shall be the number of linear feet of guide rail properly furnished and placed. Terminal sections shall be paid for under this item and installed as indicated by the Standard Sheet.
5. Basis of Payment. The unit price bid per lineal feet for this item shall include the cost of all labor, materials, and equipment necessary to complete the work, including end sections.

ITEM 608 - BRICK PAVING AND MORTAR SETTING BED

1. Description. This work shall consist of the construction of furnishing and placing brick paving and mortar setting bed. All work shall be in accordance with these specifications in reasonably close conformity with the lines and grades shown on the plans or established by the Engineer.
2. Materials. Brick pavers shall be manufactured from extruded fire clay or shale and shall be the shape, size and color to match existing pavers being removed. Samples of the brick pavers shall be submitted to and approved by the Engineer prior to beginning of work.

The brick pavers shall be fired to produce a dense paver with the average water absorption less than 8.0% after 24- hour submersion in cold water and the average compressive strength in excess of 8,000 psi. The paver shall be free of chinks, screeding scan, stress cracks or foreign substances. The brick pavers shall also conform to the other requirements outlined in A.S.T.M. C216 and C62, Grade SW.

3. Brick Pavers. Brick pavers shall be the size(s), shape(s), pattern(s) and color(s) as being removed from project site.
4. Mortar for Brick Paving. Mortar shall meet the requirements of New York State Department of Transportation St. S. January 1995, with latest addendum for Portland Cement 701-01 and mortar sand 703.03. Mix shall consist of 1 part Portland Cement and 3 parts mortar sand by volume, mixed as stiff as practicable.
5. Brick Paving. All brick pavers shall be laid in the pattern to match existing brick paving, or as directed by the Engineer to provide a uniformly even surface. Joints shall be hand tight unless otherwise specified. No brick pavers shall be laid or grouted in freezing weather.

A dry mixture of mortar for brick paving shall be swept over the brick pavers until the joints are completely filled and the joints lightly wetted with water. Brick pavers shall be cleaned of excess mortar and joints finished prior to the mortar setting up. All brick paving shall be kept moist for 4 days after filling the joints with mortar. After the 4 day curing period, removal of remaining mortar film may be accomplished by the use of a light acid wash (10% solution of hydrochloric or muriatic acid) followed by flushing clean with water or as approved by the Engineer. Care shall be taken to avoid the use of acid in areas where runoff could damage trees or other vegetation.

All brick pavers used over tree pits shall be laid in a 3-inch bed of cushion sand with sand filled joints.

6. Brick Paving (Mortar Setting Bed). Brick pavers shall be laid in a bed of mortar with a minimum thickness of 1-inch over the specified concrete subbase.

7. Brick Paving (Optional Concrete Setting Bed). The Contractor shall have the option of installing brick paving by one of the following methods:
  - A. Bricks shall be laid on a bed of cement concrete as specified in the contract documents. The bricks shall be laid in the cement concrete while it is still fresh as approved by the Engineer and they shall be firmly positioned to provide a uniformly even surface, and a solid bedding under each brick.
  - B. Bricks shall be laid as provided for under "Brick Paving (Mortar Setting Bed)" provided the finished surface shall conform to the lines and grades shown in the contract documents.
8. Method of Measurement. Brick paving shall be measured as the number of square yards placed as shown in the contract documents or as ordered by the Engineer.
9. Basis of Payment. The price bid per square yard shall include the cost of furnishing all labor, materials and equipment necessary to complete the work, including setting bed material, as specified except that any necessary excavation and subbase course will be paid for under their appropriate items.

ITEM 1000 – SURVEY & STAKEOUT

1. Description. Under this item, the Contractor shall provide all necessary stakeout survey required for the proposed improvements. The stakeout of line and grade for curbs, sidewalks, streets, drainage structures and property lines shall be by a licensed land surveyor or an exempt professional engineer approved by the Engineer. All field notes or copies thereof shall be given to the Engineer in charge. All stakeout survey shall be referenced to the baseline shown on the plans. The Contractor shall place two offset stakes at each baseline station shown on the plans, one for each side of the street. From computations and measurements made by the Contractor or his representative, these stakes shall be clearly and legibly marked with correct baseline station, offset and cut or fill so as to establish the location of the proposed improvements. The Contractor shall be responsible for the accuracy of his work. Any work installed by the contractor, found to be out of alignment or grade because of an error by the Contractor's representative in staking out the work shall be replaced at the proper grades at the Contractor's expense. Stakes shall be maintained by the Contractor until their use is no longer necessary as judged by the engineer. Stakes or pins used for offsets shall be approved by the Engineer prior to use.

The Engineering Department will provide any information available regarding its initial survey when requested by the Contractor.

Any existing irons or monuments which define property lines, which are disturbed during construction, shall be realigned or replaced by the Contractor's representative.

2. Method of Measurement and Basis of Payment. Payment will be made at the lump sum price bid for this work. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the project survey and stakeout. Payment will be made in proportion to the amount of the project completed to date as determined by the Engineer.

ITEM 1001 – SITE SIGN

1. Description. The Contractor shall supply and erect two (2) project signs at each project site, according to the following specifications, and as shown by the detail drawings enclosed.  
Size: Four feet (4') by four feet (4'), by three-quarters inch (3/4").
2. Materials.  
Face: 3/4" exterior plywood, shop sanded on one side.  
Supports: 3" x 3" x 12' nominal post.
3. Construction Details.
  - A. Assembly. To be mounted directly to 3" x 3" post, with a 3/9" minimum bolt and nut, four on each side of the sign. Each bolt is to have two washers, one between the sign and the head of the bolt, and the other between the post and the nut.
  - B. Erection. 3" x 3" posts are to be set four feet deep into concrete twelve inches in diameter.
  - C. Paint.
    1. Face: Three (3) coats outdoor enamel, sprayed.
    2. Back: One (1) coat outdoor enamel, sprayed.
    3. Colors: Stark white background;
      - a. "CITY OF BINGHAMTON" in Green
      - b. "MONROE STREET CURBS and STORM SEWER" in Green
      - c. "MONROE STREET CURBS and STORM SEWER" in Black
      - d. "MATTHEW T. RYAN, MAYOR" in Blue
      - e. "Engineering Department, 772-7007" in Blue
      - f. City Skyline logo in Green
      - g. Lettering: Silk screen enamels. Lettering sizes and positioning will be illustrated.
  - D. Location. Shall be determined by the Engineer at the time of construction.

**It shall be the responsibility of the Contractor to maintain this sign for the duration of the project.**

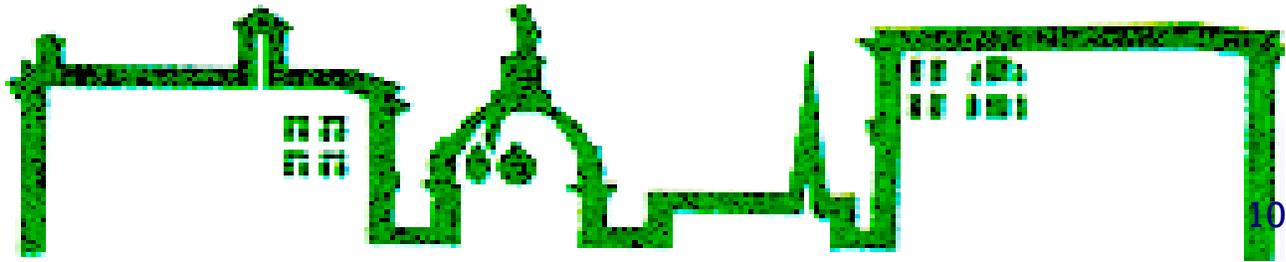
4. Method of Measurement and Basis of Payment. The site sign shall be paid for on the lump sum price bid. The price shall include all materials, equipment, and labor necessary to complete the work.



CITY OF BINGHAMTON - (4" D GREEN)

242

BENNETT AVE RECONSTRUCTION (3" D GREEN)  
(WHITE BACKGROUND)



10" H. GRE

BENNETT AVE RECONSTRUCTION - (3" D BLACK)

MATTHEW T. RYAN - (3" D BLUE)  
MAYOR - (3" D BLUE)

Engineering Department - (2" D BLUE)  
772-7007 - (2" D BLUE)

1<sup>ST</sup> EDITION

ITEM 02221 – DRAINAGE DITCH CLEANING

1. Description. This work shall consist of grading, cleaning and reshaping existing ditches so that adequate, unobstructed free flowing drainage is restored. Limits of work will be determined by the Engineer-in-Charge.
2. Related Work Specified Elsewhere.
  - Item 80M – Medium Stone Fill
  - Item 121A – Topsoil Furnished & Placed
  - Item 123 – Seeding
  - Item 126 – Geotextile
  - Item 209 – Sediment & Erosion Control
  - Item 02002 – Temporary Soil Erosion and Water Pollution Control
3. Execution.
  - A. Existing ditches shall be graded, cleaned and reshaped to provide positive drainage. Ditches shall be cleaned in a workmanlike manner and kept clean for the duration of the contract.
  - B. Excess excavated materials resulting from operations under this section shall be disposed of at off-site location for beneficial reuse, recovery, or recycling purposes.
  - C. Refurbishment of ditches shall be done under Item 80, 80M or 80L Stone Fill (Light, Medium or Heavy, respectively), when so instructed by the Engineer-in-Charge.
  - D. The contractor shall exercise due care to protect all trees, fences, markers, culverts, underground structures, utilities and installations within and adjacent to the work area. Facilities damaged by the Contractors operation shall be replaced in kind at no expense to the City of Binghamton.
4. Payment.
  - A. Method of Measurement: The work under this section shall be measured by the number of linear feet of ditch satisfactorily cleaned and/or regraded.
  - B. Basis of Payment: The unit price bid per linear foot shall include labor and materials necessary to complete the work of this section.  
The unit price bid shall include the cost of loading and disposing of excess material resulting from operations under this section.

ITEM 02222 – CUT AND SHAPE DRAINAGE DITCHES

1. Description. Work under this item shall include cutting and shaping of drainage ditches to provide positive drainage.
2. Related work Specified Elsewhere.

Item 80M – Medium Stone Fill  
 Item 121A – Topsoil Furnished & Placed  
 Item 123 – Seeding  
 Item 209 – Sediment & Erosion Control
3. Execution.
  - A. Cutting and shaping ditches should not proceed until appropriate erosion protection has been installed under Section 290 Sediment & Erosion Control.
  - B. Curt and shape drainage ditches where indicated by the Engineer-in-Charge in order to provide positive surface drainage.
  - C. Excess excavated materials resulting from operations under this section shall be disposed of outside of City of Binghamton property.
  - D. Restoration of cut and shaped ditches shall be done under Item 80M Medium Stone Fill, Item 121A Topsoil Furnished & Placed, Item 123 Seeding.
4. Payment.
  - A. Method of Measurement: The work under this section shall be measured by the number of cubic yards of drainage ditches satisfactorily cut and shaped.
  - B. Basis of Payment: The unit price bid per cubic yard shall include the costs of furnished all equipment, labor, and materials necessary to complete the work of this section.
 

The unit price bid shall include the cost of loading and disposing of excess material resulting from operations under this item.

ITEM 16010 – GENERAL PROVISIONS – ELECTRICAL WORK**PART 1 – GENERAL**1. Documents

- A. All work in this division is subject to the provisions of the General Conditions and specifications of the “General Requirements” for this project.
- B. The Contractor shall refer to the General Conditions and the General Requirements and shall abide by same as integral to this Contract.
- C. Thoroughly study all drawings. Submission of bid indicates that the Contractor has performed this review and accepts responsibility for coordination of the work with that shown for other trades.
- D. Drawings and specifications are complementary when relating to electrical work. Where a discrepancy occurs between drawings and technical specifications, the conflict is to be brought to the attention of the Engineer. For purposes of estimating, the method or installation which is the most expensive is to be priced by this Contractor, unless advised in writing to the contrary by the Engineer. No change Orders will be allowed for the resolution of conflicts, unless the Engineer’s written interpretation modifies the intent of the documents.
- E. The Engineer shall be the sole source for interpretation of the Contract Documents.

2. Scope

- A. The scope of work shall include, but not be limited to, the following:
  - 1. All work as indicated on the drawings and in the specifications.
- B. Include in this bid the cost of all labor, materials, tools, transportation, equipment, insurance, taxes (where applicable), benefits, temporary protection, permits, and all necessary and miscellaneous items required to provide the various systems shown and described, complete and in good operating condition, whether or not all miscellaneous items are specifically described in these specifications or shown on the drawings. The Contractor shall install all work in accordance with applicable codes and shall prepare additional coordination drawings and/or shop drawings as necessary to obtain approval of governing bodies have jurisdiction over this project.
- C. The previously described work is specifically included in this section without limiting the generality implied by these specifications and drawings.

3. Related Work Not Included

- A. The following specific items of work shall not be included under the scope of this section of the specifications:
1. No items are specifically excluded from the work shown on the drawings.

4. Definitions

- A. “Provide”, means to deliver and install, including all labor and material for approved operation.
- B. “Furnish”, “Supply”, or “Deliver” means to deliver to the job site location, unload, and set in a location determined by the Engineer, as required without installation.
- C. “Install”, means to mount and make approved operating connections no matter who provides the related systems, equipment, or devices.
- D. “Equal”, “Approved Equal”, or “Equal as Approved” means equal in the opinion of or approved as equal by the Engineer.
- E. “Approved”, “Acceptable”, or “Satisfactory” means the Engineer’s acceptance of a finished work or stated part thereof.
- F. “Substantial Completion” means that point in time when the Engineer determines that the electrical systems are complete to a point where the Owner can take occupancy and beneficial use of the apparatus. This may be independent from the substantial completion of other portions or the complete scope of the entire project.
- G. “Start of Warranty” means that point in time when the Owner accepts the installation after being certified as complete by the Engineer. A written confirmation of this date will be required to inform the Owner that the warranty on equipment is to begin. The start date of warranties may differ for differing pieces of equipment if in the opinion of the Engineer it is the Owner’s interest to do so.
- H. “Removal” means to disconnect, unhook, remove, and dispose of the referenced item to include dismantling of conduit, removing of existing wires back to a safe point as determined by the Engineer, and dismantling of any support structure, which remains.

5. Codes, Regulations, and Standards

- A. Materials furnished and/or installed under this specification shall conform to applicable requirements of codes, regulations, and standards described herein or otherwise in affect. Any material that is substandard to any of the following shall not be installed, but any material exceeding such requirements shall be used when specified or shown.

- B. All materials and equipment installed shall comply with standards of:
1. National Fire Protection Agency (NFPA)
  2. Local Utilities
  3. Owner's Insurance Underwriters
  4. Applicable Government Agencies and Departments
  5. Underwriters Laboratory (UL)
  6. Federal and State Occupational Safety and Health Act (OSHA)
  7. Local Municipality
  8. Local Fire Department
  9. Americans with Disabilities Act
- C. Equipment standards shall be as follows, unless otherwise specified:
1. Lighting – UL, IES
  2. Motors – NEMA Standards, UL listed, USA Standard 50
  3. Switches – UL, NEMA
  4. Panel boards and breakers – UL
  5. Wire – UL, NEC
- D. Contractor shall also be bound by any local ordinance or regulation, which has jurisdiction over this work.

6. Permits and Fees

- A. It shall be the responsibility of this Contractor to obtain all permits and pay all fees required by any agency having jurisdiction over this project. This shall include, but not be limited to, electrical permits, fees for inspections, and fees required upon submission of drawings for approval by local agencies.

7. Quality Assurance

- A. Install all work true to line and grade, parallel and close to walls, and as direct as feasible while maintaining maximum head room. Do not work across windows, doors, or other openings.
- B. Disconnect switches, transformers, panel boards, starters, and all other equipment shall be accessible for operation, service, or maintenance.
- C. The Engineer may stop the use of any materials or equipment not complying with the drawings or specifications, and may instruct the Contractor to replace all substandard work or materials at no cost to the Owner.

- D. All equipment and systems shall operate under all specified loads without sound or vibration, which is objectionable to the Engineer. Such conditions shall be corrected in an approved manner before the related installation will be accepted.
  - E. All equipment and materials shall be new and without blemish or defects.
  - F. All equipment of one type (such as switchboards, panels, starters, disconnects, etc.) shall be the products of one manufacturer.
8. Examination of Premises and Drawings
- A. Before submitting proposal:
    - 1. Examine all drawings and specifications relating to work of all other trades to determine scope and relation to other work.
    - 2. Examine all existing conditions affecting compliance with plans and specifications by visiting site and or building.
    - 3. Ascertain access to site, available storage, and delivery facilities.
  - B. Before commencing work:
    - 1. Verify all governing dimensions at site and or building.
    - 2. Inspect all adjacent work.
  - C. Tender of proposal confirms agreement by Contractor that site has been visited and existing conditions verified wherever accessible. No consideration shall be granted for alleged misunderstandings due to the failure of this Contractor to visit the site prior to bidding.
9. Obstacles, Interference, and Coordination
- A. General Requirements:
    - 1. Plans show general design arrangement. Install work substantially as indicated. Verify exact location and elevations on the job. **DO NOT SCALE PLANS.**
    - 2. Due to small scale of drawings, it is not possible to indicate all offsets, fittings, or changes in elevations. Adjust installation of conduit, equipment locations, etc. to accommodate work with obstacles and interference's encountered as part of contract.
    - 3. Advise the Engineer in a timely manner of questions on equipment locations, heights, etc.
  - B. Interference:

1. Thoroughly coordinate work with all other contractors and determine exact route or location of each conduit or piece of equipment prior to installation. Maintain maximum headroom wherever possible and obtain special approval before installing any work below 7'-0" clear headroom in mechanical or electrical spaces. Install work so that all equipment is serviceable and operable.
2. Should details, field conditions, changes in equipment, or shop drawing information necessitate an important rearrangement, report same to Engineer and obtain approval before proceeding.
3. Do not install conduit, J-Boxes, electrical devices, equipment below HVAC equipment which needs to be replaced for maintenance, i.e., heat pump, air handling unit, in-line pump, etc.

C. Roughing:

1. Before roughing for equipment furnished by others, obtain approved rough drawings and exact location for each piece of equipment. No not "rough-in" services without approved drawings.
2. Obtain drawings or proper information giving final location of all motor and control connections.
3. Unless otherwise detailed or specified:
  - a. All services shall be concealed in wall above ceilings, etc.
  - b. Work shall be exposed only where approved by the Engineer.
  - c. Notify Engineer if work cannot be concealed, as intended.
  - d. Branch circuits and feeders shall not be installed under floor slab, unless noted on drawings.

D. Coordination with Architectural Drawings:

1. Review all construction drawings, and if necessary, request of other contractors shop drawings to coordinate work. If conflict occurs between electrical drawings and/or other construction drawings, advise Engineer in writing before installation and act in accordance with the Engineer's direction.

E. It is the responsibility of this Contractor and not the Engineer to coordinate the installation of all work in the field.

F. If it should be necessary to remove and/or relocate any material or equipment that has been installed without proper investigations or coordination with the work of other contractors, such materials or equipment shall be removed and relocated without any additional cost to the Owner.

10. Structural Limitations

- A. This Contractor shall be responsible for any damage to any new or existing structure or contents thereof, due to overloading as a result of his work or under his direction. If the Contractor has any doubts about the ability of the structure to withstand his loads, he is to submit the questions in writing to the Engineer for a written response.

11. Scheduling and Procedure of Work

- A. The Contractor, immediately after being awarded the contract, shall prepare and submit to the Engineer an estimated progress schedule for the work. Such schedule shall indicate the dates for starting and completion of significant stages of construction and shall be kept current during the execution of the work. The format shall be in accordance with Division 1, "General Requirement".
- B. The Contractor shall provide and maintain such qualified personnel and equipment as necessary to perform the work in accordance with the progress schedule. It shall be the responsibility of this Contractor to maintain his schedule so as to not to delay the progress of the project or the schedules of other contractors.
- C. Prior to performing any work in an existing structure, the Contractor shall obtain the approval of the Owner to cut into existing circuits.

12. Shop Drawings

- A. Refer to the technical sections hereinafter in Division 16 for items which require submission of shop drawings for review by the Engineer.
- B. For those items so stated, Contractor shall submit the number and type of drawings in Division 1, "General Requirement". After review by the Engineer the sepia or shop drawing shall be returned to the Contractor for his use and distribution as necessary. One copy shall be retained in the records of the Engineer.

13. Submittal of Equipment and Materials

- A. Refer to the technical section hereinafter in Division 16 for items which require submission of catalog cuts or descriptive literature.
- B. The Contractor shall submit the quantity of equipment catalog cuts or descriptive literature as required by Division 1, "General Requirements".
- C. For the items so listed, cuts or literature shall be marked to indicate the following:

1. Function of the equipment to be furnished.
2. Picture of the unit.
3. Ratings, dimensions, and service clearances.
4. Arrangement to be furnished.
5. Electrical or other power characteristics.
6. Data sheets of accessories to be furnished.
7. Operating weight of each equipment unit.
8. Designation of item as shown on the drawings.

D. Use equipment of one manufacturer and type for all similar applications, unless otherwise specified.

14. Subcontractors

- A. Within 14 days of contract award, the Contractor shall submit a list of subcontractors for the Engineer's information. Included shall be the subcontractor's address and phone number. This list shall not be approved or reviewed by the Engineer for acceptability, but shall be retained in his files for coordination purposes.
- B. All provisions of this Contract shall apply equally to the Contractor, his subcontractors, second tier subcontractors, and/or suppliers.

15. Substitutaions

- A. The provisions of the Division 1, "General Requirements", shall prevail for utilization of products considered "OR EQUAL" by the named manufacturer(s) in the technical specifications of Division 16.
- B. The Engineer shall be the sole judge for determining if a submitted product is "EQUAL" to the named manufacturer(s) in the technical specifications.
- C. Equipment substituted for that of the first named manufacturer must conform to the space requirements shown on the drawing. Any substituted equipment that cannot meet space requirements shall be replaced at the Contractor's expense. Any modifications of related systems (electrical, piping, ductwork, etc.) caused by a substitution shall be made at the Contractor's expense.
- D. The cost of redesign for any building component necessitated by the substitution of equipment for the first named in the technical specifications of Division 16 shall be borne by the Contractor making such substitution and shall be included as part of his bid.

- E. Acceptance of substituted equipment by the Engineer does not relieve the Contractor from meeting all requirements of Division 16.
- F. Substitution of equipment, systems, etc., requiring approval of local authorities must comply with such regulations and shall be filed for approval at the expense of Contractor (should filing be necessary). The Contractor in offering substitutions shall hold the Owner and Engineer harmless if the substituted item is an infringement of a patent held by the specified manufacturer.

16. Contractor Supervision

- A. The Electrical Contractor shall assign one or more competent supervisors who shall:
  - 1. Have authority to accept and execute orders or instructions from the Engineer. Such orders or instructions shall constitute due notice when confirmed in writing.
  - 2. Cooperate with the other Contractors, subcontractors, the Engineer, the Architect and the Owner in all matters to avoid conflicts and delays.
  - 3. Make necessary decisions relating to all aspects of Division 16.

17. Temporary Services

- A. Refer to the Division 1, “General Requirements”, for requirements for temporary services.
- B. Design for temporary services shall be the responsibility of the designated contractors. The Engineer shall not be liable for any design or approval of temporary services.

18. Cutting and Patching

- A. For existing buildings, the following requirements shall apply:
  - 1. This Contractor shall do all cutting in existing construction required for his conduit, unless specifically indicated to the contrary on the drawings.
  - 2. Piping penetrations shall be core drilled, unless approval for other means of cutting is obtained from the Engineer.
  - 3. No building structural member shall be disturbed by this Contractor without receiving prior approval of the Engineer.
  - 4. No cutting or core drilling of existing walls or floors shall proceed until the Owner is notified to remove items or equipment, which may be damaged by dust or water.

5. This Contractor shall protect existing finishes from damage due to his cutting operations.
6. After drilling or cutting is complete, this Contractor shall clean the affected area of dust and debris and leave it in a condition similar to that found prior to starting.
7. Core drilled holes shall be sized so that an annular space of not more than 1" is left between the new work and the hole.
8. When openings are cut in lieu of core drilled, sleeves shall be installed in the rough openings by the Contractor for patching later. Sleeves to be sized so that an annular space of not more than 1" is left between the new work and the sleeve.
9. Annular space between conduit or other new work and the sleeve shall be in accordance with Paragraph 1.20 of this section.

B. For new work, the following shall apply:

1. Should changes, omissions, or errors in the Contractor's work or layout require cutting or altering any portion of new construction, such work shall be performed by him at his expense according to the specifications listed above for existing construction.

C. The patching of all work materials disturbed by this Contractor shall be accomplished by tradesmen who normally perform that type of work. The cost of such patching shall be borne by the Contractor who created the opening. Patching shall match as closely as possible the surrounding materials and finishes, and shall be done in accordance with applicable sections of the General Construction Specifications, or as directed by the Engineer. All patches shall be painted by this Contractor to match existing conditions.

19. Sleeves and Chases

- A. Provide sleeves for conduits, bus-ducts, and wireways passing through floors, walls, partitions, ceilings, and roofs of new or existing buildings, unless otherwise shown in the drawings.
- B. Circular sleeves in new construction shall be 20-gauge or heavier, galvanized iron or preformed plastic, filled with sand or other suitable material to maintain their shapes and prevent distortion during construction operations.
- C. Large square or rectangular openings shall be formed with lumber, plastic, or 20-gauge galvanized iron to the dimensions required. Forms shall be suitably braced or filled with sand to prevent distortion during construction operations.

- D. Provide cast iron sleeves with water step flanges when conduit or wireway is required to pass through walls or floors in contact with earth or water, except where below the lowest floor level.
- E. All sleeves, chases, and openings shall be located and sized by the Contractor whose work must penetrate the building elements, but shall not exceed a dimension of 1" beyond each side of the conduit, wireway, or bus-duct shown on the drawings.
- F. Sleeves shall be equal in length to the depth of construction. In waterproof floor construction, sleeves shall extend a maximum of 2" above finished floor level.

20. Flashing and Sealing

- A. Seal as required where conduit, wireway, or bus-duct or other materials pass through or are affixed to general construction.
- B. For waterproof walls, floors, or partitions:
  - 1. The annular space between conduit, wireway, or bus-duct and sleeves or cored holes shall be sealed with Thunderline Corporation "Link-Seal" or approved substitute having equal or superior structural and water-resistant features. In lieu of this, untreated, handpicked oakum may be tamped into the space and sealed with bitumastic, hot pitch, lead, or compressible foamed plastic.
  - 2. Spaces left between conduit, wireway, or bus-duct and formed openings in floors, walls or roofs where sleeving is not practical shall be sealed with 20-gauge galvanized sheet metal closure pieces with openings cut to fit the electrical arrangement. The split sheet metal closure pieces shall be field assembled to fit within 1" of each conduit and shall be embedded in bitumastic or hot pitch and anchored to the floor, wall, or roof construction with galvanized screws and acceptable shields. Closure shall bear on general construction a minimum of 2" in all directions. Openings for conduits shall include a 1" projected lip of 20-gauge sheet metal formed to provide a sleeve around the conduit. Annular space shall then be sealed as specified in the previous paragraph. Joints in the closure pieces shall be field soldered or otherwise sealed to form a watertight barrier.

21. Protection of Materials and Equipment

- A. All material and equipment is, and shall remain, the property of each Contractor or subcontractor until accepted by the Owner or approved for payment. Any loss or damages prior to that time shall be replaced or repaired at no cost to the Owner.

- B. Each Contractor and subcontractor shall diligently:
1. Protect all material and equipment against loss or damage by corrosion, the weather, other trades, foreign matter, or theft.
  2. Keep his material and equipment stored in an orderly manner where it will not interfere with other work.
  3. Move his material or equipment to a new location at his own expense if its presence interferes with other work.
- C. Any material or equipment damaged or corroded may be rejected by the Engineer as unacceptable and shall be replaced at no cost to the Owner.

22. Concrete

- A. All concrete required for thrust blocks, supports, equipment pads, encasement, or inertia pads shall be provided under this Division of the work. Concrete shall have a minimum compressive strength of 3,000 psi and a maximum slump of 6". Forms used for concrete work shall be straight and shall not distort under loading. Equipment pads shall have a chamfer strip included on the top edge to minimize damage to the finished product. Excessive honeycombing or cracking shall be corrected to the Engineer's satisfaction. Equipment pads installed on grade shall have 6" of crushed stone beneath them. Stone shall be provided by this Contractor. Equipment pads constructed on concrete floors shall have anchors drilled into the floor to anchor the pad. Pad height shall be a minimum of 4", or as shown on the drawings.

23. Supports and Anchor Bolts

- A. After thoroughly investigating architectural, structural, mechanical and electrical contract drawings and shop drawings related to how and where equipment is to be supported, the Contractor shall provide:
1. Necessary framing, bolts, inserts, stands, brackets, or other items required for proper support.
  2. Supporting accessories, where required, whether shown or not.
- B. Supports shall be rigid enough to prevent any movement of the mounted equipment and shall be acceptable to the Engineer.
- C. The use of wooden supports shall be unacceptable, unless prior approval of the Engineer is obtained.
- D. Anchor bolts, where required, shall be the length and diameter as shown on the drawings. Anchor bolts shall be set or drilled into concrete pads or walls and shall be protected during construction to prevent damage to threads. The layout

pattern of all anchors required for electrical equipment shall be the responsibility of this Contractor. Anchor bolts, washers, and nuts shall all be *TYPE 304* stainless steel, unless otherwise approved by the Engineer.

24. Painting

- A. In general, painting will be described under other sections of these specifications. Regardless of those sections, it is the responsibility of the electrical Contractor to provide painting of the following items:
1. Touch-up of factory finishes applied to equipment or devices finished under Division 16.
  2. Finish painting of all exposed equipment.
- B. Prime painting shall be accomplished by painting or spraying the surface with modified alkyd rust-inhibitive primer similar to Trnemec 10-99 gray or approved equal. Surfaces shall be cleaned of oil, grease, and similar contaminants prior to application of painting.

25. Identification

- A. Provide identification of equipment and systems in accordance with the following schedule:
1. Panel boards - Identify all lighting or power panels on the interior surface of the door with an engraved plastic nameplate, fastened to the surface with two flat head sheet metal screws. Designation shall match that shown on the drawings. Install a typed directory of the breakers in the pocket provided.
  2. Contractors disconnect switches – Identify with an engraved plastic nameplate fastened to the front of the device with two flat head sheet metal screws.
  3. Buried conduit – On the top of the sand bed, place a continuous fabric marker, made of plastic or other non-destructible material, with the words "CAUTION – ELECTRICAL WIRES".
- B. All nameplates shall be a minimum of 1" x 3" lamicoïd signs, white with black letters, a minimum of 1/4" high. Plates shall have mastic on the back and two screw holes for mounting hardware.

26. Testing

- A. Testing procedures for each piece of equipment, apparatus, or system shall be as stated in the technical sections of Division 16.

- B. All costs associated with testing and verifying electrical equipment operation shall be borne by the Contractor, including water, power, independent agency fees, wages and expenses of manufacturer representative, and standby labor.
- C. All tests shall be performed by the Contractor in the presence of the Engineer. A five-day notice to the Engineer concerning scheduled tests shall be required of the Contractor.
- D. At the completion of each test, a written report or documentation shall be prepared by the Contractor or his agent and forwarded to the Engineer for this evaluation and acceptance.
- E. No system, equipment, or installation shall be accepted for use by the Owner until all specified testing has been accomplished to the satisfaction of the Engineer.

27. Cleaning

- A. Prior to acceptance by the Owner, all new equipment, material, conduit, wireway, bus-duct, or other items provided under Division 16 shall be swept, vacuumed, or wiped clean by the Contractor and left in good condition. This shall include, but not be limited to, horizontal ledges, conduit, tops of bud-duct, top of equipment, interiors of enclosures such as control cabinets or panel enclosures, transformers, control devices, disconnects, starters, motor control centers, and instruments. In addition, all light fixture lenses shall be cleaned on the inside and outside and left in spotless condition.
- B. Failure to perform this cleanup in a timely manner will result in the work being done by the Owner with the resultant cost deducted from the contract amount.

28. Operating Instructions

- A. At the time of occupancy by the Owner, whether partially or totally, the Contractor shall provide to the Engineer, three (3) copies of operating and maintenance data, bound into hard cover binders with the Contractor's name and project description affixed to the front cover. Manuals shall be divided into sections by equipment with each section identified by a tab index.
- B. For each piece of equipment provided under Division 16, the following data shall be included:
  - 1. Manufacturer's printed instructions for installation, operation, maintenance, and replacement parts.
  - 2. Wiring diagrams.
  - 3. Lubrication charts and instructions, including a list of oils and greases.
  - 4. Equipment test reports.

5. Shop drawings, when required by the technical specifications.
  6. Manufacturer's material or equipment guarantees, made out to the Owner.
  7. Fuse sizes.
  8. Inspection reports.
  9. Copies of record submittals, when required by the specifications.
- C. Standard Manufacturer literature included in the O&M Manuals shall be marked to indicate the specific model or unit supplied for this project.

29. Start Up

- A. The Contractor shall be responsible to schedule all start-up of all electrical equipment and assume all associated costs, including wages and expenses of manufacturer's representatives.
- B. Where required by the technical specifications, the manufacturer's authorized representative shall be present at the time of equipment start-up and shall be responsible for conducting all tests and certifying the results.
- C. After all systems have been started and checked out by the Contractor, the Engineer shall be notified by the Contractor that his tests are complete and the Engineer can begin his inspection and verification procedures. The Contractor shall provide whatever labor and material is necessary to aid the Engineer in completing this task.
- D. After verification by the Engineer that the installation is acceptable and can be transferred to the Owner, the Contractor shall provide the services of qualified people to instruct the Owner's representative or custodial force in the operation of each partial or complete system or piece of equipment. Advance notice of at least 48-hours shall be given to the Owner and Engineer prior to the scheduling of this instruction period. The Engineer reserves the right to postpone acceptance of any equipment for which the Owner has not received instructions.

30. Guarantees

- A. It is understood that the Contractor shall immediately respond to all calls from the Owner or Engineer to correct any deficiencies found during the guarantee period and shall immediately correct them at no cost to the Owner.
- B. It is also understood that certain maintenance items are not part of the guarantee and are the Owner's responsibility during the first year. These include, but are not limited to:
  1. Lubrication of rotating parts.
  2. Cleaning of light fixture lenses.

3. Scheduling of operating times.
  4. Replacement of blown fuses, unless associated with equipment failure during warranty period.
- C. If, in the opinion of the Engineer, a Contractor's callback is the result of lack of maintenance by the Owner or is due to actions of others beyond the Contractor's control, repair or correction will not be required, unless authorized by the Owner as work additional to the original contract. In this case, a written decision will be rendered by the Engineer.
31. Record Drawings
- A. The Contractor shall comply with the provisions of Division 1, "General Requirements", with regard to maintaining and providing Record Drawings.
  - B. In addition, any field changes to wiring diagrams, control sequences, or manufacturer's standard equipment shall be recorded in the published literature for that item and a copy placed with the apparatus in the field.
32. Coordinated Drawings
- A. None required for this project.
33. Method of Measurement and Basis of Payment
- A. Pay Under Item 16400.

## ITEM 16100 – BASIC MATERIALS AND METHODS FOR ELECTRICAL

### **PART 1 – GENERAL**

#### 1. Scope

- A. This section covers the basic materials and methods to be used for the electrical systems.

#### 2. Description

- A. For each electrical system, provide all labor, tools, materials, and equipment necessary for the installation of wiring, conduit, devices, and other miscellaneous devices covered by this section.

#### 3. Quality Assurance

- A. Listed below are references to the specification standards of recognized authorities to which conduit, wiring, and other electrical apparatus must conform to be acceptable. All references shall be the latest edition in force at the time of bidding.

NEC – National Electrical Code

NEMA – National Electrical Manufacturers Association

NFPA – National Fire Protection Association

UL – Underwriters Laboratory, Inc.

#### 4. Submittals

- A. The following items are to be submitted to the Engineer for review prior to ordering or installing. Refer to the General Provisions for specific submission instructions.

1. Fuses
2. Wiring Devices
3. Fusible Disconnect Switches
4. Time Switches
5. Photo Controls
6. Weather Tight Enclosure
7. Precast Hand Holes
8. Marking Tape

### **PART 2 – PRODUCTS**

#### 1. Raceway Systems

- A. Rigid Steel Conduit (RSC)
1. Conduit:
    - a. Hot dipped galvanized, electro-galvanized, or sheradized, furnished in standard 10-foot lengths, including a coupling with each length.
    - b. Acceptable manufacturers are Allied, Triangle, Youngstown, Jones & Laughlin, Republic, Pittsburgh Standard or Wheatland.
  2. Fittings and Couplings:
    - a. Threaded galvanized, malleable iron.
    - b. Supplied by same manufacturer as conduits.
    - c. Sweep elbows to be factory made, NOT field fabricated.
  3. Nipples:
    - a. Galvanized steel, factory made.
  4. Locknuts:
    - a. Plated malleable iron.
  5. Bushings:
    - a. Malleable iron with insulated insert.
  6. Unions (Erikson Couplings)
    - a. Plated malleable iron.
  7. Expansion Couplings:
    - a. Weatherproof, plated malleable iron, 4" movement with bonding jumpers.
    - b. Crouse-Hinds XJ or O-Z/Gedney Type AX.
  8. Condulets:
    - a. Cast metal; lacquer protective coating with galvanized sheet steel covers attached by screws or clog devices.
- B. Electrical Metallic Tubing (EMT)
1. Conduit:
    - a. Galvanized steel, industry standard, thin wall conduit.
  2. Fittings and Couplings:
    - a. Compression or set screw type zinc plated steel.
    - b. Elbows to be factory made or field bent in accordance with NEC.
  3. Conduits:
    - a. Cast metal; lacquer protective coating with galvanized sheet steel covers attached with screw or clog devices.
- C. Rigid Plastic Conduit – PVC
1. Conduit:
    - a. Rigid polyvinyl chloride, schedule 80, high impact, rated for 90°C for use in direct sunlight, conforming to UL Standard UL-651.
  2. Fittings and Couplings:

- a. Fittings and couplings to be solvent weld manufactured by the supplier of the conduit.
- b. Provide solvent as recommended by the conduit manufacturer.
- 3. Acceptable Manufacturers:
  - a. Pittsburgh Standard
  - b. Carlon
  - c. Or Approved Equal.

D. Wireway – Steel

- 1. Auxiliary gutters or wireways shall be formed heavy gauge sheet with baked enamel finish.
- 2. Covers shall be screw type NEMA 1, unless otherwise specified or required by code.
- 3. Acceptable manufactures shall be:
  - a. Keystone
  - b. Square D
  - c. G.E.

2. Boxes

A. Outlet Boxes:

- 1. Galvanized sheet steel.
- 2. Covers:
  - a. As required by device or equipment mounted on box.
  - b. Blank covers for boxes with no device or equipment mounted on box.
- 3. Minimum depth 1-1/2”.
- 4. Make:
  - a. Appleton
  - b. Crouse Hinds
  - c. General Electric
  - d. Pyle-National

B. Pull and Junction Boxes:

- 1. Galvanized or baked enamel sheet steel
- 2. Covers:
  - a. Flat: Attach with a minimum of four screws.
  - b. Galvanized or baked enamel steel to match box.
  - c. Make: Same as outlet boxes.

C. Precast Handholes:

1. Weatherproof, fiberglass exterior boxes.
2. Size 10" x 15" x 18" deep.
3. Heavy duty design.
4. Covers:
  - a. 1-3/4" thick bolt down fiberglass cover with skid resistant surface.
  - b. Flat: Attach with a minimum of four (4) stainless steel screws.
  - c. To match box. The words "electric" shall be cast on the cover.
5. Design based on CDR system.

### 3. Conductors

#### A. Building Wire

1. Conductor:
  - a. All conductors shall be annealed uncoated copper, 98% conductivity, #10 AWG and smaller solid #8 AWG and larger stranded.
  - b. Aluminum conductors shall only be allowed for feeders when called for on the drawings.
    - 1) The conductor shall be AA-8000 series electrical grade aluminum alloy material stranded.
2. Insulation:
  - a. UL type THHN or THWN 75°C for #8 AWG and smaller in all locations, unless otherwise shown on drawings or specified below.
  - b. UL type THW or THWN 75°C for #6 AWG and larger.
  - c. UL type THW or THHW 90°C for #8 AWG and smaller in Mechanical Rooms adjacent to heating pipes and other locations where excessive heat exists.
3. Manufacturers:
  - a. Essex Group
  - b. BICC General
  - c. Pirelli Cable
  - d. Rome Cable
  - e. Southwire
4. Aluminum Conductor Termination:
  - a. Aluminum feeders shall be terminated with compression type fittings, i.e.: copper tails.
  - b. Manufacturers: AMP, Bundy, Thomas & Bello, and IlSCO.

#### 4. Wiring Devices and Cover Plates

##### A. Toggle Switch (20 amp):

1. AC type, back, and side wired, specification grade, on piece rivetless spring contact arm, UL listed, silver cadmium oxide contacts, automatic ground clip ears, rated for 20 amps, 120-277V, Ivory color.
2. Equivalent to Hubbell 1221-1.

##### B. Ground Fault Interrupter Receptacle (20 amp):

1. Duplex, straight blade, specification grade, pre-wired with #14 AWG leads, UL listed, high impact nylon face, ivory color, complete with "Test" and "Reset" buttons, rated for 20 amps, 120V. Include nylon wall plate to match.
2. Equivalent to Hubbell GF – S3621.

##### C. Stainless Steel Switch Cover:

1. Type 302 stainless steel, smooth style, satin finish, equivalent to Hubbell S series. Provide a single, multi-gang plate for multiple devices at one location.

##### D. Stainless Steel Receptacle Cover:

1. Type 302 stainless steel, smooth style, satin finish, equivalent to Hubbell S series. Provide a single, multi-gang plate for multiple devices at one location.

#### 5. Switching and Protective Equipment

##### A. Fusible Disconnect Switches:

1. Quick make, quick break, heavy duty fusible disconnect switch with defeatable cover-interlock, lockable OFF position, poles as required by load, NEMA 1 enclosure, unless otherwise noted on the drawings.
2. Rating to be 480/250V, with current carrying capacity as shown on the drawings.
3. Fuse clips UL rejection type to reject all fuses except Type R. The UL listed short circuit rating of the switches shall be 200,000 RMS symmetrical amperes when class R fuses are used.
4. Equivalent to Square D, Type H, with rejection fuse clips.

##### B. Low Voltage Fuses (0-600 amps):

1. All fuses on this project shall be of the same manufacturer.
2. All fuses shall have a 200.00 ampere interrupting rating.
3. Fuses shall be UL Class "RK-1"
  - a. Dual element, time-delay and current limiting.
    1. The overload element shall include a spring activated thermal element having a 284°F melting point alloy with a minimum 10-second delay at 500% of rated current.
    2. Short circuit element, 200,000 amps interrupting rating, with silver links for very high-speed response and current limitation, in a separate compartment.
4. The fuses shall be Bussman LPN-RK for 250V and LPS-RK for 600V or approved equal that meet the above specification.
5. If fuse size is not shown on the drawings, fuses shall be sized by the Contractor not to exceed 125% of motor full load amperes for 1.15 service factor motors and 115% for 1.00 service factor motors.

6. Starters and Contractors

- A. None required for this project.

7. Structural Supports

- A. 1-5/8" x 1-5/8" channel roll from 12-gauge strip steel.  
 B. Ninety-degree angle fittings, nuts, stud nuts, screws, etc., as required.  
 C. Hot dipped galvanized finish.  
 D. Equivalent to Unistrut P-1000 channel and fitting.

8. Specialty Items

- A. Time Switches:

1. Clock
  - a. Astro dial, control shall adjust for seasonal changes (lighting)
  - b. Seven (7) day dial and day-omitting device (mechanical controls).
  - c. Powered by a self-starting synchronous motor.
  - d. Removable on-off trippers shall make possible a minimum on period of twenty minutes and a minimum of two-hours between one off operation and the next.
2. Contacts:
  - a. Shall be capable of switching 40 amperes per pole continuously at 277V, SPDT.
3. Terminals:
  - a. Shall be capable of receiving #8 AWG wire.

4. Enclosure:
  - a. Shall be NEMA 1 surface mounted finished with baked epoxy enamel with 1/2", 3/4" knockouts on bottom, both sides, top and back. Provisions shall be made for positive padlocking.
5. Make:
  - a. Tork Z series: Astro Dial
  - b. Tork W series: Seven (7) day dial
  - c. Paragon 4000 series: Astro dial
  - d. Paragon 7000 series: Seven (7) day dial

B. Photo Controls

1. Capacity:
  - a. 2000 watts 16.6 amps tungsten at 120V 60 Hz AC.
2. Contacts:
  - a. SPST normally closed snap action prevents possibility of chatter.
  - b. Fail-safe load shall remain on in case of cell failure.
3. Photo Cell:
  - a. Hermetically cadmium sulfide cell operating in temperature range of -30°F to +158°F.
  - b. Built-in minimum time delay of 10 seconds prevents false switching due to light for vehicles, lighting, etc.
  - c. Operating levels 2 to 10 foot candles easily field adjustable by a sliding bar, for earlier or later turn on or off.
4. Enclosure:
  - a. Weatherproof die cast housing with 1/2" nipple, meets UL rain-tight standards.
5. Make:
  - a. Tork 2101 120V.
  - b. Paragon CW201-00 120V.

C. Weather Tight Enclosure:

1. Designed to enclose electrical and/or electronic equipment and protect against harsh, industrial environments.
2. NEMA 4X.
3. Formed 14-gauge steel.
4. Smooth, continuously welded seams ground smooth.
5. Door stiffeners.

6. Formed lip on enclosure to exclude flowing liquids and contaminants.
7. Oil resistant gaskets permanently secured.
8. Collar studs provided for mounting inner panel.
9. Includes hardware kit with panel mounting nuts and sealing washers for wall mounting holes.
10. Bonding stud provided on door and grounding stud installed in enclosure.
11. Doors are secured with a three-point handle and bracket for padlock.
12. Hinges are constructed from 304 stainless steel.
13. Visible hardware is zinc diecast with black epoxy finish.
14. Hinge pins are stainless steel.
15. Finish: Cover and enclosure are finished in recoatable smooth ANSI/ASA 61 black powder coating.
16. Accessories: Touch-up paint.
17. Size 60" wide x 36" tall x 12" deep.
18. Designed for mounting to concrete base.
19. Design based on Hammond enclosure.

D. Marking Tape:

1. Tape shall be continuous, yellow in color, fabricated from plastic or other non-destructible material, with the words "CAUTION – ELECTRICAL WIRES".

### **PART 3 – EXECUTION**

1. Raceway Installation

A. Usage:

1. Rigid Steel Conduit
  - a. All exteriors exposed raceways.
  - b. All interiors exposed raceways subject to mechanical injury or damage.
2. Rigid Plastic Conduit
  - a. Exterior raceways below grade and/or below slabs. No exposed usage, unless called for on plans.
3. Liquid Tight Flexible Metal Conduit
  - a. Short (6 foot or less) flexible connections to equipment and lighting fixtures in wet or damp locations, in vaults or equipment cabinet only.

B. General Requirements:

1. Plug openings until wire is installed.
2. Field Modifications:
  - a. Cutting by hacksaw, ream.
  - b. Cut tapered threads into rigid steel conduits.
  - c. Bend without reduction in internal diameter.
3. Raceway fittings for Wire Pulling:
  - a. In exposed raceway installations only as required by location.
  - b. Supported by raceway.
  - c. Opening in position to make wire installation easily.
  - d. Size and shape as required by raceway installation.
4. Pull and junction boxes, as required for number and sizes of raceway and wires entering.

### C. Special Requirements

1. For Rigid Conduit:
  - a. Threads to be cut square and tapered.
  - b. Utilize threaded couplings and make all joints up tight for a continuous low impedance ground return. Where “one-way” turning is not practical for making tight joints, utilize “Erickson” type couplings. Exclude running threads, split couplings, and threadless couplings.
  - c. Make up tight to boxes, enclosures, and cabinets utilizing double locknuts.
  - d. Utilize bakelite or plastic bushings at all terminations, both free standing and within boxes, enclosures, and cabinets.
  - e. Minimum size to be 3/4".
  - f. Provide supports at a minimum of 10-feet on center or in accordance with Table 346-12 of the NEC. Provide a support within three feet of each outlet box, junction box, cabinet, or fitting.
2. For Rigid Plastic:
  - a. Install in accordance with manufacturer’s recommendations.
  - b. Provide supports in accordance with Table 347-8 of the NEC and within three feet of each outlet box, junction box, cabinet, or fitting.
  - c. Do NOT use in boiler rooms, in plenum ceiling spaces, or in areas subject to ambient temperature over 100°F.

## 2. Precast Hand Holes

- A. Install hand holes on a gravel base so they are level and plumb. Maintain grades as shown on the drawings and as required by the NEC.
- B. Backfill around hand holes using excavated materials in accordance with other sections of these specifications.
- C. Seal around all conduit entrances with cement mortar to securely anchor raceway.
- D. Set frame and cover flush with finished grade. Raise frame with brick and mortar to meet this requirement. Secure in place with cement mortar.

## 3. Wire and Cable Installation

### A. General

- 1. Minimum conductors for power wiring shall be #12 AWG and minimum for control wiring shall be #14 AWG, unless otherwise shown or specified.
- 2. Neutral conductors shall be the same size as line conductors. All lighting circuits with electronic ballast shall have a neutral for each phase conductor.
- 3. Conductor color-coding shall provide circuit leg continuity with solid colors as follows:
  - a. Phase Conductors shall be the color as designated for the full length for conductors #8 or smaller. Conductors #6 and larger shall be wrapped with tape of the corresponding color at all parcels, 3-boxes, wireways, disconnects, starters or any other place the conductor is exposed.
    - 1. System phase conductors with nominal operating voltage of 208V/120V.
      - A – Black
      - B – Red
      - C – Blue
  - b. Neutral conductors only shall be white or natural gray.
  - c. Grounding or bonding conductors only shall be green or bare wire.
- 4. Conductor Sizing:
  - a. All conductors shall be sized per minimum requirements of NEC, unless otherwise shown on plans.

- b. All conductors exceeding 100 L.F. to the first device shall be sized per NEC, limiting voltage drop to 3% or less.
- 5. Wire and cable shall be neatly grouped and supported with D-rings. Wire and cable shall not be wrapped around pipes, pipe supports or other mechanical systems.
- 6. MC Cable shall be trimmed prior to connection. Excess cable left coiled above a ceiling, in a wall or laying on top of ceiling tiles is unacceptable.

#### 4. Electrical Termination

- A. All electrical terminations 100 amps and larger must be tightened to the manufactures prescribed torque value, in accordance with NEC 110 3 (b).
  - 1. When the equipment manufacturer has no published table of torque values for his equipment, the following recommended torque values for main C/B or lugs shall be used:

##### PANELS THROUGH 125A

#6-4 AWG 35 IN-LB  
#3-2/0 AWG 50 IN-LB

##### PANELS THROUGH 150-225A

#3-1 AWG	125 IN-LB
#1/10-2/0 AWG	150 IN-LB
#3/0-4/0 AWG	200 IN-LB
250-450 MCM	250 IN-LB
500-750 MCM	300 IN-LB

- 2. When the amperage ratings of terminations exceed the above schedule or the termination is not in a panel, the following schedule shall be used. This schedule is based on the size of the bolt head or socket.

<u>SOCKET SIZE</u> <u>ACROSS FLATS (INCHES)</u>	<u>TORQUE</u> <u>(LB – IN)</u>
1/8	45
5/32	100
3/16	120
7/32	150
1/4	200
5/16	275
3/8	375
1/2	500
9/16	600

- B. This Contractor shall include with his request for final payment a signed statement that all electrical terminations have been torque to the prescribed values.
- C. The manufacturer's torque value requirements shall be made part of the operation and maintenance manuals prepared by this Contractor.

5. Grounding

- A. Unless otherwise shown or specified, all circuits and equipment grounding shall conform to NEC Article 250. This shall be supplemented but not superceded by the following detailed requirements:
  - 1. Enclosures, cases, mounting frames, etc., of all circuit control devices, motors, and electrically operated equipment shall be connected to a source ground.
  - 2. No system neutral or any current carrying conductor shall be used for grounding.
  - 3. When shown on the drawings, a separate equipment-grounding conductor shall be installed in the raceway with the circuit conductors and shall be terminated at the ground but in the panel. Isolated ground circuits shall have an insulated grounding conductor terminated on isolation ground bars in panels, which shall have insulated grounding conductors to the main service ground.

6. Wiring Device Installation

- A. Local Switches:
  - 1. Mounting height to centerline of box above finished floor to be 45”.
  - 2. Locate on strike side of doorways.
  - 3. Provide cover plate firmly held in place with screws. Adjust as necessary to eliminate gaps behind plate.
  - 4. Switch plate shall be plumb and level. Contractor shall adjust box as necessary to meet this requirement.
  - 5. The location of any switch may be changed a distance not to exceed six feet from plan location, before work is actually in, at no additional cost to the Owner.
- B. Wall Receptacles:
  - 1. Mounting height to centerline of box above finished floor to be 18”, unless otherwise designated on the drawings.
  - 2. Provide ground fault interrupter receptacles where shown on the drawings or required by NEC. Computer outlets shall be isolated ground type.

3. Provide cover plate firmly held in place with screws. Adjust as necessary to eliminate gaps behind plate.
4. Cover plate shall be plumb and level. Contractor shall adjust box as necessary to meet this requirement.
5. The locations of any receptacle may be changed a distance not to exceed six feet from plan location, before work is actually in, at no cost to the Owner.

7. Switching and Protective Equipment Installation

A. Disconnect Switches:

1. Disconnects shall be mounted so they are plumb and level. All disconnects must be accessible for servicing.
2. Follow code requirements of NEC for locating disconnect switches.
3. For disconnects with fuses (when applicable), fuses shall not be installed until equipment is ready to be energized. All fuses shall be furnished and installed by this Contractor regardless of who provides the disconnect switch. All fuses shall be of the same manufacturer.

8. Starters and Contactors

- A. Does not apply to this project.

9. Structural Support Installation

- A. Provide where required for supporting lighting fixtures, supporting equipment, trapeze handers, etc.

10. Installation of Specialty Items

A. Time Clock:

1. Install where shown on drawings.
2. Securely anchor box to wall or other supports.
3. Box shall be plumb and level.
4. Mount where access can be assured and not subject to interfere with other devices.

B. Photo Control:

1. Install where shown on drawings.
2. Insure proper orientation with light source as recommended by the manufacturer.

C. Marking Tape

1. Install tape 3" above conduit, directly above raceway or cable. Tape shall be continuous. Overlap joints a minimum of 12".

11. Tests

- A. Testing shall be limited to operational testing of all new work.

12. System Cleaning

- A. After completion and prior to acceptance by the Owner, all boxes, outlets, and devices shall be cleaned of debris and shall be wiped down to remove all dust, grease, and other foreign matters.

13. Identification

- A. Refer to the General Provisions for electrical work for identification requirements.
- B. In addition, all conduit containing voltage in excess of 600V shall be labeled with the words "DANGER - HIGH VOLTAGE" every 50 feet.

14. Spare Parts

- A. Fuses:
  1. A complete set of spare fuses shall be purchased at the same time the initial fuses are purchased. Spare fuses shall consist of 10% of each type and rating or a set of three, whichever is greater.
  2. Spare fuses shall be turned over to Owner.
  3. Deliver to Owner and obtain a signed receipt with itemized listing. Forward a copy to the Engineer.
- B. Ballasts and Lamps:
  1. The Contractor shall provide the following spare ballasts and lamps:
    - a. 250W Streetlight
      1. One (1) ballast
      2. Two (2) lamps
    - b. 100W Pedestrian Light
      1. One (1) ballast
      2. Two (2) lamps

15. Method of Measurement and Basis of Payment

- A. To be paid for under Item 16400.

## ITEM 16400 – DISTRIBUTION AND SERVICE

### **PART 1 – GENERAL**

#### 1. Scope

- A. This section contains specifications for materials and methods of installation for distribution and service operations. Refer to Item 16010 and 16100 for specifications for basic materials such as raceways, conductors, and switching devices.
- B. This section shall include all materials, equipment and labor required, including conduit, pull boxes, junction boxes, conductors, complete control panels with necessary equipment and hardware, and conduit excavation, backfill required to satisfactorily install street and pedestrian traffic control system power supply at the locations shown on the plans and as specified in the contract documents.

#### 2. Description of Service

- A. The character of the service shall be as follows:
  - 1. 208/120V, wye, 3 phase, 4 wire.
- B. The source for electrical energy for this project shall be as follows:
  - 1. NYSEG.
- C. Metering for the service shall be as follows:
  - 1. Furnish and Install power disconnect switch.
  - 2. Socket style meters
  - 3. Meters by utility company.

#### 3. Quality Assurance

- A. Listed below are references to the specification standards of recognized authorities to which service gear, panel boards, main switches, and motor control centers must conform to be acceptable. All references shall be the latest edition in force at the time of bidding.

NEC – National Electrical Code

NEMA – National Electrical Manufacturers Association

NFPA – National Fire Protection Association

UL – Underwriters Laboratories, Inc.

**PART 2**1. Grounding

- A. All grounding shall be in strict compliance with Article 250 of the national Electrical Code and with utility company standards.
- B. Grounding system shall have a grounding resistance of 10 ohms or less. Provide additional ground rods as and if required to achieve this.
- C. Tested in accordance with method described in National Electric Safety Code.
- D. Approved Method of Connections:
  - 1. All joints and connections to ground rods, ground cables, bonding cables, etc. (both below and above grade) shall be made by molded fusion welding process; Cadweld, Thermoweld. All connections to water pipes, etc. shall be by means of mechanical lugs securely fastened using silicone bronze hardware.
- E. Metallic, non-current-carrying metal enclosures: Connect to ground at service entrance equipment through conduit system using proper fittings at junction boxes and expansion joints.

2. Testing

- A. Contractor shall provide a Meggar test of service equipment and feeders prior to energizing.
- B. Meggar testing shall be done with a Meggar suitable for the rating of the cable.
  - 1. Test shall be applied for 60 seconds with readings taken at 30, 45, 60 seconds.
  - 2. Minimum acceptable test 10 megohms adjusted for temperature and humidity.
  - 3. Record ambient wet and dry bulb temperatures on day of test.
  - 4. The results of Meggar testing shall be recorded and included in the operational manual.
- C. Cable shall be tested to 125% of operating voltage.
- D. Load Test:
  - 1. Conduct load test prior to request for final acceptance, maximum simultaneous normal light and power load. Test for continuous period of two (2) hours, when directed.
  - 2. Record during load test:
    - a. Voltage at service and each panel.

- b. Current on each leg of all feeders.
3. Have Engineer witness test.
4. Reconnect as directed to provide balanced load on all feeders.
5. Provide and install all necessary meters, etc.

3. Method of Measurement and Basis of Payment

- A. The lump sum bid price to be paid for under this item will include all labor, materials and equipment necessary to complete the work.

EXCAVATION - General Specification

- A. Work. This Item is not a measurement or payment item. Its procedures shall apply, in general, to all Excavation and earthwork operations. Where more stringent requirements exist in the specification for the pay item, the pay item specification shall govern.

The Contractor shall remove all rock, earth, and other material required by the plans and as ordered by the Engineer. He shall dispose of this material as required by the various items of this Specification, or otherwise dispose of the material in spoil areas.

The Contractor shall conduct all excavation operations in a safe and prudent manner in order to avoid damage to private property and utilities and to vegetation outside of the grading limits. All damages caused by the Contractor's operations shall be repaired by the Contractor at his own expense and to the satisfaction of the Engineer. No direct payment will be made for any precautionary measures. The cost of these measures shall be included in the price bid for the applicable excavation item.

Topsoil shall be removed in accordance with the methods outlined under the paragraph, "Topsoil." Unsuitable material shall be excavated within the road section to the depths ordered. The entire length of the roadway, ditches, side slopes, highway junctions and driveways shall be graded to the required lines and elevations and within the tolerances specified under the various contract items. The preparation of the embankment foundations and the placing and compacting of the excavated materials, including any borrow that may be required, shall be included in the work to be done. All culverts shall be cleaned. Old foundations, floors, and structures shall be completely demolished and all objectionable material removed from the entire highway except as provided for under other items or as shown on the plans.

Where the alignment of the existing highway is changed, the Contractor shall excavate, and place or cover with suitable material and regrade, as directed, all or part of any existing old road metal lying outside of the area of the pavement under construction unless otherwise directed by the Engineer.

Grading operations shall not be started until the Engineer is satisfied that sufficient equipment is available to perform the work properly. Grading operations shall not be performed from November 1 to April 1, except with written permission of and under such special conditions and restrictions as may be imposed by the City Engineer.

- B. Excavation and Disposal. All suitable materials from the excavation shall be placed in roadway embankments and at such other places as called for on the plans. "Topsoil" and "Unsuitable Material" shall be disposed of as described under their respective paragraphs. Structure excavation or trench and culvert excavation shall be disposed of as directed and will be paid for under their respective items.

Any surplus suitable materials shall be used for flattening the embankment slopes, or shall be deposited in spoil areas within the right-of-way as designated by the Engineer or in spoil banks, not visible from the highway, provided by the Contractor at his expense. No additional payment will be allowed for such disposal. Before laying the pavement at any location, the Contractor shall remove and dispose of all surplus material within reasonable limitations of pavement operations.

When the Contractor elects to stockpile any portion of the excavated suitable material for later use under the same item, or for disposal, no extra payment will be made for placing the material in stockpiles or removing material from stockpiles for its disposal or use, the cost of such shall be included in the price bid for excavation.

Excavated materials when suitable may, with permission of the Engineer, be used in other items of the contract. In such cases, the Contractor shall furnish at his own expense an amount of satisfactory material equivalent to that which the excavated materials would occupy in the embankments. Payment will be made for the excavation of borrow made necessary for the substitution and replacement of materials.

Where Contractor is required to saw cut exiting pavement to install utilities, he shall not saw cut more than 400 L.F. of a trench without physically verifying the utility location.

- C. Topsoil. Topsoil shall be considered and the surface layer of soil and sod suitable for use in seeding and planting. It shall contain no admixture of refuse or any material toxic to plant growth, and shall be free from subsoil and stumps, roots, brush stones, clay lumps or similar objects larger than two inches in greatest dimension.

The required amount of suitable topsoil called for on the plans for topsoiling, including sod within the road section, shall be removed by excavations, stripping or other approved methods from those areas shown on the plans or as designated by the Engineer. The depth to which topsoil is removed shall be determined by the Engineer. Topsoil shall be removed before other excavation is commenced.

Payment for material designated as topsoil and materials which are used as topsoil in the contract shall be made (1) under unclassified excavation; and (2) under the appropriate topsoil item.

Payment for topsoil materials not required for use as topsoil in the contract which is excavated or stripped in accordance with these specifications shall be paid for only as unclassified excavation.

In areas where the topsoil is not required for use as a contract item, the following procedures shall apply:

1. Where the final grade is less than six feet above the original ground surface, sod and topsoil shall be stripped as shown on the plans or as directed by the Engineer and disposed of in spoil banks, not visible from the highway, provided by the Contractor at his own expense, or incorporated in the construction as designated on the plans. No extra payment will be made for any stockpiling or rehandling, except that designated and used as topsoil. The cost of disposal of stripped material, other than that designated and used as topsoil shall be included in the price bid for excavation.

Where the final grade is six feet or more above the original ground surfaces, no removal of sod or topsoil will be required unless ordered by the Engineer.

2. When topsoil is within the area of the spread of branches and shrubs to be saved, topsoil shall be stripped unless otherwise directed. Topsoil intended for the topsoil item shall be kept separate from all other classes of excavated material and shall be stockpiled in approved locations within the limits of the right-of-way. Unless otherwise approved, such stockpiles shall contain not less than four feet and be trimmed in a workmanlike manner to fairly uniform surfaces and slopes. The cost of removing and stockpiling topsoil will be paid for at the price bid for "Excavation."
3. Where an embankment is to support a bridge substructure, regardless of the height of fill, the topsoil shall be removed from the area under the embankment beneath the footing, and from an additional area which shall extend horizontally in each direction for a distance of fifty feet from the outer limits of the footing.

- D. Unsuitable Material. The Contractor shall remove all humus, spongy material, roots, stumps, and any other objectionable materials as directed by the Engineer. The Engineer shall be the sole judge of what constitutes unsuitable material. The Contractor shall also remove all peat, and other organic swamp deposits to the payment limits as shown on the plans, cross section, or as established by the Engineer prior to such excavation. No reimbursement will be made for any excavation or approved backfill in excess of such payment limits. Unsuitable materials shall be placed in spoil banks, not visible from the highway, provided by the Contractor at his expense, or incorporated in the construction as designated on the plans. No extra payment will be made for any stockpiling or rehandling of unsuitable material, the cost of such shall be included in the price bid for excavation.
- E. Ditching and Grading. The Contractor shall provide and maintain slopes, crowns, and ditches on all excavations and embankments to insure satisfactory drainage at all times. If it is necessary to interrupt existing surface drainage, sewers, or underdrainage, then temporary drainage facilities shall be provided until the permanent drainage work is complete. The construction of all temporary drainage facilities shall be considered as incidental to the construction of the project and no additional payment will be allowed. Interception ditches shall be completed before adjacent excavation operations are begun, as directed by the Engineer.

The grading of earth back slopes in cut sections shall be so conducted as to avoid removing or loosening any material outside of the required slopes, and any such material removed or loosened shall be replaced and thoroughly compacted to the required cross-section at the Contractor's expense. The equipment used in the grading work and the procedures of operation followed shall assure satisfactory results.

The Contractor shall also excavate and dispose of seepage pockets of soft, wet, unstable materials on cut slopes at locations designated by, and as directed by the Engineer. Payment for this work will be made at unit price bid for "Excavation" item for the number of cubic yards of material in its original position on the slope. The excavated areas shall be immediately backfilled and blanketed with approved granular material as directed by the Engineer. Payment for backfilling will be made at the unit price bid per cubic yard measured in final position, for the granular material item designated in the

plans and proposal for this use, or in the absence of such designation, any granular material item included in the proposal, as selected by the Engineer.

- F. Borrow. If there is not sufficient excavated material of a suitable quality to complete the embankment, sub grades, shoulders, and backfilling to the required lines and grades, the Contractor shall borrow the necessary additional material. Borrow may be necessary, even though not shown on the plans. Borrow, if required, shall be paid for under the regular item of unclassified excavation, unless specifically provided for in the contract. The source and acceptability of the borrow material shall be subject to the approval of the Engineer at all times. Acceptability of the borrow will be determined not only by the characteristics of the material itself, but also whether it will be satisfactory in that portion of embankment in which it is to be used. Any soil having a natural in-place moisture content in excess of 2 percent wetter than Optimum Moisture Content, as determined by the ASTM D698, will not be considered as acceptable borrow material. The Contractor shall request the Engineer's approval of proposed borrow areas at least ten working days before taking any material from such areas. All test pits and explorations required by the Engineer to evaluate the acceptability of borrow shall be done by the Contractor at his own expense. All borrow pits outside the highway shall be acquired by the Contractor at his own expense.

The Contractor shall not remove materials for more than one item from any source or pit except with written permission of and under such conditions and restrictions as may be imposed by the Engineer.

- G. Embankment Foundation. The foundation for the embankment shall be prepared by removing the topsoil and sod specified under "Topsoil," removing all existing unsuitable material, and removing surface boulders larger than the sizes specified under Sections (H) "Embankments," and (I) "Subgrade Areas," all as directed by the Engineer. The entire embankment foundation area shall be rolled until the underlying soil is thoroughly compacted to the satisfaction of the Engineer before any construction of the embankment is begun. Where embankments are to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment, the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment. However, the maximum allowable thickness for such layer shall be three feet. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the embankments could be constructed in the approved manner over such ground by the use of lighter or modified equipment after proper ditching and draining have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. No extra payment will be made for such treatment, but the cost shall be included in the price bid for the "Excavation" item. The cost of providing suitable trafficability conditions for construction equipment over any area of the contract will be the responsibility of the Contractor, and no extra payment will be made therefore; such cost shall be included in the price bid for the "Excavation" item. The remainder of the embankments shall be constructed in layers as specified below. Where filling or back filling is to be placed

under water, only acceptable granular material or rock shall be used. Acceptable granular material shall consist of well graded, hard, durable particles so graded that, of the material passing the 4-inch square sieve, not more than 70 percent by weight shall pass the No. 40 mesh sieve and not more than 10 percent by weight shall pass the No. 200 sieve, as determined by washing through the sieve in accordance with ASTM Designation D1140. Unless provided for on the plans or in the proposal, such material will be paid for under the item of "Excavation."

Where old pavement is encountered within two feet of the elevation of the top of the Subbase Course, it shall be thoroughly broken up or scarified. No direct payment will be made for any extra work or expense which may be necessary due to this requirement, and payment shall be included in the price bid for "Excavation."

Where the embankments are to be constructed on hillsides or placed against existing embankments the slopes of which are 1 on 3 or steeper, the slopes shall be benched as the fill is constructed in layers, unless otherwise designated on the plans. Where constructed, the width and depth of the bench shall be as shown on the plans or as directed. Suitable material from the benches shall be recompacted in the new fill and shall be measured and paid for under the item "Embankment in Place."

- H. Embankments. Embankments shall be formed of suitable materials. Sod, roots, stumps, trees, brush, and frozen soil or other objectionable material shall not be used. The manner in which the materials are placed, the type, weight, and condition of the equipment, including rollers, shall provide an embankment uniformly compacted to the required densities, herein specified.

Any portion of an embankment or subgrade which has, in the opinion of the Engineer, been damaged by the Contractor's equipment in progressing his construction operations shall be repaired and recompacted by the Contractor to the satisfaction of the Engineer, and no extra payment will be made therefore.

The Maximum Density is defined as the maximum density, in pounds per cubic foot, obtainable at optimum moisture content as determined by the ASTM D 1557 (Modified Proctor).

A thoroughly and satisfactorily compacted earth embankment is defined as having a minimum dry density of 95 percent of the Maximum Density.

Where the embankment material contains less than one third, by volume, of stones or rocks larger than six inches in greatest dimension, it shall be placed in successive uniform layers not exceeding eight inches in thickness, loose measure, over the entire area of the embankment. All stones or rocks over 6 inches but less than two feet in greatest dimension shall be placed in the embankment outside the limits of the sides of the subgrade area or the downward extension of the sides, except in the shoulder subgrade area as described below. Each layer shall be thoroughly rolled over its entire area as described under "Compaction." At the close of each day's work, smooth steel wheel or pneumatic tired rollers shall be used to roll the entire working area after it has been crowned, shaped, and drained.

For rock embankments and embankments in which the material contains more than one third by volume of stone or ledge rock larger than six inches in greatest dimension, the thickness of the construction layers shall not exceed the maximum size of the rock or

stone. In no case shall the layer thickness exceed two feet. Spreading shall be done by bulldozer operation in such manner that the maximum amount of the rock fragments of each succeeding deposited load will sift into the voids of the layer under construction. The entire area of each layer of rock embankment shall be rolled as described under “Compaction.”

Unless designated on the plans or in the proposal, rock, boulders, broken pavement or slabs larger than two feet in the greatest dimension will not be permitted to be placed within the limits of any embankment.

Shoulders shall be considered an integral part of the embankment and must be formed and compacted to the elevation of the bottom of the Subbase Course for the full width of the typical section before any type of pavement is placed.

No stone larger than six inches in greatest dimension shall be placed within the area of the embankment above a line drawn four feet below, and parallel to, the top surface of the shoulder. The material within this area shall be compacted to the requirements as specified in “Subgrade Areas.”

- I. Subgrade Areas. The subgrade area shall mean a cross-sectional area with top dimension equal to the width of pavement plus one foot on each side thereof, and with sides sloping downward and outward on a 1 to 1 slope to a depth of 4 feet below the top outer edges of the pavement. This depth of four feet need not apply in areas of cuts or shallow fills where, in the opinion of the Engineer, the existing material is satisfactory. After compaction, the top surface of the subgrade area shall not extend above true grade and surface at any location.

The Contractor shall conduct the excavation operations so that available and suitable material will be utilized in the subgrade area. No direct payment will be made for any delay, extra work or expense which may be necessary due to this requirement; the cost thereof shall be included in the price bid for excavation.

Where the subgrade area changes from embankment to excavation longitudinally and the angle between the center line grade of the proposed new pavement and the line of slope of the existing intersecting ground surface is three degrees or more, a subgrade transition shall be provided as indicated on the plans or as directed by the Engineer.

A thoroughly and satisfactorily compacted subgrade area is defined as having a minimum dry density of 95 percent of the Maximum Density as defined under “Embankment.” The in-place density shall be determined by the sand cone method in accordance with ASTM Designation D1556 (sand cone method) or ASTM D2922 (nuclear method).

Where soils are suitable, the subgrade of the pavement subbase course in cuts shall be rolled to obtain the above-required densities to a depth of at least eight inches.

Where unsuitable material has been removed within the subgrade area, the material used for replacement shall not contain stones larger than six inches in greatest dimension, sod, roots, frozen soil, or other objectionable material.

It shall be placed in successive uniform layers not exceeding eight inches in thickness, loose measure, and each layer shall be thoroughly rolled over its entire area as described under “Compaction.”

After the subgrade has been properly drained, placed, and shaped and compacted by the Contractor and approved by the Engineer, the Contractor shall, if conditions warrant, as determined by the Engineer, “proof-roll” the entire top surface of the subgrade with a pneumatic tire roller. “Proof-rolling” is defined herein as the application of at least the

minimum required coverage of a heavy pneumatic tire roller to the top surface of the subgrade subsequent to the proper shaping and compaction of the subgrade. The intent and purpose of the proof-rolling procedure specified herein is to ascertain the adequacy and uniformity of subgrade compaction and to locate deficiencies that, in the judgment of the Engineer, require correction.

The roller shall have a total ballasted weight of fifty tons. This total required load shall be transmitted through axles acting in a single line perpendicular to the longitudinal centerline of the roller. The total load shall be transmitted to the ground surface on four 18:00 x 25 pneumatic tires spaced evenly across the entire width of the roller. The tires shall be attached either individually or two to each axle, so that oscillation will be obtained in each tire or in each set of two tires. A minimum pressure of 90 psi shall be maintained in each tire during rolling, unless a lower tire pressure is ordered by the Engineer.

The Contractor shall roll the entire top surface of the subgrade, between the outside edges of the shoulders, exclusive of the median area, with a minimum of six complete passes, as defined under "Compaction."

Any depressions that develop during the proof-rolling operation shall be filled with suitable material and those areas further proof-rolled. Proof-rolling shall continue as directed by the Engineer until each area has been covered by a minimum of six passes of a roller with a total roller weight of fifty tons and until no further significant depressions develop.

After the proof-rolling operation, the surface of the subgrade shall be finish rolled with an approved steel wheel roller weighing not less than ten tons. The finished surface of the subgrade shall not extend above true grade and surface at any location.

The Contractor shall exercise all care necessary to prevent disturbance or damage to conduits, pipes, culverts and underdrains. Unless otherwise directed by the Engineer, proof-roller shall not pass over nor approach closer than five feet to conduits, pipes, culverts and underdrains unless a cover of at least five feet is provided.

No direct payment will be made for proof-rolling; the cost thereof shall be included in the price bid for the "Excavation" item. No direct payment will be made for the correction of any subgrade weaknesses or deficiencies disclosed by the proof-rolling operation, nor for any delays connected with such correction; the cost thereof shall be included in the price bid for the "Excavation" item.

All culverts, ditches and drains shall be constructed satisfactorily and completed to drain the highway effectively before the placing of any pavement or subbase course will be permitted.

- J. Compaction. Equipment, suitable and adequate for uniform compaction to the specified densities, must be on hand and approved by the Engineer before any embankment or backfill operations are started by the Contractor. All compaction equipment must be in good working order and any worn or defective equipment shall be immediately replaced or repaired to the satisfaction of the Engineer. Sheepsfoot rollers shall exert a pressure of not less than 300 pounds per square inch of foot area. Pneumatic tired rollers shall have an operating weight of not less than 1000 pounds per tire. Smooth steel wheel rollers shall have a minimum weight of ten tons and shall exert a pressure of not less than 300 pounds per lineal inch of compression wheel or roll width. Earth moving and other

equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment. The use of sheepsfoot rollers with tamping feet worn to less than seven inches in length and less than five square inches of flat end surface will not be permitted.

All fill material shall be compacted at a moisture content determined by the Engineer to be suitable for obtaining the required density. In no case shall the moisture content be less than three percent drier than the Optimum Moisture content determined by the ASTM D698.

When the moisture content of the material in the layer is less than the required amount, water shall be added by pressure distributors or other equipment; water may be added also in the excavation or borrow pits. The water shall be uniformly and thoroughly incorporated into the soil by disking, harrowing, blading, or by other approved means. This manipulation may be omitted for coarse sand and gravel soils.

When the moisture content of the material is in excess of the required Optimum amount, dry material shall be thoroughly incorporated into the wet content by disking, harrowing, blading, rotary mixing, or by other approved means, or compaction of the layer of wet material shall be deferred until the layer has dried to the required Optimum by evaporation.

No extra payment will be made for any special manipulation or delay in drying soils to the Optimum Moisture Content, but the entire cost of such manipulation and delay shall be included in the price bid for the excavation item.

Any method or combination of methods used for the purpose of drying shall be as approved by the Engineer.

When the moisture content of the layer is within the limits, as determined by the Engineer, for proper compaction, the entire surface shall be rolled with the appropriate type of roller or compactor until the specified density has been obtained. In no case shall the number of passes of the roller over each portion of the fill area be less than the minimum number specified.

A pass of a piece of compaction or proof-rolling equipment over any area is defined as a direct vertical contact of the compactor wheel, tire, drum, or plate load upon all elements of that area in such a manner as to assure complete coverage of the area. NO successive layers shall be placed until the layer under construction has been brought to the required density and has been approved by the Engineer.

The minimum number of passes for each layer will vary in accordance with the following descriptions:

1. A minimum of six passes will be required for each successive layer for sheepsfoot rollers of the type exerting between 300 and 450 pounds of foot pressure per square inch; pneumatic tired rollers shaving operating weights between 1000 and 2500 pounds per tire; and smooth steel wheel rollers with a minimum weight of ten tons. In all cases, loads shall be adjusted to give the most suitable rolling results on the type of material being compacted. These loadings shall be as approved by the Engineer.

Where the Contractor chooses to use the above types of equipment, sheepsfoot rollers shall be used to compact silt-clay soils, pneumatic tired rollers shall be

used to compact sands and gravels, and smooth steel and/or pneumatic tired rollers shall be used to compact slag, coarse gravel, rock, or layers of soil and rock.

2. For heavier, vibratory, or more efficient types of approved compaction equipment, the minimum number of passes required on all portions of each successive layer shall be determined by the Engineer after appropriate field tests to evaluate the efficiency of the equipment. However, layer thicknesses shall not, under any circumstances, exceed those specified under "Embankments."

Compaction equipment shall not operate at speeds exceeding four miles per hour. In no case shall the rate of application of fill or backfill exceed the capacity of the compaction equipment based on the actual operating speed of that equipment, all as determined by the Engineer.

In areas inaccessible to the equipment designated in the foregoing, other types of compaction equipment shall be used, as approved by the Engineer. Where the impact rammer type is used, such rammer shall weight not less than 200 pounds, have a ramming foot area not exceeding 80 square inches, and be capable of delivering not less than 200 foot pounds of compacting energy per blow. Where plate vibratory compactors are used, such compactors shall be capable of delivering blows of a minimum of 2500 pounds impact at a rate of not less than 1100 per minute. A minimum coverage of three passes will be required for either rammer or vibratory equipment. For other types of compaction equipment used in area of limited space, the minimum number of passes required on all portions of each successive layer shall be determined by the Engineer after appropriate field tests to evaluate the efficiency of the equipment. The use of hand tamps will not be permitted.

- K. Intersecting Highways. At all intersecting public highways the Contractor shall grade back to a sufficient distance with acceptable materials so that a smooth riding and satisfactory junction will be produced.
- L. Excavation and Drainage of Excavation at Structures. Where the item of "Cofferdams" appears in the estimate of quantities for a structure, the excavation only will be paid for under the item of "Structure Excavation." Payment for all labor, materials, and equipment necessary for maintaining the excavations for a structure free from earth, water, ice, and snow during construction will be included in the unit price bid for the item of "Cofferdams."

If the Contractor, instead of actually constructing a cofferdam, elects to divert the water from the site of the work by means of dikes, ditches, and pipe lines, no payment for the item of Cofferdams will be made, but the Contractor will be paid for the excavation work necessary for the diversion at the unit price bid for the item of "Structure Excavation." Such payment will include the cost of furnishing all labor, materials, and equipment necessary for maintaining the excavations for the permanent structure free from earth, water, ice, and snow during construction. Substitution of the diversion method of construction for cofferdams shall be made only with the approval of the City Engineer.

Where the item of “Cofferdams” does not appear in the estimate of quantities for a structure, no direct payment will be made to the Contractor for labor, materials, and equipment necessary for maintaining the excavations for a structure free from earth, water, ice, and snow during construction. Payment for such work will be included in the unit price bid for the item of “Structure Excavation.”

Where the item of “Cofferdams” or items for temporary or permanent sheet piling are not included for any individual unit of a structure in the estimate of quantities, any sheet piling which the Contractor may elect to use in progressing the work will be included for payment in the unit price bid for the item of “Structure Excavation” and no direct payment will be made therefore.

- M. Safe Operation and Sheet Piling. Sheeting shall be used as required for the safety of employees exposed to the hazard of falling or sliding material from any trench or applicable excavation more than five feet above employees’ footing. Sheeting shall be adequate and conform to the provisions of the current Industrial Code Rule 23 as established by the New York State Department of Labor, Board of Standards and Appeals. These requirements are minimum requirements and may have to be increased depending on the hazard and/or as ordered by the Engineer.

Payment for sheeting will be made in accordance with the appropriate sheeting item.

The Contractor shall be responsible at all times for the carrying out of all excavation operations in a safe and prudent manner so that the workmen and the public will be protected from unreasonable hazard. All applicable local and/or State requirements shall be observed and necessary permits acquired by the Contractor.

- N. Filling and Backfilling at Structures, Culverts, and Pipes. The type of materials to be used in bedding, filling, and backfilling at structures, culverts, and pipes and the procedure of placement shall be in accordance with details shown on the appropriate sheets or as noted on the plans and in the specifications. No direct payment will be made for rehandling of any excavated materials for this work, but compensation for rehandling will be included in the unit price bid for “Excavation.” Where granular fill or granular backfill is specified, it shall be paid for separately.

Unless otherwise shown or indicated on the plans, filling or backfilling material shall be deposited in horizontal layers not to exceed six inches in thickness before compaction, and thoroughly compacted as described under “Compaction.” A thoroughly and satisfactorily compacted backfill is defined as having a density of 98 percent of the Maximum Density as defined under “Embankments.”

Fill or backfill adjacent to structures shall be deposited on both sides to approximately the same elevation at the same time, and when in back of abutments and walls shall not be placed until material in front of these structures has been entirely placed and compacted. Unless otherwise designated on the plans, in the proposal, or as ordered by the Engineer, fill or backfill inside of sheet piling shall be placed before the sheet piling is removed. Special care shall be exercised in placing and compacting material immediately adjacent to pipe to avoid damage either to the pipe or its alignment. Any pipe that is damaged or

moved out of alignment, regardless of cause, shall be replaced at the Contractor's expense.

All culverts shall be completed and backfilled before the road is rough graded.

The limits, to which "Filling and Backfilling at Structures, Culverts and Pipes" will apply, shall be in accordance with the contract plans.

- O. Earth Excavation. Earth excavation shall include excavation of all materials as specified above, except as provided below for "Rock Excavation," and shall include so-called muck, hardpan, soft shale, soft slate, disintegrated or decomposed ledge rock, old macadam, and topsoil and sod. Preliminary blasting and/or rippers may be required to loosen and assist in the handling of the above materials.
- P. Rock Excavation. Rock excavation shall include excavation of all boulders of more than 13 cubic feet in volume, concrete beam and slab bridge superstructures, bridge substructures, concrete or masonry arches, concrete culverts, concrete pavement, all hard and solid ledge rock and other similar materials.

Where rock encountered in cuts requires drilling and blasting, all necessary precautions shall be exercised to preserve the rock in the finished slope in a natural undamaged condition, with the surface remaining straight and clean.

Blast holes shall be drilled along the line of the proposed finished slope, at the inclination of the slope as shown as payment lines on the plans or as otherwise directed by the Engineer in writing. Such inclined slope holes shall have a spacing not exceeding four feet, center to center. No portions of any other blast holes shall be drilled closer than four feet to the proposed finished slope. The explosives in the slope blast holes shall be properly distributed throughout the lengths of the slope blast holes, such that uniform breakage of the rock from top to bottom of each hole will result and so as to minimize over-breakage. No blast holes larger than three inches in diameter will be permitted closer than twelve feet to the proposed finished slope.

Only cartridge explosives, prepared and packaged by explosive manufacturing firms, and approved by the Engineer, will be permitted to be placed in slope blast holes or holes closer than twelve feet to the proposed finished slope.

In all rock excavation operations, fractional second delay detonators shall be used to detonate all charges, except the first charge in each round.

In areas other than along the proposed finished cut slope, as stipulated above, the spacing of holes, the distribution of, and type of explosives, and the methods of relief and fractional second delay blasting will be dependent upon the character and the structure of the rock encountered. The Contractor shall continually adjust his blasting operations in accordance with the characteristics and structure of the rock formations so as to obtain the required slope conditions with a minimum of disturbance and breakage outside the proposed finished slope as approved by the Engineer.

The Contractor shall conduct rock excavation operations such that all rock which is to be placed within the limits of any highway embankment section shall be broken into pieces, each no larger than 24 inches measured in greatest dimension. The volume of any rock

excavation wasted will be deducted from the volume of any borrow made. Excess rock excavation shall, where practicable, be used to widen embankments.

At any location, all blasting shall be completed and the slopes of all rock cuts shall be thoroughly cleaned of all loose fragments, to the satisfaction of the Engineer, before the installation of any pavement. No direct payment will be made for this work; the cost shall be included in the price bid for "Excavation" item.

The Contractor shall conduct all rock excavation operations, including blasting, in accordance with all State and local laws and ordinances, and he shall exercise maximum precautions including the use of mats in order to avoid damage to private property and utilities. Mats shall be used where ordered by the Engineer and payment for all precautionary measures shall be included in the price bid for the excavation item.

- Q. Unclassified Excavation. Unclassified excavation shall include excavation and disposal of all material as specified above under "Earth Excavation." Unless otherwise specified, all excavation shall be considered unclassified.
- R. Variation in Earth and Rock Quantities. Limits of earth and rock shown or indicated on the contract plans or supporting data are in accordance with the judgment of the City Engineering Department.
- S. Maximum Payment Lines. The Contractor's attention is called to the maximum payment lines as shown on the plans. No payment will be made beyond these lines, unless specifically directed in writing by the Engineer prior to the performance of the work.
- T. Excavation for Conduits and Utilities. When the contractor, in placing conduits or utilities, excavates into the subgrade, subbase, or shoulder courses, such courses must be replaced in kind, character, and condition, in order to maintain a uniform road section.
- U. Sequence of Work. Unless otherwise directed in writing by the Engineer, grading operations shall be so scheduled and carried out that all cut slopes which are started and which are to be seeded will be completed, trimmed and seeded, from the bottom of the ditch to the top of the slope, in the fall or spring planting season next following the initiation of the cut or when ordered by the Engineer. This shall not prevent the Contractor, if he so elects, from grading and seeding such portions of the road section from the bottom of the ditch toward the pavement or shoulder as he sees fit. Ditches that are filled or inoperative will be cleaned and kept operative before the Contractor stops work for any day.

Fill slopes shall be similarly completed and seeded to the extent possible depending on the availability of excavated material, each case to be determined by the Engineer.

It is the intent of this specification to complete the cut and fill slopes and to trim and seed them as the job progresses and not to leave these items until near the end of the contract period.

The term "seeded" as used in this subsection shall mean seeding and/or fertilizing and/or mulching; the specific operations required to be as indicated on the plans or specifications for each contract.

- V. Option of City to Retain Excavated Materials. The City of Binghamton has the option of retaining the rights to all material excavated by the Contractor from the project site. If the City Engineer exercises this option, the Contractor will be required to transport this material to a City owned dump site, at no additional expense to the City. This material includes, but is not limited to: concrete curb, sidewalk, asphalt pavement, excavated material from roadway, trench excavation, and all other material designated by the City Engineer.

## HYDRAULIC CUSHION FLAP GATES

1. Description. Gates and accessories shall be the size, type, material, and construction shown on the drawings and specified herein. Gates shall be circular opening Hydro Gate Hydraulic Cushion Flap Gates, or approved equal. All component parts shall be of the type material shown in the materials section.

The design shall provide for a hydraulic cushioning of closing forces and positive closure without rebounding of the cover. All gate parts shall be of ample section to safely withstand the combined forces created during closing.

The back face of the seat shall be machined to a plane and drilled to match the pipe flange, wall thimble, or anchor bolt layout.

2. Materials. Materials shall conform to the requirements of the following ASTM standards:

- ✓ Cast Iron – ASTM A536, Grade 80-55-06
- ✓ Stainless Steel (Links) – ASTM A167, Type 304L, or ASTM A276, Type 304L
- ✓ Stainless Steel (Fasteners) – ASTM F593, (nuts) F594 (bolts), Alloy Group I

3. Method of Measurement. The number of flap gates paid for under this specification shall be the number of flap gates furnished and installed in accordance with the plans.

4. Basis of Payment. The cost of furnishing all labor, materials, and equipment necessary to complete this work shall be included in the lump sum bid for “Pump Station Renovations.”

## ITEM PCB – PRECAST CONCRETE BUILDING

1. Description. Furnish and install a 30'-0" X 11'-6 3/4" X 10'-9" High (Exterior Dim.) Precast concrete Versa-Set Thermomass Storage Building, Lakelands Concrete Products, or approved equal. Assemble specified building components to form a complete, usable structure.
2. Submittals. Submit shop drawings of building, doors, vents, and hardware. Submit color sample and photograph of proposed exterior finish and caulking. Buildings must meet all Local, State and Federal codes and regulations.
3. Materials. Precast Concrete Building Specifications:
  - Shall meet BOCA, SBC, ICBO, ANS and ACI requirements.
  - 5,000 psi steel reinforced concrete.
  - 1 standard single pass door 3'-0" x 6'8" x 1 3/4" 18-gauge steel tamper proof hinges, locking mechanism shall be compatible with "Best System". Cylinder to be installed by City of Binghamton, dead bolt lock.
  - 1 standard double door 6'-0" x 7'-0" x 1 3/4" with 2 Astragal.
  - Post-tension roof and floor, each by a single continuous tendon, forming a substantially rectangular configuration.
  - Slope roof panel with prefabricated, architectural ribbed edge.
  - Turned down roof with built-in drip edge.
  - Roof load capacity – 60 psf standard.
  - Wind load – 27 psf standard.
  - Exposed aggregate exterior finish or approved equal.
  - Interior finish – Smooth Form.
  - Caulking – Caulk all interior and exterior joints. Caulking shall be Sika Flex la Elastomeric Sealant, or approved equal. Color shall be beige or as approved.
  - All doors, hardware, etc., shall be standard, as supplied by Lakelands Concrete Products, Inc., or approved equal.
  - The following shall be supplied by the precast concrete manufacturer.
  - A clevis/hook to accommodate a max. load of 400 lbs. over hatch opening.
  - Openings for a motorized ventilation system with wall collar, motorside guard, motorized damper, weather hood, combination intake louver with motorized damper.
  - A unit heater, thermostat and disconnect capable of heating 2800 cubic ft. to a temperature of 65°.
  - Quantity (4) 1'x4' Industrial fluorescent light fixtures.
4. Installation. Building shall be set by manufacturer, or in accordance with the manufacturer's recommendations.
  - Openings for electrical conduit shall be determined by the Electrical Contractor.

5. Basis of Payment. The cost of furnishing all labor, materials, and equipment necessary to complete this work shall be included in the lump sum bid for “Precast Concrete Building”. No separate payment will be made for any items herein specified.

## PROTECTION OF EXISTING STREET TREES

1. Description. This item is not a measurement or payment item. Under this item the Contractor will be assessed damages as specified in this specification for failure to protect and care for street trees within the street right-of-way that are designated to remain on street reconstruction projects. This specification will outline the type of care and procedures to minimize the impact to trees on city streets.

City street trees are important assets to the City of Binghamton. They are considered City property and when an existing tree is designated to remain, it is important that great care be taken to prevent damage to the tree.

2. Materials. The Contractor shall use approved materials such as tree wraps, root protection, or tree salve to insure the survival of the tree during and after construction.
3. Construction Details and Methods.
  - A. Excavation in the vicinity of trees. The Contractor shall take great care in excavating around trees as follows:
    1. Excavate only to a width absolutely necessary to install curb, sidewalk or piping. In no instance shall the width of the excavation be wider than the detail shown on the plans.
    2. Take great care to protect the root system. During excavation, if a root is encountered, the Contractor is to expose the root and cut it. It shall not be ripped out by excavation equipment. All roots that are cut shall have the ends treated with a tree salve material.
 

**NOTE:** The Contractor shall not leave roots exposed for more than one week. If the roots are exposed for more than one day, then they shall be covered with burlap and kept moist.
    3. The Contractor shall not break any branches with excavation equipment. If branches are in the way, they shall be trimmed before excavation. All tree trimming shall be done by qualified personnel.
    4. The Contractor shall not remove any bark or in any way damage the trunk of trees. The Contractor shall not bump, lean, or in any way have excavation touch the tree trunk and its main stem.
4. Measurement and Payment. There will be no separate measurement or payment for protection of street trees designated to remain. The cost of protecting and maintaining trees on the street right-of-way on street and utility construction projects shall be included in all other unit price items bid on this project.

Failure of the Contractor to follow this specification and resulting damage to trees will result in a deduction from the total contract price. The deduction will be determined by an urban forester or arborist who shall assess the value of the tree before and after construction. The appraisal method shall be "*Valuation of Landscape Trees, Shrubs, and Other Plants: A Guide to the Methods and Procedures for Appraising Amenity Plants.*"

**NOTE:** The Contractor is to work closely with the Department of Engineering to coordinate which trees have to be removed on the street construction project. The Contractor shall be given a written list with addresses and size, type, and species of trees to be removed on the project. No other trees are to be removed without written authorization from the City Engineer. Permission from a resident or property owner is not sufficient authorization to remove any tree within the street right-of-way. If a tree is removed without the written authorization of the City Engineer, a deduction in the contract price shall be made in accordance with the methods outlined above.

**ITEM PD-3 - EXISTING CONCRETE BRIDGE ABUTMENT REPAIRS**

1. Description. Under this item, the contractor shall repair existing concrete channel cap to anchor pedestrian bridge. Components to be repaired shall be determined by the engineer following removal of the existing bridge. Bridge to be anchored as per manufactures recommendations.
2. Materials. Materials used shall be Class A structural concrete (3500 PSI) as per New York State Department of Transportation Specification, January 1995 with latest addendum, required anchor bolts and necessary installation components as per manufacturer specifications.
3. Construction Details. Repair or replace components as required and as ordered by the engineer. All work shall be performed by craftsmen skilled in the respective trades for the types of work required.
4. Method of Measurement and Basis of Payment: All work performed under this item shall be paid for on a "cost-plus limited basis" in accordance with Section 105.4E of the General Conditions. Contractor shall present a detailed estimate to the engineer for approval, prior to commencing work.