

DIVISION 2**SECTION 02500
SPECIAL PROVISIONS****SCOPE OF WORK**

The work to be done under this contract consists of furnishing all necessary labor, materials and equipment required for drainage construction and related improvements for:

➤ Deerfield Recreational Field Improvements

The work includes clearing and grubbing, excavation, earthwork and grading, installation of drainage structures and pipes, concrete pads, fencing and backstops, site furnishings, trench width paving restoration, loaming, irrigation system, sodding and seeding, and safety controls for construction operations and other incidental items included in the contract documents.

All work done under this contract shall be in conformance with the Massachusetts Highway Department *Standard Specifications for Highways and Bridges* dated 1988, the *Supplemental Specifications* dated February 25, 2010, and the *Standard Special Provisions* dated December 16, 2011; the *2010 Construction Standard Details*, the *1996 Construction and Traffic Standard Details* (as relates to traffic standard details only); the *2003 Manual on Uniform Traffic Control Devices with Massachusetts Amendments*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the Plans and these Special Provisions.

References within the Standard Specifications to MassDOT, the Department, or the Engineer shall, for the purposes of this Contract, be construed to mean the Town of Westwood or its designated representative.

SHOP DRAWING SUBMITTAL (Supplementing Subsection 5.02)

The following is a list of items and materials that require shop drawing, catalogue cut or sample for approval. See Special Provisions for requirements.

1. Drain pipe
2. Leaching catch basin
3. Frame and grate (cover)
4. Dense graded crushed stone for path
5. Fabric top for dugout
6. Fencing and backstop
7. Bench
8. Bleacher
9. Filter tubes
10. Irrigation system items
11. Loam and seed
12. Sod
13. Trail Sign

Within 15 days after receipt of an approved shop drawing for any item, the Contractor shall provide the Town written proof that he has ordered such approved materials required on the subject contract and a written confirmation of such order and delivery schedule from the

manufacturer of the item. This delivery schedule shall be appropriate for timely completion of this project.

All shop drawing submittal involving structural calculations shall be stamped by a Professional Engineer registered in Massachusetts.

JOINTS (Supplementing Subsection 460.65)

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

CONCURRENT WORK BY OTHERS WITHIN PROJECT LIMITS

(Supplementing Subsection 5.06)

Concurrent work may be in progress in the project areas by the Town of Westwood or utility companies or others. The Contractor is required to coordinate his activities with all work by others within and adjacent to the project limits.

No additional payments will be allowed for any disruption of work schedule caused by or required to coordinate work in this contract and work to be performed by others.

STEEL PLATES IN CONSTRUCTION ZONES (Supplementing Subsection 7.09)

At the end of each working day trenches in areas of public travel shall be backfilled and covered with steel plates, each edge of such plates shall either be beveled or protected by a slope of 2 feet horizontally to 1 inch vertically. Any temporary patching material may be used to construct the ramps. The cost of necessary patching materials, and their maintenance and removal, will be considered incidental to the item involved with no separate payment.

PROPERTY BOUNDS (Supplementing Subsection 7.13)

The Contractor shall exercise due care when working around all property bounds, which are to remain. Should any damage to a bound result from the actions of the Contractor, the bound shall be accurately replaced and/or realigned by the Contractor as required by the Designated Agent or Engineer. The Contractor shall employ a Land Surveyor registered in Massachusetts to perform this work. No further compensation will be due the Contractor for the materials and labor required to re-establish a bound disturbed by the Contractor, except as otherwise noted herein.

PROTECTION OF UNDERGROUND FACILITIES

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

The Contractor shall notify the Town and Dig Safe 72 hours prior to start of construction.

NOTICE TO OWNERS OF UTILITIES (Supplementing Subsection 7.13)

The Contractor shall give written notice to all public service corporations or officials, owning or having charge of public or privately owned utilities, of his intention to commence operations affecting such utilities one week in advance of the commencement of such operations. The Contractor shall, at the same time, file a copy of such notice with the Engineer. Before commencing work on service connections, the Contractor shall contact the serving utility to ensure that proper construction procedures are followed.

The following are the names and addresses of some of the agencies which may be affected, and must be notified. Completeness of this list is not guaranteed. The Contractor shall ensure that all affected agencies are notified.

Westwood Public Works Department
50 Carby St.
Westwood, MA 02090
Mr. Christopher Gallagher
781-320-1085

NSTAR – Electric
1 NSTAR Way
Westwood, MA 02090
Mr. Steven Owens
781-441-8709

Westwood Police Department
590 High Street
Westwood, MA 02090
Mr. William Chase, Police Chief
781-320-1000

NSTAR – Gas
1 NSTAR Way
Westwood, MA 02090
Mr. Steven Owens
781-441-8709

Westwood Fire Department
637 High Street
Westwood, MA 02090
Mr. William Scoble
781-326-3885

Westwood Department of Public Works
(Sewer)
50 Carby Street
Westwood, MA 02090
Mr. Robert Angelo
781-326-8661

Dedham/Westwood Water District
50 Elm Street
Dedham, MA 02026
Mr. Stephen Locke
781-461-2782

Spectra Energy Transmission - Gas
8 Wilson Way
Westwood, MA 02090
Mr. Frank Bailey
508-938-7713

NSTAR - Communications
1 NSTAR Way
Westwood, MA 02090
Mr. Andrew Balta
781-441-3492

Verizon
1166 Shawmut Avenue
New Bedford, MA 02746
Ms. Karen Nunes
508-991-3522

Comcast
676 Island Pond Road
Manchester, NH 03109
Ms. Jean MacLaren
603-695-1461

RCN
173 Bedford Street
Lexington, MA 02040
Margot Jones
781-652-8951

PROTECTION OF UTILITIES AND PROPERTY (Supplementing Subsection 7.13)

The Contractor, in constructing or installing facilities, alongside or near sanitary sewers, storm drains, water or gas pipes, electric or telephone conduits, poles, sidewalks, walls or other structures, shall, at his expense, sustain them securely in place, cooperating with the officers and agents of the various utility companies and municipal departments which control them, so that the services of these structures shall be maintained. He shall also be responsible for the repair or replacement, at his own expense, of any damage to such structures caused by his acts or neglect, and shall leave them in the same condition as they existed prior to the commencement of work.

In case of damage to utilities, the Contractor shall promptly notify the owner and shall, if requested by the Engineer, furnish laborers to work temporarily under the owner's direction in providing access to the utility. Pipes or other structures damaged by the operation of the Contractor may be repaired by the Town or by the utility company which suffers the loss. The cost of such repairs shall be borne by the Contractor, without compensation therefore.

If, as the work progresses, it is found that any of the utility structures are so placed as to render it impracticable, in the judgment of the Engineer, to do the work called for under this Contract, the Contractor shall protect and maintain the services in such utilities and structures and the Town will, as soon thereafter as it reasonably can, cause the position of the utilities to be changed or take such other action as it deems suitable and proper.

If live service connections are to be interrupted by any items of work by the Contractor, the Contractor shall not break the service until new services are provided. Abandoned services shall also be plugged off or otherwise made secure by the utility company involved.

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

The Contractor shall be required to furnish all labor, materials, and equipment necessary to protect underground structures and electrical vaults within the project site from construction debris and water penetration. When underground structures or electrical vault roofs are excavated, the Contractor shall be responsible for maintaining security of these structures or electrical vaults against unauthorized access. The Contractor shall be responsible for leaving the structures and vaults in a state of water tightness equal to that existing at the commencement of the contract.

The Contractor will cooperate fully with all utility companies private or public, and will notify all such companies at least twenty-four hours prior to excavating in the vicinity of any utility. It is understood that the Contractor has considered in his bid the existence of the various utilities and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him due to any interference by said utilities.

The Contractor shall pay the serving utility for their services rendered for the connection of the overhead service connections.

PROTECTION OF PERSONAL PROPERTY

The Contractor shall exercise due care when working around all personal property and roadside features which are to remain. Trees to remain within work limits shall have tree protection. Any damage resulting from the actions of the Contractor, shall be replaced and/or repaired by the Contractor as directed by the Engineer. No further compensation will be due the Contractor for

the materials and labor required to protect personal property, roadside features to remain or protection for trees.

SAWCUTTING

Unless specifically stated otherwise, no separate compensation will be made for sawcutting. Sawcutting shall be considered as included in the payment made for the various items of this contract.

WORK SCHEDULE (Supplementing Subsection 8.02)

Work on this project is restricted to 7:00 AM to 6:00 PM with the Prime Contractor and all Subcontractors working on the same shift. The Prime Contractor will have superintendent on site whenever work is being performed. No work shall be done on this contract on Sundays, or Holidays, unless otherwise approved by the Town in advance. Work will not be allowed the day before or the day after a long weekend, which involves a holiday without prior approval by the Town.

PROVISIONS FOR TRAVEL AND PROSECUTION OF WORK

(Supplementing Subsection 8.03)

Before starting any work under this Contract, the Contractor shall submit a Schedule of Operation, as provided in Section 8.02. This work schedule shall include a plan of his construction procedures, detours, and the traffic safety devices he will use during the prosecution of the work as set forth in Section 850.

In general, the Contractor shall coordinate his work with the work to be done by the public utilities or other agencies, and he shall so schedule his operations as to cause the least interruption to the normal flow of traffic in existing roads. The Contractor may be required to temporarily suspend operations, when such are considered by the Engineer to be a hindrance hazard to traffic.

In case of damage to utilities, the Contractor shall promptly notify the Owner and shall, if requested, furnish manpower under the owner's direction in getting access to the utility. Pipes or other structures damaged by the operation of the Contractor may be repaired by the owner, either the municipality or the utility company. The cost of such repairs shall be borne by the Contractor without compensation.

The Contractor shall determine the exact location of all existing utilities before commencing work. He agrees to be fully responsible for any and all damages which might be occasioned by his failure to exactly locate and preserve any and all underground utilities. The Contractor shall include in his bid a sufficient allowance to cover the cost of any exploratory excavations, which are needed to verify utility locations and to accomplish all of the required work.

The Contractor shall be responsible for maintenance of flow in all water courses, drains and other pipes in the way of the proposed work or for any conveyance of the flow to a suitable point of discharge in such a manner that there will be no flow upon or hindrance to other work or cause nuisance of any kind.

Roadways and parking areas shall remain open at all times except when specifically directed otherwise by the Town

Facilities shall be provided by the Contractor for the safe and convenient passage of pedestrians and vehicles through the project. Particular care should be taken to establish and maintain methods and procedures which will not create unnecessary or unusual hazards to public safety. The placement of necessary devices will be for daily work periods and shall be removed after the completion of work operations.

Roadway and parking area excavations must be squared-off at the end of each day and any open utility trenches shall be backfilled and covered with steel plates. Backfilling and plating shall be considered incidental to the project and not be cause for additional compensation.

The Contractor shall provide temporary backfill to ensure that any interim roadway condition is safe for the traveling public. The placement, compaction and subsequent removal of temporary fill as required by interim conditions shall be considered incidental to the project and not cause for additional compensation. Unless directed otherwise by the Town, temporary roadway surfaces shall remain in place for no more than 1 day where upon the temporary fill will be removed and replaced with the base course or other finish surface.

The Contractor shall provide temporary backfill to ensure that any interim sidewalk condition is safe for the traveling public and provides access to all abutters. The placement, compaction and subsequent removal of temporary fill as required by interim conditions shall be considered incidental to the project and not cause for additional compensation. Unless directed otherwise by the Engineer, temporary sidewalk surfaces shall remain in place for no more than 1 day where upon the temporary fill will be removed and replaced with the final sidewalk surface.

The Contractor may begin excavation at either end of the project but must continue from that end to the completion of the project. The excavated and/or reclaimed segment shall be squared-off and ramped longitudinally at a rate of 12:1 or flatter to meet existing surfaces. During non-working hours, no lateral drop-offs will be permitted within the area of excavation.

Binder course will be placed on completed base course sections when there is sufficient distance to permit efficient placement operations. Binder course surface shall be thoroughly cleaned and a tack coat shall be applied on the binder course surface before top course is placed.

The Town reserves the right to alter the lengths of excavation and other operations, in order to for the convenience of the traveling public and abutting property owners.

SAFETY CONTROLS FOR CONSTRUCTION OPERATIONS

(Supplementing Subsections 850.21 and 850.61)

Unless otherwise provided for by specific items in this contract, furnishing safety controls for construction operations shall be considered incidental to this contract and the costs for safety controls shall be included in the various price for those contract items requiring such controls.

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

DRAINAGE (Supplementing Subsection 7.13)

It shall be the Contractor's responsibility to maintain proper drainage at all times in the areas under construction until the final system is put into use. Existing drainage shall not be taken out of service without prior written notice to the Town of Westwood Department of Public Works.

The castings of all structures, which are required to be set or reset under this project, shall not be set complete in place to the final grade until after the bituminous concrete binder course has been completed and top course is scheduled to be completed with 2 weeks.

Before placement of top course material begins, utility structures shall be adjusted to final grade. Utility structures shall be exposed above binder grade for not more than two (2) weeks before placement of top course material will be required. This is a major inconvenience to the public; therefore, no work on this project shall be allowed to proceed until top course placement has begun unless otherwise directed by the Engineer.

All new pipes and structures within the limits of this contract shall be left in a clean and operable condition at the completion of the work.

All the above work shall be included under the relevant drainage item without additional compensation therefore. Any adjustments made to new drainage structures will be included under the contract unit price for the respective structures. No separate payment will be made for sawcutting required for the installation of drainage structures and pipes. All the work shall be included under the relevant drainage item without additional compensation therefore.

All existing castings to be removed and stacked shall be delivered to the Westwood Public Works yard. Compensation for removing and transporting the castings will be included under pertinent items.

DEWATERING

The Contractor's attention is directed to construction operations which may occur in the vicinity of wetland areas, pond, brooks and/or surface or subsurface areas where surface water or groundwater may exist or accumulate. All dewatering and related work shall be conducted in such a manner as to prevent siltation or contamination of any adjacent resource area. Pumping discharge shall not be allowed to enter directly or indirectly into any wetland resource area without prior treatment (filter bags, silt sacks, settling basins, etc. The Contractor shall include under each pertinent item all labor, materials and equipment necessary to dewater the affected areas for proper installation of the respective items. No additional compensation will be made for dewatering but shall be considered incidental and included in the price for each respective item.

MAINTENANCE OF EXISTING TREES

Caution shall be taken by the Contractor not to damage the plants by burning, by pumping of water, by cutting live roots or branches, or by any other means. No plants to be saved shall be used for crane stay, guys or other fastenings. Vehicles shall not be parked where damage may result to trees to be saved. Construction materials shall not be stored beneath trees to be saved.

If the existing trees to be saved within or outside the limit of work line are damaged, as determined by the Engineer, it shall be assessed at \$300 per caliper inch and deducted from the Contract amount. Existing shrubs, vines and groundcover to be saved which are damaged, as determined by the Engineer, shall be replaced with plants of equal size. All costs incurred shall be paid for by the Contractor at his own expense.

ENVIRONMENTAL CONTROLS

An Order of Conditions has been issued for work on this project by the Westwood Conservation Commission. The Contractor shall be responsible for compliance with the

conditions. All costs in connection with compliance with the Order of Conditions shall be included in the various payment items and no additional compensation will be made.

Contractor shall control all dirt, dust erosion and other related construction emissions from the project to the satisfaction of the Town. Contractor shall comply with all applicable local, state and federal environmental regulations and permit requirements.

All construction equipment shall be fitted with suitable muffling devices so that the noise from construction operation shall be properly controlled. The Contractor shall control all dirt, dust erosion and other related construction emissions from the project to the satisfaction of the Designated Agent.

Calcium chloride for roadway dust control and/or water for roadway dust control shall be applied in accordance with Section 440. All costs in connection with the application of calcium chloride and/or water shall be included in the various payment items and no additional compensation will be made.

DISPOSAL OF EXCAVATION MATERIAL

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

DISPOSAL OF SURPLUS MATERIALS

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

MATERIALS REMOVED AND STACKED

Materials directed to be removed and stacked which are the property of the Town, shall be removed, transported and stacked at the Department of Public Works yard on Carby Street in the Town of Westwood. All materials shall be neatly stacked as directed by the Town. In addition, all materials stacked shall be signed for by a Town representative.

If the Town's Representative determines that any portions of the stacked materials are unsuitable for re-use by the Town, or if other owners decide to abandon part or all of their materials, such materials shall become the property of the Contractor and he shall properly dispose of them off-site subject to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

NEW INTRODUCTIONS OF INVASIVE PLANTS INTO OR AROUND THE SITE

(Supplementing Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property)

The Contractor shall ensure that no invasive plant species, as defined and listed as Invasive, Likely Invasive, or Potentially Invasive, by the Massachusetts Invasive Plant Advisory Group <http://www.massnrc.org/MIPAG>, are introduced or spread around the site by construction activities including but not limited to improperly cleaned construction equipment and

importation of infected materials such as borrow, compost, nursery stock, seed, or hay bales. Corrective measures, if necessary, shall be made by the Contractor as directed by the Engineer. The Contractor shall be solely responsible for all costs associated with ensuring that invasive species are not introduced or spread around the site by construction activities and for all corrective measures required for as long as necessary to eliminate the introduced invasive plant species and prevent re-establishment of same.

SECTION 02550 CONSTRUCTION SPECIFICATIONS

ITEMS

All Items of work in this Contract shall be governed by the "Commonwealth of Massachusetts, Highway Department (MassDOT) Standard Specifications for Highway and Bridges", dated 1988, including the latest supplements and addendum thereto.

The following items reflect special conditions particular to this Project. As such, they amend and/or supplement the provisions governing the Item, as described in the Standard Specifications.

<u>ITEM 101.</u>	<u>SITE PREPARATION</u>	<u>LUMP SUM</u>
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The work under this Item shall conform to the relevant provisions of Section 101, and shall include the installing and removing compost filter tube; temporary moving, stacking or disposal of existing materials and items noted herein to be stacked, reset, removed or required to be moved or removed to construct the project and not otherwise included under other items of the contract. This work shall include, but not be limited to, the following:

- Furnish & Install Temporary Playground Facility
- Furnish & Install compost filter tube.
- Provide Tree Protection at trees to be retained.
- Removal and proper disposal of trees / plantings within the limits of the work not noted to be retained and authorized by the Engineer, as well as trees specifically noted to be removed.
- Removal and disposal of existing backstops, containers, and other items as directed.
- Strip and stack topsoil on site for reuse.
- Removal and Stacking Frames and Grates (Covers)
- Other items such as curbing not to be re-used in the project and considered to be of value to the Town shall be transported and stacked by the Contractor at the Town yard under this Item.

Compost Filer Tubes:

Material for the filter tubes shall be compost meeting M1.06.0, except that no manure or bio-solids shall be used. In addition, no kiln-dried wood or construction debris shall be allowed. Particle size analysis: 98% shall pass through a 3 inch sieve; 30-50% shall pass 3/8 inches sieve.

Tubes for compost filters shall be a minimum of 12 inches, a maximum of 18" in diameter. Tube material shall be a knitted mesh with 1/8" - 3/8" openings, and made of biodegradable (cotton,

jute, or oxo-biodegradable) materials. Additional tubes shall be used at the direction of the Engineer. Stakes for anchors, if required, shall be nominal 2 x 2 hard wood stakes. Tubes of compost may be filled on site or shipped. Tubes shall be placed, filled and staked in place as required to ensure stability against water flows. All tubes shall be tamped to ensure good contact with soil.

The Contractor shall ensure that the filter tubes function as intended at all times. Tubes shall be inspected after each rainfall and at least daily during prolonged rainfall. The Contractor shall immediately correct all deficiencies, including, but not limited, to washout, overtopping, clogging due to sediment, and erosion. The contractor shall review location of tubes in areas where construction activity causes drainage runoff to ensure that the tubes are properly located for effectiveness. Where deficiencies exist, such as overtopping or wash-out, additional staking or compost material shall be installed as directed by the Engineer. Contractor shall remove sediment deposits as necessary to maintain the filters in working condition. The functional integrity of filter tubes shall be maintained in sound condition at all times. Filter tubes that are decomposing, cut, or otherwise compromised shall be repaired or replaced as directed by the Engineer and be incidental to this item.

Filter tube fabric and stakes shall be removed by the Contractor when site conditions are sufficiently stable to prevent surface erosion, and after receiving permission to do so from the Engineer. All biodegradable tube fabric shall be cut and laid flat in place to decompose on-site at the direction of the Engineer. Tube fabric that is not decomposing satisfactorily shall be removed and disposed off-site by the Contractor. At the direction of the Engineer, the Contractor may rake out and seed compost so that it is no greater than 2 inches in depth on soil substrate.

Tree Protection

The work to be done under this item shall conform to the relevant provisions of Section 101 of the MassDOT Standard Specifications and the following:

This work consists of furnishing and installing standardized snow fencing or construction fencing at locations shown as indicated on the Plans or as directed by the Engineer, all in accordance with these Specifications.

Tree Protection Type II shall consist of five foot high standardized snow fencing or construction fencing. The Contractor shall utilize standard steel posts in maintaining the position of the fencing. The steel post shall be a minimum of 8 feet in length and spaced no less than six feet apart.

The snow fencing shall be placed around the tree in a circumferential manner as indicated on the Plans. The fencing or construction fencing shall be securely erected and be vertically plumb. The Contractor shall utilize standard steel posts to support the snow fence. The fence shall not be secured to the tree in any manner. At no time shall restraining lines be secured to the tree or to surrounding vegetative growth. The fencing shall be removed when all mechanical work within the surrounding areas has been completed. Removal of the fence shall be approved by the Engineer.

No material shall be stored or demolition operations carried on within the area between the fencing and the saved tree. No concrete washouts shall be permitted within the fencing limits.

Tree Clearing

No tree including trees in clear & grub area shall be removed prior to approval of the Town of Westwood.

Tree Pruning

In addition to the above, the work will include any incidental pruning of branches and limbs of trees which hinder the healthy growth or that conflict with new plantings, restrict sign visibility, sight distance, or restrict horizontal or vertical clearances. The trees to be trimmed shall be determined by the Engineer and all work shall be done to the satisfaction of the Engineer. The quality and method of work must conform to accepted tree trimming practices. All trees trimming work will be performed by a Massachusetts Certified Arborist. A copy of the Arborist's current certification will be provided to the Engineer prior to the start of the work. The method of disposal of cutting shall be the responsibility of the Contractor. No tree shall be removed prior to the approval of the Engineer.

Payment under this Item shall be a Lump Sum, which sum shall constitute full compensation for all material, labor, transportation, equipment and incidental work and costs necessary to install maintain, remove and dispose of compost filter tubes; as well as the other items of work noted above to the satisfaction of the Engineer.

ITEM 120.1

UNCLASSIFIED EXCAVATION

CUBIC YARD

The work to be done under this Item shall consist of removing and disposing in accordance with the relevant provisions of Section 120, all the materials obstructing the execution of required work, as shown on the plans and as directed, except for those materials for which payment is made inclusive with work specified to be performed under other items of this Contract.

The work under this Item shall include all excavation not otherwise included for payment under other items of this contract and include, but not be limited to, removal and disposal of excess reclaim material, substandard or damaged curb, edging, concrete, rock, cobblestones, drainage or septic system structures, guardrail and fence (directed by the Engineer), and tree stumps. The work shall also include cutting and plugging abandoned pipe removal, and disposal of drainage pipe, structures and sediments in accordance with Mass DEP requirements.

In addition, the work includes the excavation and disposal of existing soil and rock material for the construction of the grassed swales and the removal and disposal of built-up sediments, vegetation, debris and unsuitable soil alongside the roadway as necessary to restore country drainage and side slopes in areas so indicated on the plans.

Foundations left in place under the roadway surface shall be removed to a depth of 3 feet; all other foundations left in place shall be removed to a depth of 12 inches below the finished grade.

Edges of excavations made in existing pavements shall be squared by saw cutting with power-driven tools to provide a neat, clean edge for joining new pavement. Ragged, uneven edges shall not be acceptable. Pavement areas which have been broken or undermined shall be edged neatly with minimum disturbance to remaining pavement. Payment for this saw cutting work shall be paid for under this item.

No. 50	5-15
No. 200	3-10

Sampling and testing shall be in accordance with the following standard AASHTO methods:

Sieve Analysis	T27
Passing 75 um	T11

Prior to the installation of the Dense Graded Gravel Path, the Contractor shall insure that the subbase is at the required depth to accommodate the required depth of Dense Graded Gravel Path to meet the finish grade. The subgrade shall be compacted to ninety-five percent (95%) of maximum density as determined by AASHTO T-180.

Subgrade irregularities (humps or depressions) greater than one-quarter inch (1/4") in the line and grade shall be corrected prior to placing the Dense Graded Gravel Path material by adjusting the subgrade with additional subgrade material.

The Dense Graded Crushed Stone Path shall be placed and compacted to a finished thickness of six inch (6") and a width as specified on the plans. The width shall be uniform, no irregularities greater than one inch (1") will be accepted. Compaction shall be by a mechanical vibrator resulting in a compaction of ninety-five percent (95%) of maximum density.

Once the Dense Graded Crushed Stone Path has been completed the contractor shall repair any damage to the adjacent surfaces as a result of this operation at no additional cost.

Payment under this Item shall be at the Contract Unit Price bid per Square Yard for the specified thickness dense graded gravel, complete in place; which price and payment shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, gravel borrow base, compaction, materials, tools, incidental work, and construction methods in accordance with the drawings, and as directed by the Engineer.

ITEM 460.

HOT MIX ASPHALT

TON

Work under this item shall conform to the relevant provisions of Section 472 of the Standard Specifications, the Town of Westwood Standard Details, and the following:

This item includes hot mix asphalt pavement (1 ½ top course over 2 ½ inch binder course) work for trench patching, driveway aprons and driveways.

Contractor is responsible for cutting all keys to match existing pavement to the hot mix pavement. All key cuts will be sealed on the same day as the paving is completed. All joint locations where proposed pavement meets existing pavement including, but not limited to, full depth construction, utility trenching and edges of trench excavation shall be sealed with hot poured rubberized asphalt sealer. Price for tack coat and asphalt sealer will be included in this Item.

Tonnage shall be determined by weight slips submitted to the Designated Agent. Also this number will be verified by the inch per square yard method shall determine tonnage (inches of approved thickness, multiplied by square yard unit measurement, multiplied by the volume to weight conversion factor of 0.056 tons/inch/square yard).

Fabric, posts, gate frames, braces, rails, stretcher bars, truss rods, and tension wire shall be of steel. Gate hinges, post caps, stretcher bar bands, and other parts shall be of steel, malleable iron, ductile iron, or equal except that post tops and rails ends may be of aluminum. The manufacturer shall supply a notarized mill certification that all materials used have been tested and fully comply with the guidelines specified herein.

Framework and posts shall be Type II round post, steel pipe cold-formed and welded per ASTM F1043, Group IC, with a minimum yield strength of 50,000 psi. The external zinc coating shall be Type B, zinc with polymer film, 0.90 oz/sq. ft. minimum zinc coating with a chromate conversion and a verifiable polymer film. The internal coating shall be Type B, zinc 0.90 oz./sq.ft. minimum or Type D, zinc pigmented, 81% nominal coating with 0.30 mils minimum thickness. Gate framework joints shall be welded and coated in accordance with Practice A780, employing zinc-rich paint.

Framework and posts shall be sized as follows:

1. End, Corner, and Pull Post. Galvanized steel, minimum pipe sizes and weights as follows:
 - a. Up to 6-foot fabric height: 2.375 – inch OD pipe, 3.12 lbs/lin. Ft. minimum.
 - b. 7 and 8-foot fabric heights: 2.875-inch OD pipe, 4.64-lbs/lin. Ft. minimum.
 - c. Maximum spacing 10'-0" On Center.
2. Line Posts. Galvanized steel, minimum pipe sizes and weights as follows:
 - a. Up to 6-foot fabric height: 1.90 inch OD steel pipe, 2.28-lbs./lin. Ft. minimum.
 - b. 7 and 8- foot fabric height: 2.375-inch OD steel pipe, 3.12 lbs./lin. Ft. minimum
 - c. Maximum Spacing 10'-0" On Center.
3. Gate Posts. Galvanized steel, nominal gate widths, minimum pipe sizes and weights as follows:
 - a. Up to 6 feet: 2.875 inch OD pipe, 4.64-lbs/linear ft. minimum.
 - b. Over 6-feet to 13 feet: 4.0 inch OD pipe, 6.56 lbs./linear ft. minimum.
 - c. Maximum spacing 10'-0" On Center.
4. Rails (Top, middle, and bottom rails): galvanized steel, manufacturer's longest lengths joined by six-inch (6") long sleeves, rail shall run continuously along top of fence. Bottom rail shall be joined at line posts with boulevard clamps. Minimum pipe sizes and weights as follows:
 - a. 1.6660 inch OD pipe, 1.84 lbs. /lin. Ft. minimum.
5. Couplings: Expansion type, approximately six inches (6") long, install one sleeve for each 500 foot run. Standard couplings are installed at each rail end to form one continuous top rail.

6. Attaching Devices: Provide fittings for attaching top rail securely to each gate corner pull and end post.
7. Sleeves: Galvanized steel pipe not less than six inches (6") long and with inside diameter not less than ½ inch greater than outside diameter of the post pipe. Provide steel plate closure welded to bottom of sleeve of width and length not less than one inch (1") greater than outside diameter of sleeve.
8. Post Brace assembly: Manufacturer's standard adjustable braces at end of gateposts and at both sides of corner and pull posts. Provide horizontal brace located at mid-height of fabric. Use same material as top rail for brace and truss to line posts with 3/8 inch diameter galvanized steel truss rods and adjustable tightener.
9. Post Tops: Galvanized steel, weather-tight closure cap for each tubular post. Furnish caps with openings to permit passages of top rail.
10. Tension Bars: galvanized steel, one-piece lengths equal to full height of fabric, with minimum cross-section of 3/16 inch x ¾ inch. Provide tension bar for each gate and end post, and two for each corner and pull post. Stretcher Bar Bands will be manufacturer's standards.

Non-Shrink, Non-Metallic Grout: premixed factory-packaged, non-corrosive, non-staining, non-gaseous, exterior grout approved by the Engineer. Sleeves, if required for fence shall be galvanized steel pipe conforming to ASTM F1043 sizing as required to accommodate posts.

Fabric shall consist of No. 9 gauge (0.148 inch core) or 6 gauge (backstop) wire, 2 inch diamond mesh. Fabric less than 6 feet high shall be knuckled at both selvages. Public side of fabric shall be installed in accordance with the owner's directions. The height of the fabric shall be one piece.

Polyvinyl Chloride (PVC) Coated Fabric: fence fabric shall be zinc coated in accordance ASTM A392 Class 1 or aluminum-coated in accordance with ASTM A 491 (Table 3). PVC coating shall be applied in accordance with ASTM F668 Class 2a. The color of the fabric shall be black and in accordance with ASTM F934.

Concrete shall be Air entrained 4,000 PSI, ¾", as specified in Section M4.

Install new fabric, as indicated on drawings; accessories in accordance with ASTM F567. Provide dimensions as shown and space line posts at intervals indicated.

Excavate holes for concrete with vertical sides in cylindrical form.

Remove loose and foreign materials from sides and bottom of holes, and moisten soil prior to placing concrete. Center and align posts. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement. Trowel tops of footings, and slope or dome to direct water away from posts. Keep exposed concrete surfaces moist for at least seven (7) days after placement.

Allow concrete to attain at least 75 percent of its minimum 28 day strength before rails, tension wire, and fabric are installed. Do not, in any case, install such items in less than seven (7) days after placement of concrete. Do not stretch and tension fabric and wire until concrete has attained its full design strength. Provide top rail through line post tops and splice with six inch (6") long rail sleeves.

Chain link fence shall have continuous top and bottom rails. Top and bottom edge of fence fabric shall have knuckled edges. Fabric shall be stretched uniformly taut and tight as possible, true to line and grade and complete in all details. Install tension bars at corners.

Note for ballfields: Install fabric on backstops so that it faces the field, using 6 gauge fabric on lower half of backstop as shown on plans. Install fabric on inside of posts (towards field) for all straight sections of outfield fencing and on inside of posts (away from field) for curved sections of outfield fencing.

All chain link fence fabric shall be fastened on the outside of the posts unless directed otherwise by the Owner. The fabric shall be properly stretched and securely fastened to the posts, and between posts the top and bottom of the fabric shall be fastened to end and corner posts with tension bars and stretcher bars bands spaced at one (1) foot intervals.

All fabric shall be aligned so that top row of the fabric mesh is tied to the top rail twelve inches (12") on center and so that the bottom of the fabric mesh stand two inches (2") max. above finish grade or as indicated on plans, and that the bottom row of the fabric mesh is tied to the bottom rail every twelve inches (12") on center. When applicable, all fabric shall be tied to the middle rail at twelve inches (12") on center.

All fabric shall be fastened to all line posts and horizontal rails with 0.020" thickness, 200/300 series stainless steel 1/2" wide bands, with a minimum breaking strength of 850 lbs., 1/2" band capacity ear-lokt design buckles to be manufactured with 0.050" thick material, 201/301 series stainless steel. All bands shall be pulled tight and raw ends of steel bands shall be secured in buckle by folding ear tabs around steel bands as per manufacturer's recommended installation procedure. No sharp edges shall protrude from band-it buckles. When applicable, band will be PVC coated, color to match fabric and framework.

Compensation for the chain link fencing shall be paid for at the Contract Unit price per Foot which price shall include all labor, and materials to furnish and install the fence with gates, including all preparation, excavation, concrete foundations, framework, fabric, and accessories and incidental costs necessary to complete the work to the satisfaction of the Engineer.

Compensation for the chain link backstops shall be paid for at the Contract Unit price per Each which price shall include all labor and materials to furnish and install the backstops, including all preparation, excavation, concrete foundations, framework, fabric, and accessories and incidental costs necessary to complete the work to the satisfaction of the Engineer.

ITEM 701.1	4-INCH CEMENT CONCRETE SIDEWALK/PAD	SQUARE YARD
ITEM 701.2	6-INCH CEMENT CONCRETE SIDEWALK/PAD	SQUARE YARD

Loam borrow shall be placed with a minimum depth of 4 inches in-place after compaction and meet with Material Specifications M1.07.0.

Loam located in areas of proposed drainage swale shall include a 50% sand borrow mix. Sand borrow shall meet requirements of M1.04.0

All information contained in the Standard Specification shall apply with the following exception to Section M6.03.0 Seed. The seed mix shall be:

Sieve Size	Percent by Weight	Percent by Volume Pure Live Seed
Creeping Red Fescue	70%	78%
Kentucky Bluegrass	15%	68%
Perennial Ryegrass	15%	85%

Seeding Rate: 150 LBS/ Acre

Payment under this Item shall be the Contract Unit Price bid per Square Yard, which price shall be full compensation for furnishing, placing and compacting loam borrow including loam borrow mixed with sandy loam borrow, and furnishing and applying additives and seed. Unless otherwise approved by the Engineer, surfaces disturbed outside the Limits of Work line shown for the Contractor's convenience, shall be restored as specified herein, at the Contractor's own expense.

ITEM 767.12

COMPOST FILTER TUBES

FOOT

The work under this item shall conform to the relevant provisions of Sections 751 and 767 of the MassDOT Standard Specifications and the following:

This work shall include furnishing and installing a linear, compost-filled tube for filtering suspended sediments from storm water flow. The work shall also include maintenance of the tubes and removal of the tube fabric and stakes.

Material for the filter tubes shall be compost meeting M1.06.0, except that no manure or biosolids shall be used. In addition, no kiln-dried wood or construction debris shall be allowed. Compost shall pass through a 3 inch sieve.

Tubes for compost filters shall be a minimum of 12 inches and a maximum of 18" in diameter, and shall be jute mesh or approved biodegradable material. Additional tubes shall be used as required by the Engineer.

A 1 foot wide by 2 inch deep wedge of compost spread along the uphill side of the filter tube shall be incidental to this item. Stakes for anchors, if required, shall be nominal 2 x 2 stakes.

Tubes of compost may be filled on site or shipped. Tubes shall be placed, filled and staked in place as required to ensure stability against water flows. All tubes shall be tamped to ensure good contact with soil.

The Contractor shall ensure that the filter tubes function as intended at all times. Tubes shall be inspected after each rainfall and at least daily during prolonged rainfall. The Contractor shall immediately correct all deficiencies, including, but not limited, to washout, overtopping, clogging due to sediment, and erosion. The contractor shall review location of tubes in areas where construction activity causes drainage runoff to ensure that the tubes are properly located for effectiveness. Where deficiencies exist, such as overtopping or wash-out, additional staking

or compost material shall be installed as directed by the Engineer. Contractor shall remove sediment deposits, as necessary to maintain the filters in working condition.

Filter tube fabric and stakes shall be removed by the Contractor when site conditions are sufficiently stable to prevent surface erosion, and after receiving permission to do so from the Engineer. All biodegradable tube fabric shall be cut and laid flat in place to decompose on-site at the direction of the Engineer. Tube fabric that is not decomposing satisfactorily shall be removed and disposed off-site by the Contractor. At the direction of the Engineer, the Contractor may rake out and seed compost so that it is no greater than 2 inches (50 mm) in depth on soil substrate.

Compost filter tubes shall be measured in place by the foot of compost tube installed, approved, and maintained.

Compost filter tubes shall be paid for at the Contract Unit Price per Foot, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work, including but not limited to stakes and tube fabric, compost mulch wedge along top of tubes, removal and disposal of fabric and stakes, raking and seeding of compost.

ITEM 770.**SODDING****FOOT**

The work under this item shall conform to the relevant provisions of Sections 751 and 767 of the MassDOT Standard Specifications and the following:

This work shall include furnishing, installing, and maintaining sod, until acceptance, as shown on the plans. The area to be sodded is within the new stone walk except where noted.

Refer to the ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.

Subcontract sodding work to a firm specializing in such work unless contractor is fully experienced and qualified.

Protect all products from weather or other damaging or deteriorating conditions. Sod, which has been damaged or has deteriorated in transit or storage are not acceptable. Lay sod within 36 hours of harvesting. Planting Schedule: Prepare a proposed sodding schedule. Schedule dates for each type of landscape work during normal seasons for such work.

Maintenance of sodding to be performed by the installer includes: watering, re-grading and re-sodding of eroded areas, patching sparse or bare ground, and mowing. Maintain grass areas immediately after placement until grass is accepted.

Sod shall be locally grown, and exhibiting a dense mat of uniformly thriving grass and root tillers held tightly together by earth. The sod shall be good quality, relatively free of any and all diseases, pests and mineral deficiencies and shall conform to the following blended grass mixture; or approved substitute:

Type	% by Weight
Baron Kentucky Bluegrass	30%
Merion Kentucky Bluegrass	20%
Touchdown Kentucky Bluegrass	30%
Jamestown Chewing Fescue	10%

Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of 1/2 inch, plus or minus 1/4 inch, at the time of cutting. Measurement for thickness shall exclude top growth and thatch.

Pad Size: Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2" on width and plus or minus 5% on length. Pads that are broken, torn, or uneven will not be acceptable.

Strength of Sod Sections: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10% of the section.

Moisture: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

Mowing Height: Before harvesting, the turf shall be mowed uniformly at a height of 1 to 1/2 inches.

Wood Pegs: Softwood sufficient size and length to ensure anchorage of sod on slope. Pegs must be able to penetrate from top of sod to at least two (2) inches into the subsoil. **Mesh:** Interwoven hexagonal plastic mesh 2" size.

EXECUTION

Time Limitations: Sod shall be harvested, delivered and installed within a period of 36 hours. Sod not transplanted within this period shall be inspected and approved by the Owner or their representative prior to its installation.

Moistening the Soil: After all grading has been completed, the soil shall be irrigated within 12-24 hours prior to laying the sod. Sod should not be laid on soil that is dry and powdery.

Starter Strip: The first row of sod shall be laid in a straight line with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which would cause air drying of the roots.

Cutting of Sod: The Contractor shall cut the sod to the lines indicated on the plans.

Sloping Surfaces: On sloping areas, where erosion may be a problem, sod shall be laid across the slope with staggered joints and secured by pegging.

The landscape contractor or agreed upon party shall be responsible for watering sod immediately after installation to prevent drying during progress of work. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new sod pad and immediately below the sod are thoroughly wet. The general contractor shall be responsible for having adequate water available at the site prior to and during installation of the sod.

The contractor shall keep all sodded areas watered and in good condition, resodding if and when necessary for an 8 week period or until a good, healthy uniform growth is established over the entire area.

During this period, water turf as necessary to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is the equivalent of one (1") inch of absorbed water per week that is delivered at weekly intervals in the form of natural rain or is augmented as required by periodic watering.

The contractor shall keep all sodded areas maintained in an approved condition for an 8 week period, including mowing. Grass height of sodded areas shall be maintained between 1-1/2 and 2-1/2 inches unless otherwise specified. Not more than 1/3 of the grass leaf shall be removed by the initial cutting or subsequent cuttings.

Provisional acceptance of the installed sod shall be within 14 days of completion of an area or section unless otherwise specified.

It shall be the contractor's responsibility to keep records of the date(s) of installation of the area(s) of sod and to notify the landscape architect upon completion of the 14 day period(s). Provisional acceptance will not be granted until contractor has obtained a written statement from the landscape architect indicating that sod is satisfactory.

Final acceptance will not be given for a minimum of 8 weeks after provisional acceptance, and only upon written statement from landscape architect verifying that sod is satisfactory.

The landscape contractor shall not be held liable for damages incurred to sod caused by deicing compounds, fertilizers, pesticides, herbicide or other material not applied by him or under his supervision nor for those caused by act of God or vandalism.

The contractor shall guarantee work covered by this specification to the extent that all transplanted turfgrass sod shall be uniform in color, leaf texture and shoot density, and be reasonably free of visible imperfections at acceptance.

Payment under this Item shall be the Contract Unit Price bid per Square Yard, which price shall be full compensation for furnishing, and applying additives to loam base, sod, and maintenance of sodded areas. Unless otherwise approved by the Engineer, surfaces disturbed outside the Limits of Work line shown for the Contractor's convenience, shall be restored under Item 765. as specified herein, at the Contractor's own expense.

ITEM 799.1
ITEM 799.2**IRRIGATION SYSTEM**
IRRIGATION SYSTEM WATER SUPPLY**LUMP SUM**
LUMP SUM

This work under these items shall include the furnishing and installing of all sleeving, piping, sprinklers, wiring and equipment necessary for a complete and functioning irrigation system for the athletic fields in accordance with these Special Provisions, as detailed in the specifications and as directed by the Engineer.

Submittals

Submit, in accordance with Section 5.00, product data and materials of construction. Submittals shall include at least the following:

- Sprinklers
- Valves: Manual and Automatic
- Valve Boxes
- Controller/Enclosure
- Backflow Preventer
- Pipe and Fittings
- Wire and Connectors
- Quick Coupling Valves
- Rain Sensor
- Electrical Conduit
- Miscellaneous Materials

Work to be Done

Work to be done includes furnishing all labor, materials, equipment and services required to complete all irrigation work indicated on the drawings, as specified herein, or both.

The mechanical point of connection for the irrigation system shall be a tap of an existing 2-inch copper water line in the building boiler room approximately where outlined on the drawings.

The electrical point of connection for the irrigation system shall be a single 120-volt, 20-amp electrical circuit for the irrigation controller from building the boiler room.

The drawings and specifications must be interpreted and are intended to complement each other. Furnish and install all parts, which may be required by the drawings and omitted by the specifications, or vice versa, just as though required by both. Should there appear to be discrepancies or question of intent, the matter shall be referred to the Engineer for decision, and his interpretation shall be final, conclusive, and binding.

All necessary changes to the drawings to avoid any obstacles shall be made with the approval of the Engineer.

Trench excavation, backfilling and bedding materials, together with the testing of the completed installation shall be included in this work.

The Work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the drawings and specifications. All parts necessary for the proper and complete execution of the Work, whether the same may have been specifically mentioned or not, or indicated on the drawings, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.

Record drawing as well as Operating & Maintenance Manual generation, in accordance to these specifications shall also be included in this work.

Scope

The irrigation system shown on the drawings and described within these specifications represents a single controller, athletic field irrigation system supplied from potable water. The system is designed for 40 gallons per minute at 65-psi dynamic pressure from the point of connection.

Ordinances, Permits And Fees

The Work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction.

Any and all permits, tests and certifications required for the execution of Work under this Section shall be obtained and paid for.

Furnish copies of Permits, Certifications and Approval Notices to the Owner's Representative prior to requesting payment.

Examination Of Conditions

Be fully informed of existing conditions on the site before submitting bid and be fully responsible for carrying out all work required to fully and properly executing the work of the Contract, regardless of the conditions encountered in the actual Work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.

Quality Assurance

Installer: A firm which has at least five (5) years' experience in work of the type and size required by this Section and which is acceptable to the Engineer.

References: Supply three references for work of this type and size with the bid including names and phone numbers of contact person(s).

Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:

American Society for Testing & Materials (ASTM)

ASTM: D1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and C1200.

ASTM: D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

ASTM: D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

ASTM: D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

ASTM: F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

National Standard Plumbing Code (NSPC)

National Electric Code (NEC)

American Water Works Association (AWWA)

American Society of Agricultural and Biological Engineers (ASABE)

Underwriters Laboratories, Inc. (UL)

Occupational Safety and Health Administration (OSHA)

American Society of Irrigation Consultants (ASIC)

Tests

Observation: The Engineer will be on site at various times to insure the system is being installed according to the specifications and drawings.

Coverage Test: After completion of the system, test the operation of entire system and adjust sprinklers as directed by the Engineer. Demonstrate to the Engineer that all irrigated areas are being adequately covered. Furnish and install materials required to correct inadequacies of coverage due to deviations from the drawings or where the system has been willfully installed when it is obviously inadequate or inappropriate. (See Construction Methods).

Engineer shall be notified 7 days in advance for observations.

Project Record Documents:

Provide and keep up-to-date a complete redlined record set of drawings of the system as the project proceeds. Drawings shall be corrected daily, showing every change from the original drawings and specifications. Record drawings shall specify and exactly locate sprinkler type; pop up height and nozzle for each sprinkler installed. Each valve box location to be referenced by distance from a minimum of two permanent locations. Controller, rain sensor, quick coupling valves, and all other equipment shall be indicated on the drawings. All wire routing, wire size and splices shall be indicated. Mainline pipe and wire route shall have two (2) distinctly different graphic symbols (line types). This redlined record set of drawings shall be kept at job site and shall be used only as a record set.

Make neat and legible notations on this record set of drawings daily as the Work proceeds, showing the Work as actually installed. For example, should a piece of

equipment be installed in a location that does not match the plan, indicate that equipment in a graphic manner in the location of installation and so as to match the original symbols as indicated in the irrigation legend. Should the equipment be different from that specified, indicate with a new graphic symbol both on the drawings and the irrigation legend. The relocated equipment dimensions and northing and easting coordinates should then be transferred to the appropriate drawing in the record set of drawings at the proper time.

On or before the date of final field observation, deliver corrected and completed AutoCAD computer plots of "record drawings" on vellum and AutoCAD electronic files on disk to Engineer as part of contract closeout. Delivery of plots will not relieve the responsibility of furnishing required information that may have been omitted from the prints.

Delivery, Storage And Handling

Store and handle all materials in compliance with manufacturer instructions and recommendations. Protect from all possible damage. Minimize on-site storage.

Guarantee

Obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.

In addition to the manufacturers guarantees the entire irrigation system shall be warranted, both parts and labor for a period of one (1) year from the date of acceptance by the Engineer.

As part of the one-year warranty the first year-end winterization and spring start-up for the irrigation system shall be performed.

Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Engineer at no additional expense to the Owner.

A written warranty showing date of completion and period of warranty shall be supplied upon completion of the project.

Coordination

Work at all times shall be coordinated closely with the Engineer to avoid misunderstandings and to efficiently bring the project to completion. The Engineer shall be notified as to the start of work, progression, and completion, as well as any changes to the drawings before the change is made. Coordinate work with those of other trades.

Be responsible and pay for all damage to other work caused by work or workmen as directed by the Engineer.

Maintenance And Operating Instructions

Include in Bid an allowance for two (2) hours of instruction of representatives of the Town of Westwood's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Engineer office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).

Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3) three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE DEERFIELD RECREATION IRRIGATION SYSTEM, shall be submitted to the Engineer. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:

1. Table of Contents
2. Written description of Irrigation System.
3. System drawings:
 - a. One (1) copy of the original irrigation plan;
 - b. One (1) copy of the Record Drawing;
 - c. One (1) copy of the controller valve system wiring diagram
4. Listing of Manufacturers.
5. Manufacturers' data where multiple model, type and size listings are included; clearly and conspicuously indicating those that are pertinent to this installation.
 - a. "APPROVED" submittals of all irrigation equipment;
 - b. Maintenance: including complete troubleshooting charts.
 - c. Parts list.
 - d. Names, addresses and telephone numbers of recommended repair and service companies.
 - e. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.
6. Winterization and spring start-up procedures.
7. Guarantee data.

Procedure

Notify all Town departments and/or public utility owners concerned, of the time and location of any work that may affect them. Cooperate and coordinate with them in the protection and/or repairs of any utilities.

Provide and install temporary support, adequate protection and maintenance of all structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Engineer.

MATERIALS**General**

All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material overages at the completion of the installation shall be removed from the site.

No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and acceptance from the Engineer.

Copper Pipe and Fittings

Copper pipe shall be Type K, hard tempered ASTM B88.

Copper fitting shall be wrought copper, solder joint type in accordance with ASTM B828-00.

Joints shall be soldered with silver solder ASTM B32, Grade 95TA up to 250 degree using non-corrosive flux.

Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

PVC Irrigation Pipe

Pipes shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.

PVC pipe shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241 as manufactured by Certainteed, Carson, JM Eagle or equal.

The pipe insertion mark shall be visible to show the proper depth into spigot.

Wire Conduit

Conduit for above ground wiring and within the boiler room shall be Schedule 40 PVC conduit as manufactured by Carlon, Cresline, JMM or equal. Sweeps shall be long radius sweeps as indicated on the details.

PVC Irrigation Fittings

Fittings for solvent weld PVC pipe shall be Schedule 40 solvent weld PVC fittings as manufactured by Dura, Lasco, Spears, or equal.

Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.

All PVC threaded connections in and out of valves shall be made using Schedule 80 toe nipples and Schedule 40 couplers or socket fittings. Schedule 40 threads will not be approved for installation.

PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement shall be medium set not fast (no hot or wet and dry). Cement is to meet ASTM D2564 and FF493 for potable water pipes. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Heavy Duty Cement or equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68, Oatey Clear Primer for PVC and CPVC, or equal. Clear primers shall not be used.

All nipples to be schedule 80 PVC.

Spray Sprinklers

Pop up spray sprinklers shall be pressure regulating (30-psi), plastic construction with ratcheting riser, removable nozzle and check valve. Nozzle size shall be as indicated on the drawing and in the legend. Pop-up height shall be 4 inches.

Sprinkler shall carry a minimum 3-year exchange warranty against defects. Sprinklers shall be manufactured by Hunter Industries, model PROS-04-PRS30-CV or approved equal.

Small/Medium Rotary Sprinklers

Small/medium rotary sprinklers shall be gear-driven, rotary type sprinklers, designed for in-ground installation with integral check valves and in-riser flow shut-off capability. Sprinkler shall be capable of covering a 35 foot radius and flow range of 2.5 gpm at 45 pounds per square inch of pressure. Sprinklers shall have a one hundred percent warranty for two years minimum against defects in workmanship.

The nozzle assembly shall elevate minimum four inches when in operation and retraction shall be achieved by a stainless steel spring. Riser assembly shall be plastic. A nozzle

wiper seal shall be included in the sprinkler for continuous operation under the presence of sand and other foreign material.

All sprinkler parts shall be removable through the top of the unit through the removal of a heavy-duty threaded cap. The sprinkler shall have a three quarter-inch (3/4") IPS water connection on the bottom of the sprinkler.

Sprinklers shall be manufactured by Hunter Industries model I20-04 or approved equal.

Approved Performance Chart (35' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I20-04	45 psi	90/180 Deg.	2.5	2.5	35'

Large Rotary Sprinklers

Large rotary sprinklers shall be gear-driven, rotary type with drain check valve and stainless steel riser designed for in-ground installation. The nozzle assembly shall elevate three inches when in operation and retraction shall be achieved by a stainless steel spring. Check valve shall be capable of holding up to 10 feet of elevation. Sprinkler shall be capable of covering a 46 foot radius and flow range of 6.6 gpm at 45 pounds per square inch of pressure.

All sprinkler parts shall be removable through the top of the unit by removing a heavy-duty threaded cap. The sprinkler shall have a one- inch (1") IPS water connection on the bottom of the sprinkler.

Sprinklers shall be manufactured by Hunter Industries model I25-04-SS, approved equal.

Approved Performance Chart (45' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I25-04-SS	45 psi	90/180/360 Deg.	07	6.6	46'

Electric Control Valves

Electric control valves shall be one and one and one half inch remote control, diaphragm type, fiberglass or reinforced nylon body plastic valves with manual flow control, manual bleed screw and 200 psi pressure rating.

Valves shall be manufactured by Hunter Industries model ICV or approved equal.

Valve Boxes

All valve boxes shall be manufactured from unformed resin with a tensile strength of 3,100-5,500 psi conforming to ASTM D638. All boxes shall be green or black in color.

Valve boxes for single 1 inch and 1-1/2 inch electric valves, isolation valves, and quick coupling valves shall be 10-inch round valve boxes with metal detection, T-tops, and bolt down covers

Valve boxes for multiple electric valves shall be 12-inch standard valve boxes with metal detection, T-tops, and bolt down covers. When multiple electric valves are installed in the same area, they are to be installed two (2) 1-1/2 inch valves or up to three (3) 1 inch valves in a 12-inch standard box

Valve boxes for three electric valves with isolation shall be 18-inch jumbo valve boxes with metal detection, bolt down covers and T-top lids.

Valve boxes for wire splices shall be 10 inch round valve boxes with detectable disks. All splices shall be in separate valve boxes and not included with isolation valves. 24 volt splices shall have gray lids.

Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer.

Valve boxes shall be manufactured by Highline Products, Olde Castle Specifications Grade, NDS Pro Series or approved equal.

Automatic Controller

Controller shall be electronic in construction with capability of up to 12 hour run times per zone in increments of 1 or 10 minutes. Controller to have minimum four independent programs, auto/off switch and be capable of manual, semi-automatic and automatic operation. Controller shall have water budgeting feature, cycle and soak feature, sensor input terminal, test program, rain sensor bypass, programmable rain delay, non-volatile memory, delay between stations, global seasonal adjustment, monthly seasonal adjustment, maximum 9 hour delay between stations, sensor programmable by zone, total runtime calculator, no water window, event day off programming, two sensor inputs, locking, weather resistant cabinet and internal transformer. Terminal strip connection shall be easily accessible. The controller shall be U.L. listed, 120 volt, 60 Hertz, A.C. type. Controller shall have a 5 year warranty.

Controller shall be as manufactured by Hunter model I-CORE IC-2400-PL, or approved equal.

Station quantity shall be minimum of 24.

Controller Enclosure

The enclosure shall be vandal and weather resistant in nature manufactured entirely of 304-grade stainless steel. The main housing door shall be louvered at the bottom and

equipped with a hollow center thermoplastic door seal. The entry lip shall be louvered on the backside. Filter screens shall cover all louvers. The top entry lid shall have two gas springs, for easy access, a continuous stainless steel piano hinge, and a three point locking mechanism with provisions for padlock. Removable stainless steel tray shall be provided and installed for the mounting of electronics and other equipment.

The enclosure shall be a NEMA 3R Rainproof Enclosure as listed by Underwriters Laboratories, Inc.

Controller enclosure shall be 16 inches wide x 15.5 inches deep x 38 inches tall, as manufactured by Strong Box, model SB-16SS or approved equal.

Wire

All valve control wire shall be minimum #14-awg, common #12-awg, single strand, solid copper, UL- approved direct burial AWG-U.F. 600V and shall meet all state and local codes for this service. Individual wires must be used for each zone valve. Common wire shall be white in color, control wire shall be red in color, and spare wires, installed where indicated on the drawings, shall be blue. White color shall be used for common wire only.

In ground wire connections shall be UL listed, manufactured by 3M, model DBR/Y-6 splice kits or equal. All wire splices shall be made in valve boxes, at controller, or at valves.

Power wire for controller shall be "Tray Cable", #12/2 with ground. Wire shall be UL listed, type TC, 600 volts, VW-1 rated, 90 degree centigrade dry, 75 degree centigrade wet. Wire shall be high dielectric PVC insulation with a nylon insulation armor and overall PVC jacket. 120 volt wire shall consist of a single jacketed three wire combination.

All wiring shall be in strict accordance with all national, state and local electrical codes.

Backflow Prevention Device

Backflow prevention device shall be 1 1/2-inch Reduced Pressure Assembly as per Westwood Massachusetts Cross Connection Department requirements. Backflow prevention device shall have maximum 12-psi pressure loss at system flow.

Backflow prevention device shall be as manufactured by Watts model 909-M1, Febco 825Y or approved equal.

Quick Coupling Valves

The valve body shall be of cast brass construction with a working pressure of 125 psi. The valve seat disc plunger body shall be spring loaded so that the valve is normally closed under all conditions when the key is not inserted.

The top of the valve body receiving the key shall be equipped with ACME threads and smooth face to allow the key to open and close the valve slowly. The quick coupling valve shall be equipped with a vinyl cover.

The valve body construction shall be such that the coupler seal washer may be removed from the top for cleaning or replacement without disassembling any other parts of the valve.

Keys shall be ACME with 1-inch male thread and 3/4-inch female thread at the top.

Quick coupling valves, keys and swivels shall be manufactured by Hunter Industries, model HQ-44RC-AW, HK-44A and HS-1 or approved equal.

Isolation Valves

Isolation valves for mainline piping in front of electric valves and shall be gate type, of bronze construction, US Manufacture, 200 WOG with steel cross handle and 200 psi rating. Gate valves to be as manufactured by Apollo model 102-T, Nibco model T-113-K, or approved equal.

Swing Joints

Spray sprinklers and small rotary sprinklers shall be installed on 1/2 or 3/4-inch prefabricated PVC unitized swivel joint assemblies with double O-ring seals, minimum 315 psi rating and minimum length of 12 inches. Prefabricated PVC swivel joints shall be as manufactured by Lasco or equal.

Large rotary sprinklers shall be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double O-ring seals, minimum 315 psi rating and minimum length of 12 inches. Prefabricated PVC swing joints shall be as manufactured by Dura, Lasco, Spears or equal.

Quick coupling valves to be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double O-ring seals, minimum 315 psi rating and minimum length of 12 inches with brass insert and stabilizer (unless stabilizer is an integral part of the quick coupling valve). Prefabricated PVC swing joints shall be as manufactured by Dura, Lasco, Spears or equal.

Automatic Rain Sensor

Rain sensor shall be plastic in construction with adjustable interruption point, 1/2-inch IPS threads and stainless steel vandal resistant guard. Rain sensor shall be manufactured by Hunter Industries, model Rain-Clik or approved equal with sensor guard.

Concrete

Standard concrete mix shall be in accordance with ASTM C150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 3,000 psi.

Grounding Equipment

Grounding rod for controller to be 5/8 inch x 10 foot copper clad, UL Listed.

Grounding plate for controller shall be 4 inch x 96 inch x 0.06 inch copper with integral connection of 25 feet of #6 AWG insulated, solid copper wire, UL Listed conforming to the minimum requirements of Section 250 of the National Electric Code. Connection of the wire to plate shall be performed by the plate manufacturer.

Grounding wire shall be #6 AWG, solid, insulated copper wire.

Ground enhancement material shall be PowerSet as manufactured by Loresco or approved equal, 50 lb. bags.

Crushed Stone

1/2 inch crushed stone shall be washed at the source facility to remove fine-grained soils and shall be well graded within the following limits:

Sieve Size (ASTM D422)	Percent Passing by Weight
3/4 inch	100
1/2 inch	90-100
3/8 inch	0-10
No. 4	0

Sand

Shall consist of well-graded natural sand, free from organic, other weak or compressible materials, or frozen materials, conforming to the following gradation:

<u>U.S. SIEVE NO.</u>	<u>% PASSING BY WEIGHT</u>
#8	100
#50	15-40
#100	2-10
#200	0-5

Spare Parts

Supply the following tools and equipment to the Engineer before final observation:

Two (2) wrenches or keys for disassembling and adjusting each type of sprinkler provided.

Two (2) quick coupler key assemblies.

Five (5) of each type sprinkler and pattern (PC & FC) used in the project.

Five (5) of each type nozzle used in the project.

Before final observation can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown.

CONSTRUCTION METHODS

General

Before work is commenced, hold a conference with the Engineer to discuss general details of the work.

Examine all contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Engineer for timely resolution.

All works indicated on drawings shall be provided whether or not specifically mentioned in the specifications.

If there are ambiguities between drawings and specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by the Engineer and compliance with the decisions shall be required. In the event the installation contradicts the directions given, the installation shall be corrected at no additional cost to Owner.

Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details, legend or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of the Engineer.

Make all field measurements necessary for the work. Project shall be laid out essentially as indicated on the Irrigation Plans, making minor adjustments for variations. Major changes shall be reviewed with the Engineer prior to proceeding.

Layout of sprinkler lines indicated on drawings is diagrammatic. Location of sprinkler equipment is contingent upon and subject to integration with all other underground utilities. Employ all data contained in the Contract Documents and verify this information at the construction site to confirm the manner by which it relates to the installation.

During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Engineer. The superintendent shall not be changed, except with the consent of the Engineer, unless that person proves unsatisfactory and ceases to be employed. Directions given to the superintendent shall be binding.

At all times, protect paving, structures, walls, footings, etc. from damage. Any inadvertent damage shall be reported to the Engineer at once.

Replace, or repair to the satisfaction of the Engineer, any existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to damaged paving.

Pipe and Fittings Installation

The Contractor shall do all excavating, vibratory plowing, backfilling and compaction required for the proper installation of the work.

Using proper width trencher chain, excavate a straight (vertical) and true trench to a depth of 2-inch of pipe invert elevation.

Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths as shown on the drawings and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and no additional compensation will be allowed therefore.

Pipe shall be laid on undisturbed trench bottom provided suitable base is available, no rock; if not, excavate to 2-inch below pipe invert and provide and install sand base or crushed stone upon which to lay pipe.

Backfilling shall be accomplished as follows: backfill material shall contain no foreign matter and no rock. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.

Make all solvent-weld joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of primer or solvent, and wiping off excess solvent from each connection. Allow welded joints at least 15 minutes set-up/curing time before moving or handling. When the temperature is above 80° F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80° F, follow manufacturer's recommendations. Provide and install for expansion and contraction as recommended. Wire shall be laid in same trench as mainline and at pipe invert (see Wire Installation).

Mainline pipe shall have minimum 22 inches of COVER (excavate to invert as required by pipe size). Lateral pipe shall have minimum 16 inches of COVER.

Cut plastic pipe with handsaw or pipe-cutting tool, removing all burrs at cut ends. All pipe cuts are to be square and true. Bevel cut end as required conforming to Manufacturer's specifications.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the piping is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. All piping, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the piping, no additional piping may be installed or backfilled until all

water is removed from the trench. Pipe shall not be installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40° F or below. Pipe installed at temperatures below 40° F shall be removed and replaced at no cost to the owner. PVC pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.

Maintain 6-inch minimum clearance between sprinkler lines and lines of other trades. Do not install sprinkler lines directly above another line of any kind.

Maintain 1-inch minimum between lines which cross at angles of 45 to 90 degrees.

Throughout the guarantee period refill any trenches that have settled due to incomplete compaction.

Pulling of pipe will be allowed provided soil is suitable and specified depth of burial can be maintained.

Electrical Wire Conduit Installation

Electrical conduit shall be installed in all non-soil areas, for above ground wiring and interior wiring.

Conduit shall extend 18 inches beyond edges of any pavement.

Isolation Valve Installation

Install isolation valves per detail where indicated on the drawings and in front of electric valves. Install all isolation valves on a level crushed stone base so that they can be easily opened or closed with the appropriate valve wrench. Install specified valve box over each isolation valve.

Check and tighten valve bonnet packing before valve box and backfill installation.

Isolation valves are required per valve or valve manifold.

Valve Box Installation

Furnish and install a valve access box for each electric valve, quick coupling valve, isolation valve and wire splice.

All valve access boxes shall be installed on a minimum 4-inch crushed stone base. Finish elevation of all boxes shall be at grade. Supply all crushed stone and install before valve box. Crushed stone shall not be poured into previously installed valve boxes.

Valve boxes shall be installed neatly at all times. Boxes shall be parallel or perpendicular to hard-scape edges and to other valve boxes installed in the same location. A sufficient amount of turf shall remain in place between each valve box and between valve boxes and hardscapes

Valve box extensions shall be provided as required on all valve boxes in order to install valve box covers at grade.

Bricks, stones, etc. shall not be used to support valve boxes.

24 Volt Control Valve Installation

Control valves shall be installed on a level crushed stone base. Grade of bases shall be consistent throughout the project so that finish grades fall within the limits of work. Valves shall be set plumb with adjusting handle and all bolts, screws and wiring accessible through the valve box opening. Valves shall be set in a plumb position with 24-inch minimum maintenance clearance from other equipment.

Install at sufficient depth to provide no more than 6-inch, nor less than 4-inch cover from top of valve to finish grade.

Adjust zone valve operation after installation using flow control device on valve.

Wiring Installation

Wiring shall be installed along with the mainline. Multiple wire bundles shall be cinched together at maximum 12-foot centers using plastic cable cinches and shall be laid beside, and at the same invert as, the irrigation lines. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide and install an additional 8 inches to 12 inches slack at all changes of direction. Wiring in valve boxes shall be a sufficient length to allow the valve solenoid, splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box. Each valve shall have a separate wire back to the controller.

All wire shall be laid in trenches and shall be carefully back-filled to avoid damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 2 inches layer of sand or stone dust on the bottom before the wires are laid into the trench and back-filled. The wires shall have a minimum of 22 inches of cover (See Detail). Wire not to be installed that day shall not be laid out.

An expansion curl shall be provided and installed within 6 inches of each wire connection to a solenoid. Expansion curls can be formed by wrapping five (5) turns of wire around a 1-inch diameter or larger pipe and then withdrawing the pipe.

Provide and install a common ground wire of white color. No white color shall be used for power wire. Control wire shall be red, and spare wiring shall be blue in color.

Service wiring in connection with drawings and local codes for low voltage service. All in-ground wire connections shall be waterproofed with 3M DBR/Y-6 or equal splice kits. All splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box-valve box shall be used). Splice locations shall be shown on the record drawings.

Power wire shall be installed from boiler room to controller location at minimum 24 inches. Power wire shall be on opposite side of the trench from 24 volt wire.

Provide a complete wiring diagram showing wire routing for the connections between the controller, and valves. See section one for the inclusion of wiring diagram in operation and maintenance manuals.

Controller Installation

Install controller in pedestal generally where indicated on plan. Wire valves into controller and set proper program.

Wire controller to electrical supply installed to the controller location from the interior of the building, through the boiler room.

Keys shall be turned over to Engineer.

Grounding Installation

Controller grounding rod shall be driven into the ground its full length 12-feet from the controller and connected via a Cadweld or approved equal connection to #6 solid, bare copper wire. The copper wire is to be installed in as straight a line as possible, and if it is necessary to make a turn or bend, it shall be done in a sweeping curve with a minimum radius of 8 inches and a minimum included angle of 90 degrees. There shall be no splices in the bare copper wire. The top of the ground rod shall be driven below the ground surface. A 4-inch grated cover as specified, set a minimum of 1-inch below grade, shall be placed over the ground rod and Cadweld or approved equal connection for periodic maintenance. Cover shall be installed on a minimum of 6 inches of 4-inch ADS or equal corrugated polyethylene, perforated drainage pipe. Plate shall be installed 36 inches below grade with 50 lbs. of Power Set or approved equal ground enhancement material spread evenly below the plate and 50 lbs. of Power Set or approved equal ground enhancement material spread evenly above the plate in accordance with the manufacturer's requirements. Plate shall also be covered with a 4 inch grated cover as specified, set a minimum of 1-inch below grade, to facilitate drainage onto the plate. Cover shall be installed on a minimum of 36 inches of 4-inch ADS or approved equal corrugated polyethylene, perforated drainage pipe.

Backflow Prevention Installation

Install 1½ -inch reduced pressure back flow prevention assembly at tap of existing 2-inch copper line as specified. Backflow installation shall be in accordance with the Town of Westwood Massachusetts Cross Connection Department.

Pipe discharge to the existing drain line to the sump approximately 24 feet from the location of the backflow preventer.

Controller Enclosure Installation

Install enclosure on concrete pad as indicated on the detail, generally where indicated on the drawings.

Concrete pad for controller enclosure shall be 24 inches long by 24 inches wide by 6 inches deep.

Install one (1) 1-inch sweep elbow (power), one (1) 1-1/2-inch sweep elbow (ground), and one (1) 3-inch sweep elbow (field wiring) through concrete pad into controller enclosure as per detail.

Rain Sensor Installation

Install rain sensor on controller enclosure in guard, per detail. Rain sensor shall be in direct contact with the weather and not in contact with the irrigation spray.

Sprinkler Installation

Small spray and rotary sprinklers shall be installed flush (perpendicular) to grade on swivel joint assemblies.

Large rotary sprinklers shall be installed flush to grade on 1-inch prefabricated PVC unitized swing joint assemblies with integral O-rings, minimum length 12 inches.

Sprinklers shall not exceed maximum spacing indicated

Adjust sprinkler zone after installation using flow control device on valve.

Quick Coupling Valve Installation

Provide and install quick coupling valves where indicated on the drawings.

Quick coupling valves to be mounted on 1-inch prefabricated PVC unitized swivel joint assemblies with integral O-rings, minimum length 12 inches with brass insert and stabilizer as per details.

Check/Test/Start-Up/Adjust

Flushing:

After all piping, valves, sprinkler bodies, pipelines, and risers are in place and connected, but prior to installation of sprinkler internals, open the control valves and flush out the system under a full head of water.

Sprinkler internals, flush caps and riser nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Engineer.

Flush the entire system after installation is complete and service any clogged nozzles for thirty (30) days after substantial completion of the irrigation system.

Testing:

Leakage test: test all lines for leaks under operating pressure. Repair all leaks and re-test.

Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Engineer at least seven (7) days in advance of scheduled

coverage test). The Engineer will determine if the water coverage is complete and adequate. Readjust sprinklers and/or sprinkler locations as necessary or directed to achieve proper coverage.

All testing shall be at no additional expense to the Owner.

Cleaning And Adjusting

At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.

Adjust sprinklers, valve boxes, and quick coupling valves to grade as required, so that they will not be damaged by mowing operations.

Continue sprinkler coverage adjustment as required by settlement, etc., throughout the guarantee period.

Each control zone shall be operated for a minimum of 5 minutes and all sprinklers checked for consistency of delivering water. Adjustments shall be made to sprinklers that are not consistent to the point that they match the manufacturer's standards. All sprinklers, valves, decoders, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.

Acceptance And Operation By Owner

Upon completion of the work and acceptance by the Engineer, train the Owner's Personnel in the operation of the system (provide minimum 7 day written notice in advance of test). Furnish, in addition to the record drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. Guarantee all parts and labor for a minimum period of one (1) year from date of acceptance.

Clean Up

Upon completion of all installation work remove all leftover materials and equipment from the site in a safe and legal manner.

Remove all debris resulting from the work.

Regrade, lightly compact, and replant around sprinklers where necessary to maintain proper vertical positioning in relation to established grade.

Fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with drawings requirements.

METHOD OF MEASUREMENT

Item 799.1, Irrigation System will be measured for payment as a lump sum installed complete in place including electrical less interior plumbing and exterior copper piping with sleeving and fully tested and operational as determined by the Engineer.

Item 799.2, Irrigation System Water Supply will be measured for payment as a lump sum installed complete in place including all interior plumbing, backflow prevention device, interior and exterior copper pipe with sleeving and fully tested and operational as determined by the Engineer.

BASIS OF PAYMENT

Item 799.1 Irrigation System will be paid for at the contract unit price per lump sum. The unit price shall include full compensation for all labor, tools, equipment, materials, transportation and incidental costs required to complete the work to the satisfaction of the Owner's Representative. This price will include earth and pavement excavation, backfill materials, pipe, valves, enclosures, inspection fees and all incidentals for complete system installation.

Item 799.2, Irrigation System Water Supply will be paid at the contract unit price per lump sum. The unit price shall include full compensation for labor, equipment, materials and incidental costs to complete the plumbing and sleeving work to the satisfaction of the Engineer. The materials required for surface restoration, such as hot mix asphalt, cement concrete sidewalk, etc. will be measured for payment under the respective bid item.

ITEM 830.

TRAIL SIGN

EACH

Work under this Item shall conform to the applicable requirements of Sections 828 and 840 of the MassDOT Standard Specifications and shall consist of providing Trail Signs, including supports, for this project.

The Trail Signs shall conform to the plans and shall be located as determined by the Engineer.

Materials shall conform to Sections 828 and 840. Sign shall be Type B Aluminum Panel. There shall be two sign faces per sign and the entire sign face shall be reflectorized with reflective sheeting conforming to M9.30.0, Type III, or Type IV. Sign face and letters shall be in accordance with the plans. Mounting hardware shall be tamper proof, stainless steel

Trail Signs are to be placed in such a manner so that path users can easily identify the detour route.

Item 830. shall be paid for at the contract unit price per each, which price shall include excavation, installation, concrete footing, sign panels, posts, hardware and all labor, materials, equipment, transportation, and incidental costs to complete the work to the satisfaction of the Engineer.