Contractor's responsibility. All hazardous wastes generated shall be contained, collected, segregated, labeled per all applicable federal EPA, Massachusetts DEP, and Federal DOT regulations or other applicable local, state or federal hazardous waste regulations, pending the appropriate disposition. Contractor shall provide for properly packaging hazardous waste, preparing the proper shipping papers, identifying a permitted disposal site, and contacting the Owner at least 24 hours prior to shipment of the waste. The Owner will review the hazardous waste shipment and sign the paperwork. The Owner must keep the "Generator" copies of the manifest on file.

4. The contractor must inform the Owner if they intend to store oil in 55 gallons or larger quantities, this includes oil for equipment, form oil, cutting oil, diesel, gasoline, etc. Spills of any oil outside to soil, water or ambient air shall be reported to the Owner. Oil is also considered to be a hazardous waste in the state of MA when it is disposed. All waste oil must be managed in accordance with the hazardous waste section of this document.

5. The Owner will be immediately notified if an OSHA, DEP or EPA regulator visits the site.

6. Owner personnel shall have the authority to exercise on-site compliance audits on the construction site. Deficiencies discovered during site inspections and visits will be relayed to the contractor's company safety representative and the Town. The contractor will communicate back to the Owner on the course of corrective action to be taken and the timeline for completion. If during such an audit, in his or her professional opinion, there exists an imminent danger or serious violation of established environment, health and safety standards that could lead to death or serious physical harm, damage to property or the environment, the Owner has the right to request the immediate halt of such operations.

7. All Hot Works, including cutting, welding, brazing, etc., requires the Contractor to provide a minimum of one operable fire extinguisher approved by a recognized testing laboratory and rated for the intended purpose near each Hot Work operation. At least one employee of the contractor shall remain on the site for one hour after the hot work has ceased to ensure against the outbreak of fire.

8. Use of Liquefied Propane Gas (LPG) and containers on site must be approved by and a permit must be secured through the local Fire Department.

    a. Conformance to State Fire Prevention Regulations 527 CMR 6 and National Fire Protection Association standard on LPG: NFPA 58 1998.

    b. Contractor must provide a minimum of one operable 20 BC rated fire extinguisher approved by a recognized testing laboratory near each LPG operation.

9. Use of torches or other flame-producing devices must conform with the State Fire Marshal's regulations (527 CMR 10.24).

    a. Permit must be secured through the local Fire Department.

    b. An approved and operable fire extinguisher must be kept in the work area.

    c. At least one (1) workman must remain at the work area for (1) hour after the use of the torch or flame-producing device has ceased.

10. All construction will comply strictly with the Massachusetts State Building Code - Article 30 (780 CMR 30): Required fencing, sidewalk sheds, storage of flammables, portable fire extinguishers, fire standpipe operation and rubbish removal will be enforced by the Owner.

11. Confined Space Requirements

a. Permit Required Confined Spaces, (PRCS). If work under this Contract specifically or incidentally requires this Contractor or any of his Sub-Contractors to enter spaces that are meeting the definition provided in 1910.146 of a "Permit Required Confined Spaces", it shall be the responsibility of the Contractor entering the space to have in place a Permit Required Confined Space Entry Program that meets OSHA 29CFR 1910.146 requirements. No entry shall be made without the permit. UMass requires that confined spaces encountered in construction projects be evaluated and entered in accordance with 1910.146.

b. It is also the responsibility that any work performed under this contract in PRCS's be performed in strict compliance with the contractor's own PRCS/OSHA Policy.

c. At the conclusion of any work in a PRCS, the General Contractor shall debrief the Project Manager and provide copies of the documentation required under the Contractor's PRCS Policy.

d. If Town personnel must enter the PRCS, coordinate with the Owner.

12. Contractors intending to use a device labeled as a Class 3 or 4 laser, in the services required under the contract, shall notify the Owners Representative at least two (2) working days prior to the intended date of use. Utilization of such a device shall meet the Commonwealth of Massachusetts Regulations, under 105 CMR 121.000, entitled Rules And Regulations Relative To The Use Of Laser Systems, Devices Or Equipment To Control The Hazard Of Laser Rays Or Beams.

a. Prior to entry for review or work, in any areas storing or using radioactive material, the Contractor shall submit a written request for clearance, to the Owner. No work shall be performed in such areas until a "Radiation Area Job Permit" has been approved, signed, and issued to the Contractor, by the Owner. Such areas have the appropriate signs and labels posted at each entrance.

b. Prior to any entry in active laboratories, contractor employees that will be entering the space are required to notify the Owner.

D. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

E. In event of damage, promptly make replacements and repairs to the approval of the Project Designer, the Owner, and at no additional cost to the Owner.

F. Additional time required to secure replacements and to make repairs will not be considered by the Designer to justify an extension in the Contract Time or Completion.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 01 10 00

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GERNERAL CONDITIONS and all sections within Division 1- GENERAL REQUIREMENTS, which are hereby made a part of this section of specifications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No.1 – Remove Players Benches from the Project:

Lump Sum DEDUCT

Alternate No.1 description: The entirety of work associated with furnishing and installing the players benches is removed from the scope of the Project.

B. Alternate No.2 – Remove Fertigation System from the Project:

Lump sum DEDUCT

Alternate No.2 description: The entirety of work associated with furnishing and installing the Fertigation System as shown on the plans as detailed and specified is removed from the scope of the Project.

C. Alternate No.3 – Remove the Well Pump from the Project:

Lump sum DEDUCT

Alternate No.3 description: The entirety of work associated with furnishing and installing the pump for the already dug well, as shown on the plans as detailed and specified is removed from the scope of the Project.

D. Alternate No.4 – Remove Town Water Supply from the Project:

Lump sum DEDUCT

Alternate No.4 description: The entirety of work associated with furnishing and installing the Town Water Supply which begins at the connection to a Town supplied Stub and includes everything up to the Cistern, as shown on the plans as detailed and specified is removed from the scope of the Project. The cistern and associated equipment with pumping the Cistern and beyond remain in the scope.

END OF SECTION 01 23 00

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by the Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
   2. Submit the Schedule of Values to the Engineer and Owner at earliest possible date but no later than the pre-construction meeting.
   3. Schedule of values are equivalent to the unit price bid form. Unit prices will be used to review additional costs and/or credits to the project except that lump sum items will be adjusted according to the change order requirements and an adjustment based on other means permitted in the contract.

B. Format and Content: Use the bid tab unit schedule to establish line items for the Schedule of Values. Provide a line item for each item bid.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Engineer.
      c. Contractor's name and address.
      d. Date of submittal.
   2. Arrange the Schedule of Values in tabular form with separate columns to replicate the bid form adding the following columns:
      a. Percent complete
      b. Change Orders (numbers) that affect value.
      c. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
4. Each item in the Schedule of Values and Application for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
5. Schedule Updating: Update and resubmit the Schedule of Values before each Application for Payment in which Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Designer.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Contract and General Conditions. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Contractor shall provide at their cost completed AIA Documents G702 and AIA Document G703, Continuation Sheets, as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Designer will return incomplete applications without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit owners required quantity of signed and notarized original copies of each Application for Payment to the Designer. Each copy shall include waivers of lien and similar attachments if required.
   1. Applications for Payment shall be accompanied by a transmittal form listing attachments and recording appropriate information about application.

F. Weekly Payroll Records: Each Contractor and Subcontractor is required to submit a copy of their weekly payroll records. This is required to be done on a weekly basis.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. Schedule of Values.
   2. Contractor's Construction Schedule
   3. Products list.
   4. Schedule of unit prices.
   5. Submittals Schedule (preliminary if not final).

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted.

1.6 SUBMITTAL OF CERTIFIED PAYROLL WITH INVOICE REQUEST FOR PAYMENT

A. The Contractor shall submit Certified Payroll Records, as required by Contract, with monthly invoices/requests for payments. Invoices received without such certified payroll documentation will not be accepted and will be returned to the Contractor for re-submittal with required Certified Payroll Records.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Project Record Documents.
   3. Warranties.
   4. Instruction of Owner's personnel.
   5. Landscape Repairs

B. Related Sections include the following:
   1. Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
   2. Divisions 2 through 33 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 APPLICATION FOR SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion:
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Submit specific warranties, maintenance service agreements, final certifications, and similar documents.
   3. Prepare and submit Project Record Documents, irrigation operation and maintenance manual, construction photos, damage or settlement surveys, topographic survey, and similar final record information.
   4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   5. Make final changeover of permanent locks. Advise Owner of changeover in security provisions.
   6. Complete testing of irrigation systems.
   7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   8. Advise Owner of changeover in utilities.
   9. Submit changeover information related to Owners occupancy, use, operation, and maintenance.
   10. Complete final cleaning requirements.

11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
12. Perform Landscape Repairs.
13. A drone flight of the property provide photos and video as a submittal.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Designer, Engineer, or Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Designer will prepare the Certificate of Use/Occupancy after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Designer, that must be completed or corrected before certificate will be issued. The time frame for the completion of the "punch list items" shall not exceed the completion date of the contract. Should the "punch list items" not be completed within the specified time frame, the Owner may invoke the rights provided under the General Conditions.
   1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
   2. Submit certified copy of Designer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the Designer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Written certification that installed equipment and systems have been tested in the presence of the Designer and are operational and satisfactory.
   4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Engineer or Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Designer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

B. Include the following information at the top of each page:
   1. Project name.
   2. Date.
   3. Name of Designer.
   4. Name of Contractor.
   5. Page number.

1.6 PROJECT RECORD (AS-BUILT) DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes.

B. Record Drawings: Maintain and submit one set of red marked prints of Contract Drawings and Shop Drawings.
   1. Mark Record Prints to show the actual installation where installation varies from that shown originally.
   2. Note Construction Change Order numbers where applicable.
   3. Contractor shall sign each drawing to certify the as-built conditions.
   4. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

C. Submit topographic survey of the completed site improvements by Massachusetts Licensed Land Surveyor.

D. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   2. Note related Change Orders, Record Drawings, and Product Data, where applicable.

E. Submit an electronic copy of all final Record specification, addenda and modification on a CD in a PDF format.

F. Record Product Data: Submit an electronic copy of all Product Data submittals on a CD in a PDF format. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1.7 IRRIGATION OPERATION AND MAINTENANCE MANUAL

A. Submit an electronic copy of the operation and maintenance data of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
   1. Operation Data:
      a. Emergency instructions and procedures.
      b. System, subsystem, and equipment descriptions, including operating standards, performance curves, rating data and parts lists.
      c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
      d. Description of controls and sequence of operations.
      e. Piping diagrams.
   2. Maintenance Data:
      a. Manufacturer's information, including list of spare parts.
      b. Name, address, and telephone number of Installer or supplier.
      c. Maintenance procedures.
      d. Maintenance and service schedules for preventive and routine maintenance.
      e. Maintenance record forms.
      f. Sources of spare parts and maintenance materials.
      g. Copies of maintenance service agreements.
      h. Copies of warranties and bonds.
      i. Name, address and telephone numbers of repair and service companies for each of the systems installed.

1.8 WARRANTIES

A. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

B. Submit one electronic file of all warranties on a CD in PDF format.

1.9 LANDSCAPE REPAIRS

A. Landscape repairs: Disturbed areas shall have the lawn restored as a stand of grass with the same species and requirements of the contract documents. If the soil shall be amended as needed to establish lawn.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

B. Lawn: Use seed mixes and amenities per contract documents

C. CD's shall be R type discs (read only), RW discs will not be accepted.

D. CD's shall be provided in protective jewel cases labeled with the project name, Project Bid No. and dated with the General Contractors contact information.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owners personnel to adjust, operate, and maintain irrigation systems.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Schedule training with owner personnel with at least fourteen (14) days' advance notice.
   3. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes:
   1. System design and operational philosophy.
   2. Review of documentation.
   3. Operations.
   4. Adjustments.
   5. Troubleshooting.
   6. Maintenance.
   7. Repair.

END OF SECTION 01 77 00

SECTION 11 68 33
ATHLETIC FIELD EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section and are complementary.

1.2 SUMMARY

A. Work Included: Providing and installing all athletic equipment including:
   1. Ball Safety Netting System
   2. Baseball diamond base pads as shown on the plans and details.
   3. 21' aluminum player benches

1.3 SUBMITTALS

A. Provide Shop Drawings: Contractor shall provide fully dimensioned manufacturer's shop drawings detailing specific product and conforming anchoring system.

B. Manufacturer shall certify that all equipment meets current NFHS regulations and standards.

1.4 QUALITY ASSURANCE

A. All materials and construction methods shall conform to the Standard Specifications and shall be used for materials compliance and execution of the work in this section.

PART 2 - PRODUCTS

2.1 PLAYER BENCHES

A. Aluminum direct bury, 20'-21' provide shop drawing

2.2 BASEBALL PLATES

A. As manufactured by BSN Sports
   1. Homeplate model #BBHPSAFW
   2. First Base (Double) Model #BBDFBSNR
   3. 2nd & 3nd Bases Model #BBMNANCH
   4. Anchors Model #1274145
   5. Pitching rubber

2.3 BASEBALL FIELD FOUL POLES

A. Foul Pole with Screen Model #LGFPW420 – 20' foul pole with foul pole ground sleeve, Model # GS-04-48, as manufactured by Sportsfield Specialties Inc., (1-888-975-3343), or approved equivalent.

2.4 BASEBALL FIELD OUTFIELD FENCE TOPPER

A. "Safety Top Cap" yellow smooth plastic fence topper, as manufactured by On Deck Sports, (1-800-365-6171), or approved equal. Install on all 6 feet high chain link outfield fencing at baseball field.

2.5 BALL SAFETY NETTING SYSTEM

A. Acceptable Manufacturers:

1. Gill Athletics
   601 Mercury Drive
   Champaign, IL 61822-9648
   1-800-637-3090

2. Sportsfield Specialties, Inc.
   41155 State Highway 10
   P.O. Box 231
   Delhi, NY 13753
   1-888-975-3343

3. Kwikgoal
   140 Pacific Drive
   Quakertown, PA 18951
   1-800-531-4252
   Or approved equivalent

B. Minimum Post Requirements:
1. Height: 14 feet
2. Total length: 120 feet
3. 4 inch Diameter 0.125 inch T-6061-T6 aluminum posts with end caps
4. Powder coat black

C. Minimum Net Requirements:
1. Height: 14 feet
2. #504 knotless nylon netting with a minimum breaking strength at 200 foot/pounds
3. 1-3/16 inch square mesh
4. Color Black
5. Top and bottom vinyl 0.25 inch diameter coated steel cables
6. 5/16 inch shell block pulley & eyebolt with carabineer snap hooks to hoisting upper net cable at each pole
7. Bottom cable retention system at each pole

PART 3 - EXECUTION

3.1 All work shall be constructed as shown on the plans and as recommended per the manufacturers' specifications.

END OF SECTION 11 68 33

SECTION 31 10 00
SITE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work under this section includes all materials, equipment, and services necessary to furnish and deliver work as shown on the Drawings, as specified, and as required by job conditions including, but not limited to the following:
   1. Protection of existing trees, vegetation, landscaping materials, existing utilities and site improvements not scheduled for clearing, which might be damaged by construction activities.
   2. Clearing and grubbing of stumps, vegetation, debris, rubbish, site improvements.
   3. Temporary protection of adjacent property, structures, benchmarks, and monuments.
   4. Removal and legal disposal of cleared materials.

1.2 RELATED SECTIONS

A. 31 22 00 Temporary Sediment and Erosion Controls

B. 31 30 00 Earthwork

C. 32 90 00 Topsoil, Seeding, Mulching, and Plantings

1.3 QUALITY ASSURANCE

A. Workmen: All workmen shall be thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.4 JOB CONDITIONS

A. Traffic
   1. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements
   1. Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
   2. Protect improvements on adjoining properties and on Owner's property.
   3. Restore damaged improvements to their original condition, as acceptable to property owners.

1.5 EXECUTION

A. Clearing and Grubbing

1. Clear site of tree stumps, shrubs and other vegetation protect and retain as noted on the plans.
2. Completely remove stumps, roots, and other debris protruding through ground surface. Chip all brush and limbs, stockpile for later use.
3. Use hand methods in vicinity of trees to remain.
4. Fill depressions caused by clearing and grubbing operations with approved soil material, unless further excavation or earthwork is indicated.
5. "Removal" includes excavating and off-site disposal of stumps and roots.
6. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.
7. Remove and dispose of existing debris in catch basins.

B. Removal of Site Improvements
1. Remove existing above-ground and below grade improvements as indicated on Plans and as necessary to facilitate new construction.

C. Clean-up
1. Keep grounds clean of rubbish caused by work and of unused materials at all times.
2. Dispose of cleared materials and rubbish off-site in a legal manner.
3. Remove unused materials and equipment. Leave area clean.
4. Do not store hazardous or flammable materials or liquids on site, unless stored in approved containers, properly labeled and approved by the owner.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 31 25 00
TEMPORARY SEDIMENT AND EROSION CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. The General Conditions and Supplementary General Conditions apply to this Section of the Specifications.

B. Provide all labor, materials, tools and equipment, as and when required to perform the work specified herein or as shown on the plans, including but not necessarily limited to the following:

1. Straw wattles
2. Erosion control mat
3. Temporary chain link construction fence
4. Construction entrance pad
5. Inlet protection for storm drain inlet
6. Tree protection

C. These guidelines shall apply to all work consisting of any and all temporary and/or permanent measures to control water pollution and soil erosion, as may be required, during the construction of the project.

D. In general, all construction activities shall proceed in such a manner so as not to pollute any wetlands, watercourse, waterbody, and conduit carrying water, etc. The Contractor shall limit, insofar as possible, the surface area of earth materials exposed by construction methods and immediately provide permanent and temporary pollution control measures to prevent contamination of adjacent wetlands, watercourses, and waterbodies, and to prevent, insofar as possible, erosion on the site.

1.2 SCOPE OF WORK

A. Construct and maintain straw wattles where shown on the plans and where other excavation or stockpiled material may cause erosion and sedimentation.

1. Temporary Seeding: Seed areas where surplus material is placed or stockpiled to provide temporary turf establishment.
2. Temporary vegetative cover shall be established on all unprotected areas that produce sediment, areas where final grading has been completed, and areas where the estimated period of bare soil exposure is less than 12 months. Temporary vegetative cover shall be applied if areas will not be permanently seeded by September 1.

B. Construct and maintain construction access tracking pads in locations shown on the plans. Construction Entrance (Anti-Tracking Pad).

1. The construction entrance shall be constructed as shown in the plans. The Contractor will be responsible to maintain this pad (i.e. add stone, regrading, etc.) for the duration of the project.

C. During the construction, the Engineer may direct the Contractor to install additional straw wattles, sediment filter fencing, or hay bales for protection of drainage system..

D. Construction Entrance (Anti-Tracking Pad): The construction entrance shall be constructed as shown in the plans. The Contractor will be responsible to maintain this pad (i.e. add stone, regrading, etc.) for the duration of the project.

E. At the completion of the project, the Contractor shall remove and dispose of all temporary sediment and erosion controls, and restore all impacted areas to its original configuration. All material shall be disposed of in a proper manner in accordance with current regulatory standards and in legally acceptable disposal areas.

1.3 RELATED WORK

A. Section 31 10 00 – Site Preparation

B. Section 31 30 00 – Earthwork

C. Section 32 90 00 – Topsoil, Seeding, Mulching, and Plantings

1.4 SUBMITTALS

A. Submit manufacturer's description, design and specifications of all materials specified.

B. Submit a plan and construction details of proposed erosion and sedimentation control measures for review and approval by the Engineer seven days prior to the start of construction

PART 2 - PRODUCTS

A. Temporary Mulching Straw or Hay 70-90 lbs/1,000 sq. ft. (Temporary Vegetative Areas)

B. Construction Entrance filter fabric shall be Amoco No. 4553 Filter Fabric or approved equal.

C. Construction Entrance stone must meet the requirements of Section M2.01.1.

D. Sediment filter fence.

E. Compost filter tubes.

F. Perennial Ryegrass 3 lbs/1,000 sq. ft. (Ioluium Perenne)

PART 3 - EXECUTION

3.1 CONSTRUCTION OF TEMPORARY PERVIOUS BARRIERS USING BALES OF HAY, SEDIMENT FILTER FABRIC, OR COMPOST FILTER TUBES, AS DETAILED ON THE CONSTRUCTION DRAWINGS.

A. Each bale shall be embedded into the soil a minimum of four (4") inches.

B. Bales shall be securely anchored in place by wood stakes or reinforcement bars driven through the bales and into the ground. The first stake in each bale shall be angled toward the previously laid bale to force bales together.

C. Filter fabric shall be securely anchored at the top of a three (3') foot high fence and buried a minimum of six (6") inches to the soil. Seams between sections of filter fabric shall overlap a minimum of two (2') feet.

3.2 INSTALLATION AND MAINTENANCE

A. Baled hay erosion barriers, sediment filter fence, construction entrances, pumping settling basin and temporary seeding shall be installed at locations shown on the plans and as ordered by the Engineer.

B. All erosion checks shall be maintained until adjacent areas are stabilized.

C. Inspection shall be frequent (at minimum monthly and before and after heavy rain) and repair or replacement shall be made promptly as needed.

D. Erosion checks shall be removed when they have served their usefulness so as not to block or impede storm water flow or drainage.

E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removals.

3.3 SITE PREPARATION OF TEMPORARY VEGETATIVE COVER

A. Install required surface water control measures.

B. Remove loose rock, stone, and construction debris from area.

C. Apply lime according to soil test or at a rate of one (1) ton of ground dolomitic limestone per acre (5 lbs per 100 sq. ft.).

D. Apply fertilizer according to soil test or at the rate of 300 lbs. or 10-10 per acre (7 lbs. per 1,000 sq. ft.) and second application of 200 lbs of 10-10-10 (5 lbs. per 1,000 sq. ft.) when grass is four (4") inches to six (6") inches high. Apply only when grass is dry.

E. Unless hydro-seeded, work in lime and fertilizer to a depth of four (4") inches using a disk or other suitable equipment.

F. Tillage should achieve a reasonably uniform loose seedbed, work on contour if site is sloping.

3.4 ESTABLISHMENT

A. Utilize seed types as noted on the plans and within specifications. Note rates and seeding dates (see vegetative cover selection and mulching specifications).

B. Apply seed uniformly according to the rate indicated by broadcasting, drilling or hydraulic application (see vegetative cover selection and mulching specifications).

C. Unless hydro-seeded, cover ryegrass seeds with not more than ¼ inch of soil with suitable equipment.

D. Mulch immediately after seeding if required. Apply straw or hay mulch and anchor to slopes greater than 3% or where concentrated flow will occur.

END OF SECTION 31 22 00

SECTION 31 25 00
TEMPORARY SEDIMENT AND EROSION CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDES

A. The General Conditions and Supplementary General Conditions apply to this Section of the Specifications.

B. Provide all labor, materials, tools and equipment, as and when required to perform the work specified herein or as shown on the plans, including but not necessarily limited to the following:

1. Installation and maintenance of Sediment Filter Fence and/or Filter Tube
2. Installation and maintenance of Construction Entrance
3. Inlet protection for drainage structures
4. Dust control including metering of water of which is at the contractors cost
5. Temporary seeding
6. Slope stabilization with erosion control mat

C. These guidelines shall apply to all work consisting of any and all temporary and/or permanent measures to control water pollution and soil erosion, as may be required, during the construction of the project.

D. In general, all construction activities shall proceed in such a manner so as not to pollute any wetlands, watercourse, waterbody, and conduit carrying water, etc. The Contractor shall limit, insofar as possible, the surface area of earth materials exposed by construction methods and immediately provide permanent and temporary pollution control measures to prevent contamination of adjacent wetlands, watercourses, and waterbodies, and to prevent, insofar as possible, erosion on the site.

1.2 SCOPE OF WORK

A. Construct and maintain temporary silt fencing/ filter tube where shown on the plans and where other excavation or stockpiled material may cause erosion and sedimentation.

B. Construct and maintain construction access tracking pads in locations shown on the plans.

C. Temporary Seeding: Seed areas where surplus material is placed or stockpiled to provide temporary turf establishment.

D. During the construction, the Engineer may direct the Contractor to install additional sediment controls for protection of drainage system at no additional cost to the Owner.

E. Temporary pervious barriers using bales of hay, straw, or siltation tubes held in place with stakes driven through the bales and into the ground or sediment filter fabric fastened to a fence

post and buried into the ground, shall be installed and maintained as required to check erosion and reduce sedimentation.

F. Temporary vegetative cover shall be established on all unprotected areas that produce sediment, areas where final grading has been completed, and areas where the estimated period of bare soil exposure is less than 12 months. Temporary vegetative cover shall be applied if areas will not be permanently seeded by September 1.

G. Construction Entrance (Anti-Tracking Pad): The construction entrances shall be located in the field. The Contractor will be responsible to maintain pad(s) (i.e. add stone, regrading, etc.) for the duration of the project.

H. At the completion of the project, the Contractor shall remove and dispose of all temporary sediment and erosion controls, construction entrances, and restore all impacted areas to its original configuration. All material shall be disposed of in a proper manner in accordance with current regulatory standards and in legally acceptable disposal areas.

1.3 RELATED WORK

A. SECTION 31 10 00 – Site Preparation

B. SECTION 31 20 00 – Earth Moving

1.4 SUBMITTALS

A. Submit manufacturer's description, design and specifications of all materials specified.

B. Submit a plan and construction details of proposed erosion and sedimentation control measures for review and approval by the Engineer seven days prior to the start of construction

PART 2 - PRODUCTS

A. Temporary Mulching Straw or Hay 70-90 lbs/1,000 sq. ft. (Temporary Vegetative Areas)

B. Construction Entrance filter fabric shall be Amoco No. 4553 Filter Fabric or approved equal.

C. Construction Entrance stone must meet the requirements of Section M2.01.1.

D. Sediment filter fence.

E. Perennial Ryegrass 3 lbs/1,000 sq. ft. (Ioluium Perenne)

F. Water or chemicals for dust control shall be approved by the owner

PART 3 - EXECUTION

3.1 DUST CONTROL

A. A water truck, temporary irrigation, or other dust control measure shall be used to keep clouds of dust from polluting the air, degrading air quality, and impairing vision.

B. Water from adjacent hydrants or on site sources shall be metered by the contractor and at the contractors cost, coordinate with water supply authority for permitting and other requirements.

3.2 CONSTRUCTION OF TEMPORARY PERVIOUS BARRIERS USING BALES OF HAY OR SEDIMENT FILTER FABRIC, AS DETAILED ON THE CONSTRUCTION DRAWINGS.

A. Each bale shall be embedded into the soil a minimum of four (4") inches.

B. Bales shall be securely anchored in place by wood stakes or reinforcement bars driven through the bales and into the ground. The first stake in each bale shall be angled toward the previously laid bale to force bales together.

C. Filter fabric shall be securely anchored at the top of a three (3') foot high fence and buried a minimum of six (6") inches to the soil. Seams between sections of filter fabric shall overlap a minimum of two (2') feet.

3.3 INSTALLATION AND MAINTENANCE

A. Baled hay erosion barriers, sediment filter fence, construction entrances, pumping settling basin and temporary seeding shall be installed at locations shown on the plans and as ordered by the Engineer.

B. All erosion checks shall be maintained until adjacent areas are stabilized.

C. Inspection shall be frequent (at minimum monthly and before and after heavy rain) and repair or replacement shall be made promptly as needed.

D. Erosion checks shall be removed when they have served their usefulness so as not to block or impede storm water flow or drainage.

E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removals.

3.4 SITE PREPARATION OF TEMPORARY VEGETATIVE COVER

A. Install required surface water control measures.

B. Remove loose rock, stone, and construction debris from area.

C. Apply lime according to soil test or at a rate of one (1) ton of ground dolomitic limestone per acre (5 lbs per 100 sq. ft.).

D. Apply fertilizer according to soil test or at the rate of 300 lbs. or 10-10-10 per acre (7 lbs. per 1,000 sq. ft.) and second application of 200 lbs of 10-10-10 (5 lbs. per 1,000 sq. ft.) when grass is four (4") inches to six (6") inches high. Apply only when grass is dry.

E. Unless hydro-seeded, work in lime and fertilizer to a depth of four (4") inches using a disk or other suitable equipment.

F. Tillage should achieve a reasonably uniform loose seedbed, work on contour if site is sloping.

3.5 ESTABLISHMENT

A. Utilize seed types as noted on the plans and within specifications. Note rates and seeding dates (see vegetative cover selection and mulching specifications).

B. Apply seed uniformly according to the rate indicated by broadcasting, drilling or hydraulic application (see vegetative cover selection and mulching specifications).

C. Unless hydro-seeded, cover ryegrass seeds with not more than ¼ inch of soil with suitable equipment.

D. Mulch immediately after seeding if required. Apply straw or hay mulch and anchor to slopes greater than 3% or where concentrated flow will occur.

END OF SECTION 31 25 00

SECTION 31 30 00
EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Work under this section includes all materials, labor, equipment, and services necessary to perform the work of this section as shown on the Drawings,. as specified, and as required by job conditions, including, but not limited to, the following:

1. General excavation and backfill for structures and other site improvements.
2. Preparing of subgrade
3. Trench excavation and backfill for utilities.
4. Rock excavation, mass, and trench.
5. Subsoil compaction control.
6. Site grading, temporary sediment basin.
7. Common Borrow from off-site sources, if required.
8. Disposal of unsuitable materials off-site, if required.

1.2 RELATED WORK

A. Section 31 10 00 – Site Preparation

B. Section 32 90 00 – Topsoil, Seeding, and Sodding

1.3 DEFINITIONS

A. Excavation: removal of material encountered to subgrade elevations indicated and subsequent distribution of materials on-site. Materials other than soil which are excavated such are roots, masonry, glass, and other unacceptable materials are to be removed as part of the contract.

1. In areas where rock is encountered, excavation shall consist of over-excavating a minimum of 12" in all directions.

B. Unauthorized excavation: removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation shall be at the Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Clean concrete fill may be used to bring elevations to proper position, when acceptable to the Engineer.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.

C. Subgrade: the undisturbed soil or compacted soil layer at footing bearing elevations or immediately below the subbase at slabs, walks, paving, beneath the topsoil in lawn areas, and beneath the mulch in playground areas or landscape beds.

D. Structure: buildings, foundations, slabs, tanks, curbs, or other manmade stationary features occurring above or below ground surface.

E. Unsuitable material: on-site materials, which are of improper gradation to allow adequate compaction, are organically contaminated or have been identified as improper for the intended use by the Engineer.

1.4 SUBMITTALS

A. Test reports: submit the following reports directly to Owner from the testing services, with copy to Contractor:

1. Gradation test reports on borrowed material.

2. (1) Gallon bucket/pale sample for every material to be used or re-used.

3. Field reports; in-place soil density tests.

4. One optimum moisture-maximum density curve for each type of soil compacted.

B. The Contractor shall submit samples of all materials from off-site sources to the testing laboratory at least ten (10) calendar days prior to use in the work. The Contractor shall not deliver or use any materials for off-site sources until written approval is received from the Engineer based upon test results showing compliance with these specifications.

1. The cost for testing materials shall be included in the Contract Sum.

C. On-site excavated material, including fill and topsoil, if available, shall be submitted for testing.

1.5 QUALITY ASSURANCE

A. Codes and Standards: perform earthwork in compliance with applicable requirements of authorities having jurisdiction.

B. Massachusetts Department of Transportation Standard Specifications and Supplements.

1.6 SUBGRADE CONFIRMATION OF GRADE AND ADJUSTMENT:

A. As-built topographic shall be by a Licensed Land Surveyor

B. Engineer's review of grades will be singular. Each subsequent review after the first will be at the contractors cost.

C. Deliverable:

1. As-built topography shall be provided to the Engineer as an Autodesk Civil 3D Cadd file:
    a. Drawing format 2013
    b. Containing all the content required to compile triangulated irregular network surfaces (TIN Surface)
        1) For the soccer field
        2) For the remainder of the site
    c. In the same horizontal and vertical datum as the construction documents
    d. Be provided with the surface styles showing contours and triangles
        1) For the soccer field displaying two tenth foot intervals
        2) For the remainder of the site displaying one foot intervals
2. Adobe portable document file (PDF) representing the content from 1.6.C.1
    a. With a title block, legend, north arrow, scale, date, supplier of topography
    b. At the scale equivalent to the construction documents

D. Adjustments: Contractor shall adjust grades meeting tolerances per 1.7 below at no additional cost to the contract.

1.7 TOLERANCES FOR GRADES

A. General: the Drawings indicate finished elevations. The grading to be performed consists of establishing finished grade elevations as shown on the Drawings.

B. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are indicted, or between such points and existing grades.

C. Subgrade shall be free from irregular surface changes, and as follows:
1. Topsoil shall be 6" depth minimum but not more than 8". Pay limit for topsoil is 6" depth. Topsoil placed at greater depths is at no additional cost to the contract.
2. Grades shall be within the construction document grades as follows:
    a. Athletic fields:
        1) Equal to or 0.5% flatter than the grades shown
        2) Without depressions or high spots creating unintended undulations trapping water within the field of play. Depressions can be rectified in the topsoil layer up to 8" total topsoil depth. Topsoil in excess of 6" is at the contractors cost.
    b. Remaining lawn areas
        1) Equal to or 0.5% steeper than the grades shown

2) Without depressions or high spots creating unintended undulations trapping water from reaching drainage structures or natural drainage conveyances. Depressions can be rectified in the topsoil layer up to 8" total topsoil depth. Topsoil in excess of 6" is at the contractors cost.

1.8 PROJECT CONDITIONS

A. Notify Owner if unexpected subsurface conditions are encountered and discontinue work in area until Owner provides notification to resume work.

B. Examine the substrata of the areas and ascertain the conditions under which earthwork is to be performed/installed. Do not proceed until all unsatisfactory conditions, if any have been corrected to the satisfaction of the Owner.

C. The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. The telephone number of the Dig Safe Call Center is 1-888-344-7233. Work shall not proceed until clearance is received.

D. Existing utilities: locate existing underground utilities in areas of excavation work. Provide adequate means of support and protection during earthwork operations.

E. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

F. Do not interrupt existing utilities serving facilities occupied by Owner or others during occupied hours except when permitted and then only after acceptable temporary utility services have been provided.

G. Provide adequate notice to the Owner and receive written notice to proceed before interrupting utility.

H. Demolish and completely remove from site existing underground utilities indicated to be removed and any abandoned utility if unidentified on the plans for removal. Coordinate with utility companies for shutoff of services if lines are active.

I. Protection of persons and property: barricade open excavations occurring as part of this work and post with warning lights.

J. Operate warning lights as recommended by authorities having jurisdiction.

K. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

L. Protect benchmarks and existing structures, roads, sidewalks, paving, and curbs against damage from equipment and vehicular or foot traffic.

M. Underpin adjacent structures, which may be damaged by excavation work, including service lines and pipe chases.

N. Provide necessary safeguards to prevent accidents, to avoid all necessary hazards, and to protect the public, the work, and the property at all times, including Saturdays, Sundays, and holidays.

O. Contractor shall be responsible for any and all damages which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life, and limb.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Common Borrow:

1. Select excavated material obtained from the construction site or imported

2. Conforming to M1.01.0 "Ordinary Borrow" by the Standard Specifications

a. Physical characteristics of soils designated as group A-1, A-2-3, or A-3 under AASSHTO-M145. It shall have properties such that it may be readily spread and compacted for the formation of subgrade.

B. Gravel Borrow:

1. Select excavated material obtained from the construction site or imported

2. Conforming to M1.03.0 "Gravel Borrow" by the Standard Specifications

a. Consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials.

b. Gradation:

Sieve Designation	**Percent Passing**
1/2 inch	50-85
No.4	40-75
No.50	8-28
No.200	0-10
Maximum size of stone in gravel shall be as follows	
M1.03.0 Type b	3 inches largest dimension
M1.03.0 Type c	2 inches largest dimension

C. Crushed gravel:

1. Select excavated material obtained from the construction site or imported

2. Conforming to M2.01.4 by the Standard Specifications

a. Consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials.

b. Crushed stone shall consist of one or the other of the following material:

1) Durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated* or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15% of the total weight.

2) Durable crushed gravel stone obtained by artificial crushing of gravel boulders or fieldstone with a minimum diameter before crushing of 8 in.

*Thin or elongated pieces are defined as follows: Thin stones shall be considered to be such stones whose average width exceeds four (4) times their average thickness. Elongated stones shall be considered to be such stones whose average length exceeds four (4) times their average width.

The crushed stone shall be reasonably free from clay, loam or deleterious material and not more than 1.0 % of satisfactory material passing a No. 200 sieve will be allowed to adhere to the crushed stone. Where crushed stone is to be used for surfacing, this requirement shall be not more than 0.5 % of satisfactory material passing a No. 200 sieve.

The crushed stone shall have a maximum percentage of wear as determined by the Los Angeles Abrasion Test (AASHTO-T-%) as follows:

c. The crushed stone shall be uniformly blended according to the grading requirements for the respective stone sizes shown in the following Table.

d. Gradation:

Sieve Designation	**Percent Passing**
1 inch	100
3/4 inch	90-100
1/2 inch	10-50
3/8 inch	0-20
No.4	0-5

D. Filter fabric: conform to the requirements of Section M9.50 – Type IV Erosion Control/Slope Protection as described in the Standard Specifications for Highways and Bridges, North American Green S75, or approved equal.

PART 3 - EXECUTION

3.1 EXCAVATION CLASSIFICATIONS:

A. Earth excavation: excavation of all materials of any kind, except as classified as rock excavation.

B. Rock excavation shall include the excavation of hard and solid ledge, boulders in excess of one cubic yard in volume and rock hard cementitious deposits, the removal of which requires the use of drilling, barring, and wedging. Blasting will not be permitted. For the purposes of payment, rock shall be defined as material, which cannot be excavated with equipment rated at less than 120 HP flywheel power developing at least 40,000 pounds breakout force measured in accordance with SAE S732C. Hard and compact materials such as cemented-gravel, glacial till, and relatively soft or disintegrated rock that can be removed without continuous and systematic drilling, barring, wedging, or other mechanical or pneumatic equipment will not be considered as mass rock even though intermittent use of these methods may be performed to increase production.

3.2 EARTHWORK FOR SOD AND SEEDED AREAS

A. Compaction control during earthwork

1. Utilize track machines to move the soils on site during construction keeping rubber tire vehicles except for landscape machinery off the soils. Use low ground pressure machines to move and spread soil materials.

2. Use a subsoiler to loosen the subsoil compaction to 6" depth after it is in place and graded if it does not meet the density specifications. Stones if present at the surface from using the subsoiler will need to be raked and removed from the surface before placing stone.

3.3 ROCK PAYMENT LINES

A. Rock payment lines are limited to the following:

1. In pipe trenches, one foot below the invert elevation of the pipe and two foot wider than the inside diameter of the pipe, but not less than a three foot minimum trench width.

2. 12" below top of subgrade elevations.

B. No payment will be made for rock removal beyond specified rock payment lines.

3.4 UNSUITABLE MATERIAL

A. Unsuitable materials are materials that can't be left in place or re-used as gravel borrow. Remove unsuitable materials from the site and legally dispose of them.

B. Removal of unsuitable material and its replacement as directed, provided it is not due to fault or neglect of the Contractor, will be paid on the basis of contract conditions relative to changes in work except that the following unsuitable items are excluded from a change in work request:

1. Removal of the existing irrigation system

2. Removal of topsoil encountered at or below subgrade

a. Shall be stockpiled separately for measurement

b. Shall be quantified by the contractor and the cubic yardage provided to the owner

c. Shall be used to adjust the quantity of borrow topsoil and amended for re-use

d. If not to be re-used on-site, become the property of the contractor and removed from the site.

3. Subgrade at sod and seed areas are the bottom of the 6" topsoil section.

C. Where the removal of unsuitable soil material is due to the fault or negligence of the Contractor in his performance of earthwork and site grading operations, excavate the resulting unsuitable material and replace with compacted common borrow as required, at no additional cost to the Contract Sum.

3.5 STABILITY OF EXCAVATIONS

A. General: comply with local, state, and federal codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local, state, and federal codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Slope the sides of excavations over 5' deep to the angle of repose of the material excavated, but not steeper than 1½ horizontal to 1 vertical. Where sloping is not possible, due to space restrictions or stability of material excavated, shore and brace in accordance with requirements of authorities having jurisdiction. In addition, provide 5' high snow fence around these areas as protection. Temporary slopes should be covered with plastic sheeting or other suitable cover where necessary to prevent the surface from drying or eroding.

D. Maintain sides and slopes of excavation in a safe condition until completion of backfilling, by scaling, benching, shelving, or bracing.

E. Take precautions to prevent slides or cave-ins when excavations are made in locations adjacent to backfilled excavations, and when sides or excavations are subject to vibrations from vehicular traffic or the operation of machinery, or from any other source.

F. Provide minimum requirements for trench shoring and bracing to comply with ANSI A10.1 "Safety for Building Construction", and with local codes and authorities having jurisdiction.

3.6 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrade and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavation limits to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.7 EXCAVATION OF TRENCHES FOR PIPES AND CONDUIT

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of six to nine inch clearance on both sides of pipe or conduit, unless otherwise indicated on drawings.

B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

1. If rock is encountered, carry excavation 12" below required elevation and backfill a six inch layer of fine aggregate fill prior to installation of pipe.

2. For pipes or conduit less than six inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

3. For pipes and equipment six inches or larger in nominal size, shape bottom of trench to fit of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped fine aggregate backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads and ensure continuous bearing of pipe barrel on bearing surface.

3.8 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.

B. Protect bottom of excavations and soil around and beneath foundations from frost.

3.9 BACKFILL AND FILL

A. General: place acceptable soil material in layers to required subgrade elevations.

1. Under trenches and other drainage structures, use M2.01.4.

2. Under piping, conduit, and equipment, use fine aggregate fill where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation to fit bottom 90 degrees of cylinder.

3. Under topsoil use Gravel Borrow, M1.03.0

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.

2. Inspection, testing, approval, and recording locations of underground utilities.

3. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.

4. Removal of trash and debris from excavation.

5. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.10 PLACING AND COMPACTION

A. Ground surface preparation: remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.

   1. When existing ground surface has a density less than that specified in this section for particular area classification, break up ground surface and pulverize, moisture condition as required to achieve optimum moisture content, and compact to required depth and percentage of density.

B. Place backfill and fill materials in layers not more than eight inches in loose depth for material compacted by heavy compaction equipment, and not more than four inches in loose depth for material compacted by hand-operated tampers.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structures to required elevations. Prevent wedging action of backfill against structures by carrying material uniformly around structures to approximately same elevation in each lift.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.

   1. Percentage of maximum density requirements: compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557.

   2. Under pavements, compact top 12 inches of subgrade and each layer of backfill or fill material to 95% maximum density.

   3. Below and horizontally to five feet outside of site pavements: compact top 12" of subgrade and each layer of backfill or fill material to 95% of maximum density.

   4. In trenches and pits: compact top 12" of subgrade and each layer of backfill or fill material to 95% of maximum density.

   5. In landscaped and lawn areas, unless specified elsewhere: compact top six inches of subgrade and each layer of backfill or fill material to 90% of maximum density.

F. Moisture control: where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

   1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

   2. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

END OF SECTION 31 30 00

SECTION 32 84 00

IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Include GENERAL CONDITIONS and applicable parts of Division 1 as part of this Section.

B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective drawings pertaining to other work.

1.2 WORK TO BE DONE

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

B. Point of connection for the potable water supply enclosure shall be to the existing 4-inch ductile iron pipe where indicated on the drawings.

C. Point of connection shall be to the 6-inch discharge of the new cistern/wet well pump system where indicated on the drawings (See Section 32 84 10).

D. Electrical point of connection shall be a 120-volt, 20-amp, electrical circuit for the irrigation controller from the building where indicated on the drawings.

E. Drawings and specifications must be interpreted and are intended to complement each other. Furnish and install 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 Owner's Representative for decision, and his interpretation shall be final, conclusive and binding.

F. Necessary changes to the drawings to avoid obstacles shall be made with the approval of the Owner's Representative.

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

H. 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. 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.

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

1.3 SCOPE

A. Irrigation system shown on the drawings and described within these specifications represents a single controller, athletic field irrigation system supplied from stored ground and potable water.

The system is designed for 220 gallons per minute at 80 psi dynamic pressure at full system flow downstream of pump system.

1.4 RELATED WORK

A. Carefully examine the Contract Documents for requirements that affect the Work of this Section.

1. Earthwork: Division 31
2. Excavating and Backfilling for Utilities: Section 26 0543
3. Planting: Section 32 9000
4. Electrical Power Supply: Division 26
5. Site Improvements: Section 32 30 00
6. Cistern/Pump System: Section 32 84 10

1.5 ORDINANCES, PERMITS AND FEES

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

B. Permits, tests and certifications required for the execution of Work under this Section shall be obtained and paid for.

C. Furnish copies of permits, certifications and approval notices to the Owner's Representative prior to requesting payment.

1.6 EXAMINATION OF CONDITIONS

A. Be fully informed of existing conditions on the site before submitting bid, and be fully responsible for carrying out work required to fully and properly execute 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.

1.7 QUALITY ASSURANCE

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

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

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

1. American Society for Testing & Materials (ASTM)

a. ASTM: B43-98 Brass pipe.

b. ASTM: A536 Ductile Iron Castings

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

d. ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and Cl200.

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

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

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

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

2. National Standard Plumbing Code (NSPC)

3. National Electric Code (NEC)

4. National Sanitary Foundation (NSF)

5. American Society of Agricultural and Biological Engineers (ASABE)

6. Underwriters Laboratories, Inc. (UL)

7. Occupational Safety and Health Administration (OSHA)

8. American Society of Irrigation Consultants (ASIC)

1.8 TESTS

A. Observation: Owner's Representative will be on site at various times to ensure the system is being installed according to the specifications and drawings.

B. Coverage Test: After completion of the system, test the operation of entire system and adjust sprinklers as directed by the Owner's Representative. Demonstrate to the Owner's Representative that 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 is obviously inadequate or inappropriate. (See Part 3 - Execution).

C. Owner's Representative shall be notified 7 days in advance for observations.

1.9 SHOP DRAWINGS

A. Provide copies of product specification sheets on proposed equipment to be installed to the Owner's Representative for approval prior to the start of work, in accordance with the parameters of Division-1. Work on the irrigation system may not commence until product sheets are submitted and approved. Submittals shall be marked up to show proper nozzles, sizes, flows, etc. Equipment to be included:

1. Sprinklers

2. Valves: Manual, Ball, Modulating and Automatic

3. Controller and Enclosure

4. Valve Boxes

5. Wire and Connectors

6. Quick Coupling Valves

7. Weather Sensor

8. Air Vacuum/Release Valves

9. Water Supply Ductile Iron Pipe and Fittings

10. PVC Pipe and Fittings

11. Irrigation Ductile Iron Fittings

12. Sleeving Pipe

13. Master Valve

14. ID Tags

15. Grounding Equipment

16. Water Meter

17. Backflow Prevention Device

18. Water Supply Enclosure

19. Pressure Gauge

20. Miscellaneous Materials

B. Project Record Documents:

1. 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, weather sensor, quick coupling valves and other equipment shall be indicated on the drawings. Wire routing, wire size and splices shall be indicated. Mainline pipe, lateral pipe and each wire route shall have four (4) 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.

2. 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.

3. 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 Owner's Representative 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. Record drawings shall not be marked up design drawings. Record drawings shall be on Contractors own title block with installed, not proposed irrigation information.

1.10 DELIVERY, STORAGE AND HANDLING

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

1.11 GUARANTEE

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

B. In addition to the manufacturers guarantees, the new irrigation equipment shall be warrantied, both parts and labor for a period of one (1) year from the date of acceptance by the Town of Longmeadow

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

D. 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 Owner's Representative at no additional expense to the Owner.

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

1.12 COORDINATION

A. Work shall be coordinated closely with the Owner's Representative to avoid misunderstandings and to efficiently bring the project to completion. Owner's Representative shall be notified as to the start of work, progression and completion, as well as changes to the drawings before the change is made. Coordinate work with those of other trades.

B. Be responsible and pay for damage to other work caused by work or workmen. Repair such damage as directed by the Owner's Representative.

1.13 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Include in Bid an allowance for four (4) hours of instruction of Town of Longmeadow's personnel upon completion of check/test/start-up/adjust operations by a competent operator (Owner's Representative office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).

B. 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 WOLF SWAMP PARK IRRIGATION SYSTEM, shall be submitted to the Owner's Representative office. After review and approval, the copies will be forwarded to the Town of Longmeadow. 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) reproducible of the Record Drawing;
   d. 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 irrigation equipment;
   b. Operation: User's Manuals
   c. Maintenance: including complete troubleshooting charts.
   d. Parts list.
   e. Names, addresses and telephone numbers of recommended repair and service companies.
6. 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.
7. Winterization and spring start-up procedures.
8. Guarantee data.

1.14 PROCEDURE

A. Notify 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.

B. Provide and install temporary support, adequate protection and maintenance of 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 Owner's Representative.

PART 2 - PRODUCTS

2.1 GENERAL

A. 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. Material overages at the completion of the installation shall be removed from the site.

B. 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 Owner's Representative.

2.2 WATER SUPPLY DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe shall be Class 52, cement lined and tar coated per AWWA, ASTM and Harvard University specifications. Pipe shall be mechanical joint connected. Pipe shall be as manufactured by U.S. Pipe and Foundry, Atlantic States, American Pipe and Supply or approved equal.

B. Fittings shall be flanged, conforming to ANSI/AWWA C110/A21.10-98.

C. Stainless steel nipples shall conform to ASTM A733. Threads shall conform to ANSI B1.20.1. Pipe used for nipple manufacturing shall conform to ANSI A312/SA312.

2.3 BRASS PIPE AND FITTINGS

A. Brass pipe shall be 125lb., cast bronze, ground joint pattern, threaded, ASTM B43-98.

B. Brass fittings shall be cast bronze, screwed, 125lb. Class.

2.4 PVC PIPE AND FITTINGS

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

B. Pipe 2-1/2 inches and below shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241 as manufactured by Ipex, JM Eagle, Silverline or equal.

C. Irrigation pipe 3-inches and above shall be PVC, Class 200, Type 1120, SDR 21, Gasket-Joint PVC, conforming to ASTM No. D1784 as manufactured by Ipex, JM Eagle, Silverline or equal.

D. Pipe insertion mark shall be visible to show the proper depth into spigot.

E. Fittings for solvent weld PVC pipe, 2-1/2 inch and smaller in size, shall be Schedule 40 solvent weld PVC fittings as manufactured by Dura, Lasco, Spears or equal.

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

G. 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.

H. PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. Cement shall be medium set not fast (no wet and dry or hot). 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-70, Oatey Primer for PVC and CPVC, or equal. Clear primers and cements are no acceptable.

I. Nipples to be schedule 80 PVC.

J. Fittings for PVC directional changes, pipe reductions and plugs 3- inch and larger in size shall be deep bell push-on gasket joint ductile iron fittings for PVC pipe. Fittings shall be manufactured of ductile iron, grade 70-55-05 in accord with ASTM A536 and gaskets shall meet ASTM F477. Fittings shall be as manufactured by Harrington Corporation - Harco, or equal.

K. For mainline pipe to zone valve / lateral pipe connections, Harrington - Harco or equal push-on gasket swivel joint ductile iron service tees with ductile iron lateral 90's shall be used. Saddles, (strap, bolt down or snap) will not be approved for installation.

2.5 PVC PIPE SLEEVES

A. Pipe sleeves beneath non-soil areas shall be PVC, Class 160 water pipe as manufactured by Ipex, National, JM Eagle or equal. Sleeve size shall be as indicated on the drawings. Minimum sleeve size to be 4-inch.

2.6 WIRE CONDUIT

A. Conduit for wiring beneath non-soil areas shall be 2-inch PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Cresline, Carlon, JMM, or equal.

B. Sweep ells shall be standard electrical type PVC schedule 40 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.

C. Conduit for above ground wiring to weather sensor and controller shall be Schedule 40 rigid conduit.

2.7 MPROTATOR SPRINKLERS

A. Full and part circle pop up spray sprinklers with multi-stream rotary nozzles shall be pressure regulating (40-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 6 inches.

B. Multi-stream rotary nozzles shall be manufactured by Hunter Industries, MP1000 for 12-foot spacing, MP2000 for 18-foot spacing, MP3000 for 25-foot spacing and MPCorner where indicated on the drawings.

C. Sprinkler shall carry a minimum 3-year exchange warranty against defects. Sprinklers shall be manufactured by Hunter Industries model PROS-06/12-PRS40.

2.8 SMALL/MEDIUM ROTARY SPRINKLERS

A. 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 25-44-foot radius and flow range of 0.9-7.0 gpm at 50-55 pounds per square inch of pressure. Sprinklers shall have a one hundred percent warranty for two years' minimum against defects in workmanship.

B. Nozzle assembly shall elevate minimum four inches when in operation and retraction shall be achieved by a stainless-steel spring. Riser assembly shall be stainless-steel. A nozzle wiper seal shall be included in the sprinkler for continuous operation under the presence of sand and other foreign material.

C. 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.

D. Sprinklers shall be manufactured by Hunter Industries model I20-04-SS.

E. Approved Performance Chart (35' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I20-04-SS	50 psi	90 Deg.	2.0	2.0	38'
Hunter I20-04-SS	50 psi	180 Deg.	4.0	4.2	41'
Hunter I20-04-SS	50 psi	360 Deg.	8.0	6.8	44'

2.9 LARGE ROTARY SPRINKLERS

A. 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 49-61-foot radius and flow range of 7.5 to 15.7 gpm at 60 pounds per square inch of pressure.

B. 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.

C. Sprinklers shall be manufactured by Hunter Industries model I25-04-SS.

D. Approved Performance Chart (45' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I25-04-SS	60psi	90 Deg.	5	5.3	45'
Hunter I25-04-SS	60psi	180/360 Deg.	8	9.2	50'

E. Approved Performance Chart (50' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I25-04-SS	60psi	90 Deg.	7	7.5	48'
Hunter I25-04-SS	60psi	180/360 Deg.	13	12.3	54'

F. Approved Performance Chart (55'/60' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I25-04-SS	60psi	90 Deg.	8	9.2	50'
Hunter I25-04-SS	60psi	180/360 Deg.	18	15.7	59'

G. Approved Performance Chart (60' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I25-04-SS	60psi	90 Deg.	15	14.3	57'
Hunter I25-04-SS	60psi	180/360 Deg.	25	23.5	66'

2.10 ELECTRIC CONTROL VALVES

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

B. Valves shall be manufactured by Hunter Industries model ICV.

2.11 VALVE BOXES

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

B. Valve box for mainline ringtite isolation gate valves shall be 5-1/4-inch round valve boxes with poly-iron (detectable) sleeves and plastic covers. Top piece shall be 15-1/2 inches long and bottom piece 24 inches. Top shall turn on bottom section to allow for adjustment to grade. Boxes to be as manufactured by Highline Products. "T" handle wrench must fit well inside of box.

C. Valve boxes for wire splices and quick coupling valves shall be 10-inch round valve boxes with metal detection, T-top lids and bolt down covers. Splice boxes shall have gray lids. Splices shall be in separate valve boxes and not included with isolation valves.

D. Valve boxes for flow sensors, master valve, single valves with isolation and dual 1-inch electric valves with isolation shall be 12-inch standard valve boxes with metal detection, T-top lids and bolt down covers. When multiple 1-inch electric valves are installed in the same area, they are to be installed two (2) valves per box in a 12-inch standard box.

E. Valve boxes for single 2-inch valves and dual 1-1/2 and 2-inch electric valves with isolation shall be 18-inch jumbo valve boxes with metal detection, T-top lids and bolt down covers. When multiple 1-1/2 inch 2-inch electric valves are installed in the same area, they are to be installed two (2) valves per box in an 18-inch standard box.

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

G. Grated covers for ground rods and plates shall be 4-inch round, green plastic with detection as manufactured by NDS or equal.

H. Valve boxes shall be manufactured by Dura Plastics, Highline Products or Olde Castle Specification Grade.

2.12 FILTER

A. Filters for MPRotator zone valves shall be a plastic filter consisting of a two-piece threaded housing with O-ring seal. The filter screen shall be 140-mesh size. Filters shall be sized to not exceed 2.5-PSI pressure loss.

B. Filter shall be as manufactured by Landscape Products, Netafim, Rain Bird or equal.

2.13 AUTOMATIC CONTROLLER

A. Controller shall be electronic in construction with capability of 1 second to 12 hour run times per zone. Controller to have minimum 32 independent programs, 20 station simultaneous operation, 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, locking, weather resistant stainless-steel 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.

B. Controller shall have flow monitoring and flow management capabilities with compatible flow sensor connection. Controller shall be capable of automatic flow learning per station and have station level flow diagnostics and alarm shutdown.

C. Controller shall have 5-year warranty.

D. Controller shall be as manufactured by Hunter Industries, model A2C-1200-75D-P with Hunter Solar Sync (weather sensor).

2.14 SURGE ARRESTOR (CONTROLLER)

A. Modular surge arrester shall be a single phase, two pole arrester designed to protect single or split phase 120 volt or 120/240-volt electrical system. Electrical connection shall be embedded in a UL recognized epoxy to seal and protect them from moisture and corrosion.

B. Surge arrestor shall be molded from weather and UV resistant polycarbonate, complying with the UL Standard for flame and strength resistance.

C. Arrestor shall include green LED operating light.

D. Surge arrester shall be manufactured by Paige Electric, model, 250090LED with mounting bracket or equal.

2.15 DECODERS

A. Decoders shall be installed between controller and the electric control valves to provide the opening and closing signal for individual valves. Decoder shall be available in 1, 2 or 4-station devices. 6 station decoders shall not be used. Decoder shall have a unique serial number and controllers-assigned address to identify it in the network.

B. Decoder shall be manufactured by Hunter Industries, model ICD-XX.

C. Flow sensor decoder shall be Hunter ICD-SEN.

2.16 AUTOMATIC WIRELESS WEATHER SENSOR

A. Controller shall be able of accepting weather data from an on-site weather sensor and using this data to automatically adjust the irrigation schedule. Sensor shall have rain and freeze shutoff.

B. Weather sensor shall be polycarbonate in construction with adjustable interruption point and metal extension arm. Wireless weather sensor shall operate up to 200 feet from receiver unit and have built-in bypass switch on receiver panel.

C. System operating frequency shall be 433MHz. Package shall be UL listed; FCC approved.

D. Receiver input power shall be 24 VAC from controllers.

E. Weather Sensor package shall carry a five (5) year warranty.

F. Weather sensor shall be manufactured by Hunter Industries, model Solar Sync. Solar Sync package shall include Solar Sync module, Solar Sync sensor (Transmitter) and Wireless Solar Sync (Receiver).

2.17 WIRE

A. Valve control wire from the decoder to the valve shall be minimum #14-awg, single strand, solid copper; UL- approved direct burial AWG-U.F. 600V and shall meet state and local codes for this service.

B. In ground wire connections, shall be UL listed (486D), manufactured by 3M, model DBR/Y splice kits. Wire splices shall be made in valve boxes, electrical junction boxes, at the controller or at decoder/valves.

C. Valve control wire from the controller to the decoder shall be through two (2), blue and orange, #12/#12 AWG, two-wire paths. Wiring shall be polyethylene double-jacketed or UF-B UL PVC double-jacketed two-conductor solid copper designed for direct burial systems. Connections shall be installed as per their manufacturers' instructions. Wire shall be manufactured by Paige Electric P7354D or approved equal.

D. Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-Volt A.C. or less.

E. Wiring shall be in strict accordance with national, state and local electrical codes.

2.18 QUICK COUPLING VALVES

A. 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 conditions when the key is not inserted.

B. 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.

C. 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.

D. Keys shall be ACME with 1-inch male thread and 3/4-inch female thread at the top. Each key shall include a ball valve shut off before the swivel hose ell. Ball valve and nipples shall be brass.

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

2.19 ISOLATION VALVES

A. Isolation ball valves for air/vacuum release valves shall be of bronze construction, US Manufacture, minimum 3/4 port, 600 WOG with stainless steel handle and chrome plated ball. Ball valves are to be as manufactured by Apollo, Boston, Watts or equal.

B. Isolation valves 2-1/2 inches and smaller shall be gate type, of bronze construction, US Manufacture, 200 WOG with bronze cross handle and 200 psi rating. Gate valves to be as manufactured by Nibco model 113-K, Apollo model 102T or equal.

C. Inground isolation valves 3 inches and larger in size shall be cast iron epoxy coated inside and outside, ringtite valves, 200 psi rated, ductile iron gland flange, bronze stem-seal replaceable under pressure, stainless steel stem, US Manufacturer, 2-inch operating nut and resilient wedge replaceable disc conforming to AWWA C-509 as manufactured by Waterous 500 Series, Clow 2630 Series or Kennedy Ken-Seal Series.

2.20 SWING JOINTS

A. ½-inch and 3/4-inch sprinklers shall be installed on prefabricated swivel joint assemblies as manufactured by Lasco, Spears or equal.

B. 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 or Spears.

C. 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 or Spears.

2.21 IDENTIFICATION TAGS

A. Valves shall have ID tags attached. ID tags shall be manufactured from Polyurethane Behr Desopan. Provide one tag for each electric valve. Use one maxi size tag for electric control valve. Each tag shall provide valve, decoder and station ID information.

B. Tags shall be as manufactured by Paige Electric, T. Christy Enterprises or equal.

2.22 BRASS FITTINGS AND NIPPLES

A. Brass/bronze fittings and nipples shall be used for air/vacuum release valve discharges and quick coupler keys and as otherwise detailed. Brass/bronze fittings shall be cast conforming to ASA B16.15. Threads shall conform to ASA B2.1.

2.23 COMBINATION AIR VACUUM/RELEASE VALVE

A. Combination air vacuum/release valve to be Crispin, Model IC-10 or equal with 1-inch NPT inlet and a 1-inch air and vacuum outlet with a 3/32-inch pressure air release orifice. The valve body shall be cast iron body with stainless steel internals and float and Buna-N seating material. The valves shall exhaust large quantities of air on system start-up and allow air to re-enter the pipeline when the line is being emptied or drained. The valves shall also automatically vent air that accumulates while the system is under pressure.

B. A 1-inch ball valve and 1-inch bronze wye strainer shall be installed below the air/vacuum release valve. Wye strainer shall utilize a 3/4-inch boiler drain for cleaning. See detail.

C. Release valve outlet shall be piped with brass elbows and nipples to direct the air out of the valve as shown on the detail.

2.24 NORMALLY OPEN MASTER VALVE

A. Normally open master control valve shall be in 3-inch in size. Valve shall provide dirty water protection and have no minimum flow feature.

B. Valve shall come with two-piece upper diaphragm and lower seat assembly. Valve shall operate within a pressure range of 20psi-200psi and have an in-rush current of 0.45amps and a holding current of 0.30 amps at 24VAC.

C. Valve shall be designed with removable filter and metering rod assembly and non-continuous flow through the solenoid. Rubber parts shall be EPDM rubber parts.

D. Master valve shall be brass construction as manufactured by Buckner/Superior, model 3325300-RW or approved equal.

2.25 FLOW SENSOR

A. Flow sensor for potable water supply shall be 3-inch, with 150 psi pressure rating. Sensor shall have flow range of 6 to 300 gpm and be installed in a PVC saddle tee. Output shall be two wire standard pulse. Flow sensor shall be as manufactured by Creative Sensor Technologies, model CSI-FS1-S30-001 w/saddle.

2.26 CONTROLLER ENCLOSURE

A. 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 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.

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

C. Controller enclosure shall be 16 inches wide x 15.5 inches deep x 38 inches tall, as manufactured by Strong Box, model SB-16SS with OPT-HUN-ACC mounting tray.

2.27 CONTROLLER GROUNDING

A. Controller shall include factory-installed and factory-recommended lightning protection and shall be connected to a 5/8-inch diameter x 10-foot long copper clad grounding rod with minimum #6 AWG, solid, bare copper wire and 4-inch x 96-inch x 0.0625-inch copper grounding plates as outlined below. Minimum 20-foot separation between rod and plate. Minimum 12-foot separation between controller and ground rod. Connection to rod shall be with exothermic connectors as specified. Connection to plate shall be performed by the plate manufacturer with 25-feet of bare copper wire already attached. Grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover with metal detection and six inches of 4-inch drainage pipe. Plate shall be installed in ground enhancement material. Plate shall be covered with 4-inch plastic grated cover with detection and minimum 36 inches of 4-inch drainage pipe. Ground rod and plate shall be UL listed.

B. Controller shall be grounded to one rod and one plate. 10-foot rod shall be installed penetrating into the soil to its full length. Plate shall be installed at a 36-inch depth with 50 lbs. of ground enhancement material spread evenly below the plate and 50 lbs. spread evenly above the plate in accordance with manufacturer's requirements. Grounding electrodes shall be installed at least 10 feet from wires connected to the controller.

2.28 COMMUNICATION PATH GROUNDING

A. Two-wire communication path shall be grounded at 600-foot maximum intervals, at every termination of a part of the wire path to a surge arrestor decoder where indicated on the drawings, and 50 feet from the controller. Each surge arrestor shall be connected to a 5/8-inch diameter x 8-foot long copper clad grounding rod and 4-inch x 36-inch grounding plate with minimum #10 AWG, solid, bare copper wire. Minimum 8-foot separation between rod and other equipment. Connections to rods shall be with exothermic connectors as specified. Each grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover with metal detection and six inches of 4-inch drainage pipe. Plate shall be installed at a 36-inch depth with 25 lbs. of ground enhancement material spread evenly below the plate and 25 lbs. spread evenly above the plate. Plates shall be covered with 4-inch plastic grated cover with detection and minimum 36 inches of 4-inch drainage pipe. Ground rods and plates shall be UL listed.

2.29 MODULATING BUTTERFLY VALVE

A. Modulating butterfly valve shall be in 2-inch in size installed in water supply enclosure.

B. Valve shall have F05/F07 ISO flanges on both sides with quarter turn actuator and NEMA 4 enclosure. Valve shall operate within a pressure range of 20psi-150psi and have a start current of 1.2-amps and 1-amp current rating at 115VAC. Valve shall have emergency handwheel.

C. Valve shall be as manufactured by Bernard, model OA8 or approved equal.

2.30 WATER METER

A. 3-inch water meter shall be Neptune compound meter w/ 3-inch strainer as approved by the Town of Longmeadow Public Works Department.

2.31 BACKFLOW PREVENTION DEVICE

A. Reduced pressure backflow prevention device shall be 3-inch, Watts LF909 w/NRS gate valves as approved by the Town of Longmeadow Public Works Department.