



## TECHNICAL SPECIFICATIONS TABLE OF CONTENTS

|                                                                       |             |
|-----------------------------------------------------------------------|-------------|
| <i>SECTION 01 14 33 – WORK WITHIN ACTON STREET RIGHT-OF-WAY .....</i> | <i>1-4</i>  |
| <i>SECTION 01 73 29 – EXTERIOR CUTTING AND PATCHING.....</i>          | <i>1-8</i>  |
| <i>SECTION 01 77 00 – PROJECT CLOSEOUT.....</i>                       | <i>1</i>    |
| <i>SECTION 02 21 13 – SURVEY MARKERS.....</i>                         | <i>1-4</i>  |
| <i>SECTION 02 41 13 – SITE PREPARATION AND DEMOLITION.....</i>        | <i>1-6</i>  |
| <i>SECTION 03 30 53 – CAST-IN-PLACE CEMENT CONCRETE.....</i>          | <i>1-9</i>  |
| <i>SECTION 10 14 00 – SIGNAGE .....</i>                               | <i>1-2</i>  |
| <i>SECTION 11 68 33 – ATHLETIC FIELD EQUIPMENT .....</i>              | <i>1-6</i>  |
| <i>SECTION 26 00 00 – ELECTRICAL.....</i>                             | <i>1-11</i> |
| <i>SECTION 26 56 68 – EXTERIOR ATHLETIC LIGHTING .....</i>            | <i>1-10</i> |
| <i>SECTION 26 60 00 – SECURITY CAMERA SYSTEM REQUIREMENTS .....</i>   | <i>1-16</i> |
| <i>SECTION 31 23 10 – EARTHWORK.....</i>                              | <i>1-18</i> |
| <i>SECTION 31 23 19 – DEWATERING AND DRAINAGE CONTROL.....</i>        | <i>1-4</i>  |
| <i>SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROLS.....</i>     | <i>1-6</i>  |
| <i>SECTION 32 11 16 – AGGREGATE BASE COURSES.....</i>                 | <i>1-3</i>  |
| <i>SECTION 32 12 16 – BITUMINOUS CONCRETE.....</i>                    | <i>1-3</i>  |
| <i>SECTION 32 18 23 – ATHLETIC SURFACING.....</i>                     | <i>1-3</i>  |
| <i>SECTION 32 31 00 – STEEL VEHICULAR GATES .....</i>                 | <i>1-5</i>  |
| <i>SECTION 32 31 13 – CHAIN LINK FENCES AND GATES.....</i>            | <i>1-6</i>  |
| <i>SECTION 32 31 19 – ORNAMENTAL FENCES AND GATES.....</i>            | <i>1-2</i>  |
| <i>SECTION 32 31 29 – WOOD GUARDRAIL.....</i>                         | <i>1-2</i>  |
| <i>SECTION 32 32 23.13 – SEGMENTAL CONCRETE RETAINING WALLS.....</i>  | <i>1-4</i>  |
| <i>SECTION 32 33 00 – SITE FURNISHINGS .....</i>                      | <i>1-3</i>  |
| <i>SECTION 32 84 00 – IRRIGATION SYSTEM.....</i>                      | <i>1-22</i> |
| <i>SECTION 32 91 00 – LOAM .....</i>                                  | <i>1-7</i>  |
| <i>SECTION 32 92 19 – SEEDING.....</i>                                | <i>1-8</i>  |
| <i>SECTION 32 92 23 – SODDING.....</i>                                | <i>1-6</i>  |
| <i>SECTION 32 93 00 – PLANTING.....</i>                               | <i>1-5</i>  |
| <i>SECTION 33 41 00 – SUBDRAINAGE FOR ATHLETIC FIELDS .....</i>       | <i>1-4</i>  |
| <i>SECTION 33 42 00 – STORMWATER CONVEYANCE.....</i>                  | <i>1-10</i> |



**SECTION 01 14 33  
WORK WITHIN ACTON STREET RIGHT OF WAY**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Within the Acton Street right of way:
    - a) Pavement removal
    - b) Drain stub removal and drain installation
    - c) Backfill and compaction
    - d) Temporary/permanent pavement repair
    - e) Filter sack installation, maintenance and removal
- C. All work described above shall be marked out in the field for review and approval by the Owner's representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. 31 23 10 – Section 1.08 WORK IN THE PUBLIC WAYS

**1.03 GENERAL PROVISIONS**

- A. This specification applies to work depicted on the Civil Drawings prepared by Quinn Engineering, Inc., herein referred to as the "Drawings" and specifically consisting of:
  - 1. Sheets C-1 through C-4.
- B. Attention is directed to PROJECT SPECIAL CONDITIONS which are hereby made a part of this Section of the Specifications.
- C. All work conducted in association with this section shall conform to the applicable requirements of the Occupational Safety and Health Administration (OSHA).
- D. In accordance with MA General Law Chapter 82 Section 40A and prior to construction, the Contractor shall contact DIGSAFE and other utility providers in order to determine the location of existing utilities within the project area. The Contractor is responsible for coordinating the work with the existing utilities so that disruption to the existing utilities is minimized.



- E. Prior to construction, the Contractor shall notify and coordinate any planned disruptions to existing utilities that are required to perform the work with the appropriate utility provider and with the Owner’s representative. Disruptions to existing utilities shall be planned so that the time of disruption is minimized.

**1.04 INDUSTRY STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. Commonwealth of Massachusetts, Department of Public Works, Standard specifications for Highways and Bridges, Supplemental Specifications, latest edition.
  - 2. AASHTO: American Association of State Highway and Transportation Officials
  - 3. ASTM: American Society for Testing and Materials
  - 4. Mass DOT: Massachusetts Department of Transportation, Highway Division
  - 5. MSSHB: Massachusetts Standard Specifications for Highways and Bridges

**1.05 PERMITS**

- A. The Contractor shall secure all necessary permits from the City of Worcester of Department of Public Works and Parks and City of Worcester Water Operations prior to construction. Securing permits shall be conducted in accordance with project specifications.
- B. The Contractor shall apply for and obtain all permits necessary for the work depicted on the Drawings and specified in this section.
- C. Permits shall be secured and paid for in accordance with these specifications.

**1.06 WARRANTY**

- A. The Contractor shall warrant all materials and workmanship specified herein for a period of one year from the time of acceptance by the Owner unless otherwise noted.

**1.07 SUBMITTALS**

- A. Submit to the Owner’s representative in accordance with these specifications, copies of all necessary permits required prior to the beginning work.

**1.08 COORDINATION**

- A. The work specified in this section shall be coordinated with all work shown/described on the Drawings and in the specifications with other portions of the work for the entire project.
- B. The Contractor shall give the Engineer at least 48 hour notice when requesting inspections on site.

**1.09 EXISTING UTILITIES**



- A. Existing utility information depicted on the Drawing has been provided to Quinn Engineering, Inc. unless otherwise noted. The Contractor is responsible for coordinating the locations of all existing utilities with the utility provider and “DIGSAFE”. Quinn Engineering, Inc. does not warrant that all existing utilities have been depicted on the Drawings. Quinn Engineering, Inc. does not warrant the accuracy of the existing utilities depicted on the Drawings.
- B. The Contractor shall take every precaution to limit disruption to existing utilities. Any existing utilities disrupted or affected by the Contractor as a result of his/her work shall be repaired at least to the condition that existed prior to construction. The Contractor shall coordinate repair of any utilities with the utility providers and any costs associated with the repair shall be borne by the Contractor.

**1.10 DRAWINGS**

- A. The Contractor is responsible for reviewing the Drawings and existing site conditions with respect to this section.
- B. The information depicted on the Drawings is believed to reflect the current site conditions unless otherwise noted on the Drawings. The Contractor is responsible for reviewing the existing site conditions in the areas of the proposed work and notify the Owner’s representative as soon as possible if any discrepancies exist between the two.
- C. The existing conditions depicted on the Drawings have been provided to Quinn Engineering, Inc. Quinn Engineering, Inc. does not warrant that all existing conditions, structures, utilities, etc. have been depicted.

**1.11 POLICE DETAILS**

- A. Contact the Worcester Police Department and provide the Police Department with a description of the work (plans, etc.) as necessary for the Police Department to determine if oversight and detail is required.
- B. The Contractor is responsible for coordinating and paying for all police oversight and details required for work in ACTON STREET.

**PART 2 - PRODUCTS**

- A. All products and execution including materials, means, method, sequencing, testing, inspection, traffic control, etc. used within the ACTON STREET right of way shall conform to the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) available from the City of Worcester Department of Public Works & Parks or online at <http://www.worcesterma.gov/uploads/f4/47/f447742802267b27c77ae3d50e4c20d8/standard-specs.pdf>

**PART 3 - EXECUTION**



- A. All products and execution including materials, means, method, sequencing, testing, inspection, traffic control, etc. used within the ACTON STREET right of way shall conform to the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) available from the City of Worcester Department of Public Works & Parks or online at <http://www.worcesterma.gov/uploads/f4/47/f447742802267b27c77ae3d50e4c20d8/standard-specs.pdf>

**END OF SECTION**



**SECTION 01 73 29  
EXTERIOR CUTTING AND PATCHING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Cutting and patching within the existing paved parking, sidewalk area and curb (not located within the Acton Street Right of Way).
- C. All cutting locations shall be marked out in the field for review and approval by the Owner's representative prior to execution of the cut.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Worcester Special Conditions and Specifications – GRAVEL BORROW
- B. Worcester Special Conditions and Specifications (additional requirements for excavation)
- C. 31 23 10 – Earthwork
- D. 32 11 16 – Aggregate Base Courses
- E. 32 91 13 – Loam
- F. 32 92 19 - Seeding

**1.03 GENERAL PROVISIONS**

- A. This specification applies to work depicted on the Civil Drawings prepared by Quinn Engineering, Inc., herein referred to as the "Drawings" and specifically consisting of:
  - 1. Sheets C-1 through C-4.
- B. Attention is directed to PROJECT SPECIAL CONDITIONS which are hereby made a part of this Section of the Specifications.
- C. All work conducted in association with this section shall conform to the applicable requirements of the Occupational Safety and Health Administration (OSHA).
- D. In accordance with MA General Law Chapter 82 Section 40A and prior to construction, the Contractor shall contact DIGSAFE and other utility providers in order to determine the location of existing utilities within the project area. The Contractor is responsible for coordinating the work with the existing utilities so that disruption to the existing utilities is minimized.



- E. Prior to construction, the Contractor shall notify and coordinate any planned disruptions to existing utilities that are required to perform the work with the appropriate utility provider and with the Owner’s representative. Disruptions to existing utilities shall be planned so that the time of disruption is minimized.

**1.04 INDUSTRY STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. Commonwealth of Massachusetts, Department of Public Works, Standard specifications for Highways and Bridges, Supplemental Specifications, latest edition.
  - 2. AASHTO: American Association of State Highway and Transportation Officials
  - 3. ASTM: American Society for Testing and Materials
  - 4. Mass DOT: Massachusetts Department of Transportation, Highway Division
  - 5. MSSHB: Massachusetts Standard Specifications for Highways and Bridges

**1.05 REFERENCES**

- A. The phrase “MA DOT Specifications” used in these specifications is used as a reference to the most current specification published by the Massachusetts Department of Transportation Highway Division, including (but not limited to) in the following publications:
  - 1. Standard Specifications for Highways and Bridges published by the Commonwealth of Massachusetts - Massachusetts Highway Department, Boston Massachusetts, dated 1988.
  - 2. Supplemental Specifications to the 1988 English Standard Specifications for Highways and Bridges and the 1995 Metric Standard Specifications for Highways and Bridges April 1, 2019
  - 3. Interim Supplemental Specifications dated September 30, 2019.

**1.06 DEFINITION**

- A. “Cutting and Patching” is defined to include the cutting and patching of existing pavement, concrete, curb, piping or other existing features in order to accommodate the new work or the installation of other items or structures or to uncover other facilities and structures for access or inspection, or to obtain samples for testing.

**1.07 OPERATIONAL AND SAFETY LIMITATIONS**

- A. The Contractor shall not cut any operation or safety-related items in a manner resulting in a reduction of capacities to perform in the manner intended or resulting in decreased operational life, increased maintenance or decreased safety.

**1.08 PERMITS**



- A. The Contractor shall secure all necessary permits from the City of Worcester of Department of Public Works and Parks and City of Worcester Water Operations prior to construction. Securing permits shall be conducted in accordance with project specifications.
- B. The Contractor shall apply for and obtain all permits necessary for the work depicted on the Drawings and specified in this section.
- C. Permits shall be secured and paid for in accordance with these specifications.

**1.09 SITE CONDITIONS**

- A. The Contractor is responsible for performing layout of all materials as specified on the Drawings and in relation to the existing conditions.
- B. The Contractor shall provide barricades or barriers to protect the public from construction activities.
- C. The work specified herein shall take place under weather conditions so as not to cause erosion or negatively impact any portion of the site.

**1.10 WARRANTY**

- A. The Contractor shall warrant all materials and workmanship specified herein for a period of one year from the time of acceptance by the Owner.

**1.11 CONFORMANCE WITH THE AMERICANS WITH DISABILITIES ACT AND THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD**

- A. Materials and work identified on the Drawings and specified herein shall conform to the Americans with Disabilities Act Standards for Accessible Design (28 FCR Part 36) and the Massachusetts Architectural Access Board (521 CMR).
- B. The Contractor shall notify the Owner’s representative of any discrepancies between the Drawings and work specified herein and the above referenced standards prior to installation.

**1.12 COORDINATION**

- A. The work specified in this section shall be coordinated with all work shown/described on the Drawings and in the specifications with other portions of the work for the entire project.
- B. The Contractor shall give the Engineer at least 48 hour notice when requesting inspections on site.

**1.13 EXISTING UTILITIES**

- A. Existing utility information depicted on the Drawing has been provided to Quinn Engineering, Inc. unless otherwise noted. The Contractor is responsible for coordinating the locations of all existing utilities with the utility provider and “DIGSAFE”. Quinn Engineering, Inc. does not warrant that all existing utilities have been depicted on the Drawings.



- B. The Contractor shall take every precaution to limit disruption to existing utilities. Any existing utilities disrupted or affected by the Contractor as a result of his/her work shall be repaired at least to the condition that existed prior to construction. The Contractor shall coordinate repair of any utilities with the utility providers and any costs associated with the repair shall be borne by the Contractor.

#### **1.14 DRAWINGS**

- A. The Contractor is responsible for reviewing the Drawings and existing site conditions with respect to this section.
- B. The information depicted on the Drawings is believed to reflect the current site conditions unless otherwise noted on the Drawings. The Contractor is responsible for reviewing the existing site conditions in the areas of the proposed work and notify the Owner, Architect, and Engineer as soon as possible if any discrepancies exist between the two.
- C. The existing conditions depicted on the Drawings have been provided to Quinn Engineering, Inc. unless otherwise noted. Quinn Engineering, Inc. does not warrant that all existing conditions, structures, utilities, etc. have been depicted.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS USED IN CUTTING AND PATCHING**

- A. The Contractor shall furnish and provide all hand tools and power tools used for cutting, sawing or grinding. Hammering and chopping of existing surfaces is not allowed.
- B. Unless otherwise indicated, the Contractor shall provide materials for patching which will result in an equal-or-better product than the material being cut and patched, in terms of performance characteristics and including visual effects where applicable. The Contractor shall use material identical with the original materials where feasible.

#### **2.02 BITUMINOUS CONCRETE PAVEMENT**

- A. Bituminous concrete shall be Hot Mix Asphalt and shall conform to the applicable MA DOT Specifications including portions of *Section 420 Class I Hot Mix Asphalt Base Course, Type I-1*, *Section 460 Class I Hot Mix Asphalt Pavement*, and *M3.00.00 Bituminous Materials through M3.11.09 Composition and Compaction Acceptance Tests*.

#### **2.03 TACK COAT**

- A. Bituminous Concrete Tack shall be as specified in MA DOT Specification *M3.03.3 Protective Seal Coat Emulsion* and *M3.11.06 Bituminous Materials B*.

#### **2.04 MINERAL AGGREGATE**

- A. Coarse mineral aggregate shall conform to MA DOT Specification *M3.11.04 Mineral Aggregate A*.
- B. Fine mineral aggregate shall conform to MA DOT Specification *M3.11.04 Mineral Aggregate B*.



- C. Gradation and quality shall conform to that specified for “HMA Intermed, Course Dense Binder” and “HMA Surface Course – Standard Top” pavements in MA DOT Specification *M3.11.03 Job Mix Formula Table A*.

**2.05 BITUMINOUS CONCRETE BERM / CURB:**

- A. Bituminous concrete used for berm and curbs shall be Class I as specified in the MA DOT Specifications including *Sections 470 Class I Hot Mix Asphalt Berms, Section 501.64 Hot Mix Asphalt Curb*, and *Section M3.12.0 Hot Mix Asphalt Curb, Types 1, 2, or 3*.
- B. Bituminous concrete curb dimensions shall be as indicated on the Drawings.

**2.06 GRAVEL BORROW**

- A. Gravel borrow used for bituminous concrete pavement base shall conform to MA DOT Specification *M1.03.0 Gravel Borrow Type c* (2 inch largest dimension). See Worcester Special Conditions and Specifications – GRAVEL BORROW for additional requirements.

**2.07 PAVEMENT MARKINGS**

- A. Pavement markings shall conform to the Federal Highway Administration Manual of Uniform Traffic Control Devices, MA DOT Specification *M7.01.24 Fast Drying Water-Borne Traffic Paint*, Architectural Access Board regulations *521 CMR*, ADA Standards for Accessible Design *28 CFR Part 36*.

**2.08 BITUMINOUS CONCRETE BERM / CURB:**

- A. Bituminous concrete used for berm and curbs shall be Class I as specified in the MA DOT Specifications including *Sections 470 Class I Hot Mix Asphalt Berms, Section 501.64 Hot Mix Asphalt Curb*, and *Section M3.12.0 Hot Mix Asphalt Curb, Types 1, 2, or 3*.

**PART 3 - EXECUTION**

**3.01 GENERAL**

- A. Employ skilled workers to perform cutting and patching.
- B. Cut existing items and surfaces to provide for installation of other components or performance of other construction activities and the subsequent patching required to restore surfaces to their original condition.

**3.02 PROTECTION**

- A. The Contractor shall be responsible for conducting the work with care so as not to damage, undermine, or destroy existing structures, utilities, etc. within the vicinity of the project. The Contractor shall also be responsible for planning the work means and methods prior to beginning work in order to identify activities or areas that may be damaged, undermined, or destroyed by the work. Any activities or areas identified as such shall be brought to the Owner’s representative attention immediately.



- B. Any damage to improvements within these areas or to adjacent properties that is outside the scope of work defined on the Drawings and herein shall be restored to the original condition that existed immediately before the damage was done. Restoration operations shall be conducted to the satisfaction of the project Owner and adjacent property owner and all costs associated with restoration shall be borne by the Contractor.

### **3.03 EXTERIOR PATCHED FINISH SURFACES**

- A. All new exterior finish ground surfaces shall:
  - 1. Be constructed flush with the adjacent finish ground surfaces.
  - 2. Have uniform slopes and shall not contain any irregularities.
  - 3. Slope away from the buildings (unless otherwise noted).
  - 4. Slope towards the existing surface drains (unless otherwise noted).
  - 5. Be stabilized. Finish all areas disturbed by new construction with top soil and grass seed (unless stabilized by other means). The contractor shall water and fertilize the grass so that a dense growth is developed.

### **3.04 PREPARATION**

- A. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- B. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

### **3.05 CUTTING EXISTING SURFACES/ITEMS**

- A. Provide temporary bracing and/or support as required to accommodate cutting and patching.
- B. In areas where new work requires removal of existing finish surfaces, saw cut and remove existing finish surfaces to provide joint at the new work location where the existing finish surface may be removed.
- C. Temporarily cover openings when not in use.
- D. All cuts shall be neat, straight, vertical cuts with no broken edges.
- E. All cuts shall be uninterrupted. In areas where trenching is required, saw cuts shall be approximately parallel to trench (max. 1:6 longitudinal variance).
- F. Trench width shall be minimum 24 inches. Removal and restoration of the existing finish surfaces shall be minimized. The Contractor shall be responsible for all surface restoration required to accommodate new work.

### **G. PAVEMENT**

- 1. The width of pavement removed shall not exceed two (2) feet outside the minimum trench width.



2. If a saw cut in pavement falls within (2) foot of an existing curb, gutter, or edge of pavement, the additional pavement shall be removed and reconstructed.
3. Unstable pavement shall be removed over cave-ins/breaks and the subgrade shall be treated as the main trench. The Contractor shall not be required to pay for the repair of any pavement damage existing prior to the excavation unless the Contractor's cut results in small floating sections that may be unstable. If this occurs, the Contractor shall remove the unstable portion and the area shall be treated as part of the excavation.
4. When saw cutting pavement, the maximum overrun allowed for any saw cut beyond the boundary removal limits of existing pavement shall be 2 inches.
5. After excavation, backfill and compaction provide new finish surface to match the existing adjacent surface material. The new finish surface shall have a uniform surface, without irregularities that is flush with the existing adjacent surface and provides a uniform slope.

#### H. BITUMINOUS CONCETE CURB

1. The minimum width of bituminous concrete curb to be removed is 24".
2. If a saw cut falls within 1 foot of an object, corner, unsuitable material or other disruption, the additional curb shall be removed and reconstructed.

### 3.06 PATCHING EXISTING SURFACES/ITEMS

#### A. PAVEMENT

1. Gravel base shall be placed to the depth specified on the Drawings and compacted in accordance with 32 11 16 – Aggregate Base Courses.
2. After backfill and compaction, tack coat all exposed surfaces prior to placement of new bituminous concrete pavement. Tack coat application shall be done in accordance with MA DOT Specification *Section 460.62 Tack Coat*.
3. Bituminous concrete paving, including spreading, finishing, compaction, correction of irregularities, and opening to traffic, shall be in accordance with MA DOT Specification *Section 420 Class I Hot Mix Asphalt Base Course, Type I-1 and Section 460 Class I Hot Mix Asphalt Pavement Type I-1*. Bituminous concrete pavement shall be placed to the depth specified on the Drawings. The depth specified on the Drawings represents the depth after compaction.
4. All exposed joints and saw cut over runs are to be sealed with tack and stone dust.
5. Replace pavement markings to match what existed prior to cutting and patching. Pavement Markings shall be applied in accordance with MA DOT Specification *Section 860 Reflectorized Pavement Markings*.

#### B. BITUMIOUS CONCRETE CURB

1. Tack coat all exposed surfaces prior to placement of new bituminous concrete curb.
2. Bituminous concrete curb shall be of the dimensions specified on the Drawings.



3. Bituminous berm shall be installed in accordance with MA DOT Specification Section 470 Class I Hot Mix Asphalt Berms and Section 501.64 Hot Mix Asphalt Curb and MA DOT Specification Section 501.64 Bituminous Concrete Curb.

C. All new exterior finish ground surfaces shall:

1. Be constructed flush with the adjacent finish ground surfaces.
2. Have uniform slopes and shall not contain any irregularities.
3. Slope away from the buildings (unless otherwise noted).
4. Slope towards the existing surface drains (unless otherwise noted).
5. Be stabilized. Finish all areas disturbed by new construction with top soil and grass seed (unless stabilized by other means). The contractor shall water and fertilize the grass so that a dense growth is developed.

**3.07 CLEANUP**

- A. The Contractor shall remove all debris, excess materials, equipment related to the storm drain installation from the site.

**END OF SECTION**



**SECTION 01 77 00  
PROJECT CLOSEOUT**

**PART 1 - GENERAL**

**1.01 FINAL INSPECTION**

- A. Upon completion of the project and prior to issuance of final payment certificates, the Contractor shall schedule a final inspection.
- B. The Owner's representative, the Contractor, and other persons designated by the Owner shall be present.
- C. Should defects or discrepancies be encountered, a listing of such items will be supplied to all parties. Following completion of this listing including repairs, etc., a second inspection will be held in accordance with paragraph "A" above.

**1.02 GUARANTEE**

- A. Neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of Work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- B. The Contractor shall remedy any defects in the Work, and pay all expenses for any damage to other Work resulting therefrom, which shall appear within a period of one (1) year from the date of final acceptance of the work unless a longer period is specified elsewhere. The Owner will give notice of observed defects with reasonable promptness. Where items of mechanical equipment carry a manufacturer's warranty of longer than one (1) year, the manufacturer's warranty shall be considered the period of guarantee for that time only.

**1.03 SUBMITTALS**

- A. The Contractor shall submit to the Owner's representative, before final acceptance, two (2) copies of all warranties, guaranties, and surety bonds on the Work, as required in the Contract Documents. All such documents shall show the name of the Project, location, and name of the Owner.

**END OF SECTION**



**SECTION 02 21 13  
SURVEY MARKERS**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Installation of granite bounds at property corners.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Worcester Special Conditions and Specifications – GRAVEL BORROW

**1.03 GENERAL PROVISIONS**

- A. This specification applies to work depicted on the Civil Drawings prepared by Quinn Engineering, Inc., herein referred to as the “Drawings” and specifically consisting of:
  - 1. Sheets C-1 through C-4.
- B. Attention is directed to PROJECT SPECIAL CONDITIONS which are hereby made a part of this Section of the Specifications.
- C. All work conducted in association with this section shall conform to the applicable requirements of the Occupational Safety and Health Administration (OSHA).
- D. In accordance with MA General Law Chapter 82 Section 40A and prior to construction, the Contractor shall contact DIGSAFE and other utility providers in order to determine the location of existing utilities within the project area. The Contractor is responsible for coordinating the work with the existing utilities so that disruption to the existing utilities is minimized.
- E. Prior to construction, the Contractor shall notify and coordinate any planned disruptions to existing utilities that are required to perform the work with the appropriate utility provider and with the Owner’s representative. Disruptions to existing utilities shall be planned so that the time of disruption is minimized.

**1.04 INDUSTRY STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:



1. Commonwealth of Massachusetts, Department of Public Works, Standard specifications for Highways and Bridges, Supplemental Specifications, latest edition.
2. AASHTO: American Association of State Highway and Transportation Officials
3. ASTM: American Society for Testing and Materials
4. Mass DOT: Massachusetts Department of Transportation, Highway Division
5. MSSHB: Massachusetts Standard Specifications for Highways and Bridges

#### **1.05 SUBMITTALS**

- A. Submit for approval prior to ordering and shipment technical information regarding the bounds.

#### **1.06 SITE CONDITIONS**

- A. The Contractor is responsible for performing layout of all materials as specified on the Drawings and in relation to the existing conditions.
- B. The Contractor shall provide barricades or barriers to protect the public from construction activities.
- C. The work specified herein shall take place under weather conditions so as not to cause erosion or negatively impact any portion of the site.

#### **1.07 WARRANTY**

- A. The Contractor shall warrant all materials and workmanship specified herein for a period of one year from the time of acceptance by the Owner.

#### **1.08 COORDINATION**

- A. The work specified in this section shall be coordinated with all work shown/described on the Drawings and in the specifications with other portions of the work for the entire project.
- B. The Contractor shall give the Engineer at least 48 hour notice when requesting inspections on site.

#### **1.09 EXISTING UTILITIES**

- A. Existing utility information depicted on the Drawing has been provided to Quinn Engineering, Inc. unless otherwise noted. The Contractor is responsible for coordinating the locations of all existing utilities with the utility provider and "DIGSAFE". Quinn Engineering, Inc. does not warrant that all existing utilities have been depicted on the Drawings.
- B. The Contractor shall take every precaution to limit disruption to existing utilities. Any existing utilities disrupted or affected by the Contractor as a result of his/her work shall be repaired at least to the condition that existed prior to construction. The Contractor shall coordinate repair of any utilities with the utility providers and any costs associated with the repair shall be borne by the Contractor.

#### **1.10 DRAWINGS**



- A. The Contractor is responsible for reviewing the Drawings and existing site conditions with respect to this section.
- B. The information depicted on the Drawings is believed to reflect the current site conditions unless otherwise noted on the Drawings. The Contractor is responsible for reviewing the existing site conditions in the areas of the proposed work and notify the Owner's representative as soon as possible if any discrepancies exist between the two.
- C. The existing conditions depicted on the Drawings have been provided to Quinn Engineering, Inc. unless otherwise noted. Quinn Engineering, Inc. does not warrant that all existing conditions, structures, utilities, etc. have been depicted.

## **PART 2 - PRODUCTS**

### **2.01 GRANITE BOUNDS**

- A. Granite bounds shall be of sound granite, the top and bottom faces parallel and the front and back shall be straight split. The bounds shall be cut to the dimensions shown on the Drawings and shall be plain or lettered as indicated on the plans or as directed.
- B. The stone shall be pointed on the top and on three sides and hammer dressed on the face for a distance of not less than 12 inches below the top. The top shall be 6 inches square and shall have a drill hole in the center 1½ inch in depth and 1/2 inch in diameter, with the bottom somewhat flared.

## **PART 3 - EXECUTION**

### **3.01 BOUND SETTING**

- A. The bounds shall be set at the depth and position as follows:
  - 1. Bounds located in lawns or other non-paved areas shall be set with the top of the bound 6 inches above the surface.
  - 2. Bounds located in sidewalks or drives shall be set with the top of the bound flush with the surface.
  - 3. Bounds located in areas where ledge or bedrock is encountered at least 24" below the ground surface may be broken/split to a shorter length to accommodate the shallower depth. Contact the Owner's representative if ledge or bedrock is encountered within 24 inches of the ground surface.
- B. Material for backfilling shall consist of suitable excavated material carefully placed about the bound and thoroughly compacted.
- C. When the excavation is in earth not suitable for backfilling, the Contractor shall furnish clean gravel or sand for backfill.

### **3.02 GRAVEL BORROW**



- A. Gravel borrow used for bituminous concrete pavement base shall conform to MA DOT Specification *M1.03.0 Gravel Borrow Type c* (2 inch largest dimension). See Worcester Special Conditions and Specifications – GRAVEL BORROW for additional requirements.

**3.03 CLEANUP**

- A. The Contractor shall remove all debris, excess materials, equipment related to the survey marker installation from the site.

**END OF SECTION**



**SECTION 02 41 13  
SITE PREPARATION AND DEMOLITION**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Protection of existing site features to remain.
  - 2. Protection of existing trees to remain.
  - 3. Clearing, grubbing, and removal of trees and other plant material.
  - 4. Removal and disposal of site features within limits of work.
  - 5. Removal and storage of items designated for re-installation
  - 6. Removal and delivery of items designated to be brought to Owner
  - 7. Dust control.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Project Special Conditions and Specifications
- B. Section 01 73 29 – Exterior Cutting and Patching
- C. Section 31 25 00 – Erosion and Sedimentation Control
- D. Section 31 23 10 – Earthwork (for extent of excavation and backfilling operations)

**1.03 SUBMITTALS**

- A. Product Literature: Prior to ordering the materials listed below, the Contractor shall submit product literature to the Owner's Representative for approval as follows. The Contractor shall not order materials until the Owner's Representative's approval has been obtained.
  - 1. Temporary tree protection fencing.

**1.04 CODES AND STANDARDS**

- A. The Contractor shall perform demolition and clearing work in accordance with applicable rules, regulations, codes, and ordinances of The City of Worcester, State and Federal Authorities, and in accordance with the requirements of public utility corporations having jurisdiction over the work.

**1.05 MATERIALS OWNERSHIP**

- A. Except for items or materials indicated to be stockpiled, relocated, reinstalled, delivered to Owner, or otherwise indicated to remain on the Owner's property, demolished materials



shall become the Contractor's property and shall be removed by the Contractor from the site and disposed of in a legal manner.

- B. Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner, which may be encountered during site preparation, remain the Owner's property. The Contractor shall carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner. See Special Conditions and Specifications for additional requirements.

#### **1.06 STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ANSI: American National Standards Institute

#### **1.07 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

### **PART 2 - PRODUCTS**

#### **2.01 DUST CONTROL**

- A. Acceptable materials for dust control use shall consist of the following or equivalent thereof:
  - 1. Potable water
  - 2. Calcium chloride
  - 3. Hydroseeding
  - 4. Motorized street sweeper
  - 5. Plastic covering
- B. The Contractor shall not use oil or similar penetrants.

#### **2.02 TEMPORARY TREE PROTECTION FENCING**

- A. Temporary construction fencing shall be orange plastic fencing as detailed on the Drawings. Posts shall be wooden or steel.

#### **2.03 TEMPORARY CONSTRUCTION FENCING**

- A. Temporary construction fencing shall be chain-link fencing, constructed in accordance with the Drawings.

### **PART 3 - EXECUTION**



### **3.01 GENERAL**

- A. See also Project Special Conditions and Specifications.
- B. Before commencing Site Preparation work, the Contractor shall meet with the Owner's Representative in order to discuss the procedures to be utilized. The Contractor shall be held responsible for any damage to all vegetation designated to remain. The Owner's Representative will be the sole judge as to damage inflicted.
  - 1. The Owner's Representative shall make the final determination of action required regarding any and all items indicated for removal, stockpiling, disposal, adjustment and protection.
- C. The work shall be conducted with prime consideration given to the following:
  - 1. Compliance with governing laws and building codes.
  - 2. Safety, protection, and convenience of the public and workers.
  - 3. Erosion control (in accordance with Section 31 25 00 Erosion and Sedimentation Control)
  - 4. Minimization of dirt and dust proliferation.
  - 5. Neat and accurate cutting and trimming of elements to be partially removed subject to the Owner's representative's approval.
  - 6. Avoidance of any damage to existing vegetation to remain

### **3.02 PROTECTION OF EXISTING CONDITIONS**

- A. The Contractor shall provide protections necessary to prevent damage to existing park features indicated to remain in place. In the event of damage, he/she shall immediately make all repairs and replacements necessary to the approval of the Owner's Representative at no additional cost to the Owner.
- B. The Contractor shall protect existing features on adjoining properties.

### **3.03 PROTECTION OF EXISTING VEGETATION**

- A. The Contractor shall protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of tree roots by stockpiling construction materials or excavated materials within drip line, foot or vehicular traffic, or parking of vehicles within drip line.
  - 1. The Contractor shall install temporary tree protection fencing at the edge of existing tree canopies (drip line) where shown on the Drawings, and in accordance with the detail for tree protection fence.



2. The Contractor shall provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. He/she shall temporarily cover exposed roots with wet burlap to prevent roots from drying out, and cover with earth as soon as possible. The Contractor shall notify the Owner's representative immediately upon damage incurred during the course of construction.
3. The Contractor shall repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to the Owner's representative. The Contractor shall employ a licensed arborist to repair damage to trees and shrubs.
4. Existing trees to be saved within or outside the limit of work line which have, in the opinion of the Owner's representative, become damaged, shall be assessed at \$300 per caliper inch and deducted from the Contract amount. Existing shrubs, vines, and groundcover indicated to be saved which have, in the opinion of the Owner's representative, become damaged, shall be replaced with plants of equal size by the Contractor.
  - a. All expenses of removal and replacement incurred shall be paid by the Contractor without additional cost to the Owner. The Contractor shall remove these plants according to the Specification requirements for removals, grub out and remove the stumps, and repair the ground surface.

#### **3.04 DUST CONTROL**

- A. The Contractor shall apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent air-borne dust from dispersing into the atmosphere. He/she shall maintain dust control at all times throughout the construction period. Control measures will be required in all areas as well as for stockpiles, temporary traffic ways, and all other areas where dust may develop.
- B. Dust control procedures shall be monitored by the Owner's representative and shall be subject to on-site review by authorities having jurisdiction.
- C. Site preparation and earthwork may be halted by the Owner's representative as deemed necessary should dust control procedures prove inadequate.
- D. The Contractor shall clean all soil and debris from wheels of all construction vehicles and cover earth loads prior to leaving the construction site.
- E. All streets, driveways, and sidewalks shall be swept daily or as required to prevent dust being a public nuisance.

#### **3.05 CLEARING, GRUBBING, AND REMOVAL OF PLANT MATERIAL**

- A. The Contractor shall accept the site as he/she finds it and shall remove and legally dispose off site all plants designated for removal and all debris, organic matter, and other material which is not suitable at no additional cost to the Owner. No burning is allowed on site.



- B. Clearing and Grubbing: The Contractor shall clear site of all vegetation indicated to be removed by the Drawings as follows.
  - 1. The Contractor shall completely remove all stumps and roots to the following minimum depths:
    - a. Eighteen (18) inches below existing ground level for shrubs
    - b. Three (3) feet below existing ground level for trees.
  - 2. The Contractor shall use only hand methods for grubbing inside drip line of trees indicated to remain.
  - 3. Unless further excavation is required, the Contractor shall fill depressions caused by clearing and grubbing operations with Ordinary Borrow material.
    - a. The Contractor shall place borrow material in horizontal layers not exceeding six (6) inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.
- C. For handling and disposal of wood, the Contractor shall follow the Asian long-horned beetle infestation protocol, in accordance with the Special Conditions and Specifications.
- D. The Contractor shall remove existing turf from areas to be graded and/or paved. Removed turf shall be disposed off site.

### **3.06 TREE BRANCH PRUNING**

- A. Any tree branches that impede installation of new construction shall be removed in accordance with ANSI A300 pruning standards, with the following exceptions:
  - 1. By-pass and scissor action pruning tools shall be used for smaller-sized cuts. Anvil-type pruning tools shall not be used. Pruning saws shall be used for pruning limbs 2 inches or greater in diameter.
  - 2. All pruning shall be conducted from the ground or from a safe platform. Any pruning that involves tree-climbing or off-ground chainsaw work shall be conducted by an arborist currently certified by the National Arborist Association or by workers under his/her direct supervision. Climbing spurs shall not be used when climbing trees, except on tree removals.

### **3.07 REMOVALS (GENERAL)**

- A. All items to be removed shall include, but are not limited to, those items as indicated on the Site Preparation & Demolition Plan.
  - 1. The Contractor shall be responsible for storing items designated to be relocated, and shall also be responsible for preventing damage to or theft of stored items.



2. The Contractor shall be responsible for delivering all items designated to be salvaged to a designated area at the Public Works and Parks Department headquarters facility at Greenhill Park and/or as directed by the Owner's Representative.
  3. All other removed items that are not to be stored for relocation or delivered to Owner shall be the property of the Contractor and shall be disposed of by the Contractor in a legal manner off-site.
- B. The Contractor shall demolish and remove all items necessary, in their entirety, to complete the work as indicated on the Drawings. The Contractor shall use methods required to complete work within limitations of governing regulations and as follows:
1. Dispose of demolished items and materials promptly off site in a legal manner.
    - a. The Contractor shall not allow demolished materials to accumulate on-site.
    - b. Burning on Owner's property is not permitted.
    - c. On-site storage or sale of removed items is prohibited.
  2. The items to be removed shall include all associated footings, accessories, and hardware when applicable.

### **3.08 PATCHING AND REPAIRS**

- A. The Contractor shall promptly patch and repair holes and damaged surfaces caused to adjacent areas by selective demolition and site preparation operations. See Section 01 72 29 (Exterior Cutting and Patching) for pavement repairs, and the Special Conditions and Specifications for additional requirements.

### **3.09 SECURING THE SITE**

- A. The Contractor shall secure the site during the entire construction period with temporary construction fencing in combination with existing and/or new perimeter park fencing. Existing park perimeter fencing to remain shall serve as temporary construction fencing throughout the construction period, and existing fencing to be removed shall serve as construction fencing until it is removed. After new perimeter fencing is installed, it shall serve as construction fencing in those areas. The Contractor shall install temporary construction fencing along all property lines where no fencing (existing or new) of at least 6' height is in place, including across gaps in existing & new fencing. Temporary construction gates shall be installed at entrance to existing parking lot and at parcel between 10 & 14 Acton Street.

### **3.10 GENERAL CLEAN-UP**

- A. The Contractor shall remove from the site all trash, litter, and debris and leave the site in a neat and orderly condition on a daily basis and to the satisfaction and approval of the Owner's Representative.

**END OF SECTION**



**SECTION 03 30 53  
CAST-IN-PLACE CEMENT CONCRETE**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Cement concrete pads
  - 2. Cement concrete mow strips
  - 3. Cement concrete footings
- C. The boundaries of all concrete pads shall be marked out in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 11 68 33 – Athletic Field Equipment
- B. Section 31 23 10 – Earthwork
- C. Section 32 11 16 – Aggregate Base Courses
- D. Section 32 31 00 – Metal Vehicular Gates
- E. Section 32 31 13 – Chain Link Fences and Gates
- F. Section 32 31 19 – Ornamental Fences and Gates
- G. Section 32 33 00 – Site Furnishings
- H. Special Conditions and Specifications (additional requirements for cement concrete)

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ACI: American Concrete Institute
  - 2. ASTM: American Society for Testing and Materials, latest edition

**1.04 TESTING, CONTROL AND INSPECTION**

- A. The Contractor shall retain the services of a qualified testing agency, approved by the Owner, to test aggregate and to prepare mix design for each strength and type of concrete specified; and shall submit such mix designs and test results to the Owner's representative for approval. The costs of all such preliminary services shall be borne by the Contractor. All other testing and inspection will be selected by the Owner's representative and shall be paid directly by the Owner.



- B. A qualified testing agency for such other testing and inspection will be selected by the Owner's representative and shall be paid directly by the Owner.
- C. The Contractor shall cooperate fully with the testing agencies' work in taking and storing samples. The Contractor shall provide storage facilities for concrete cylinders at the site. Facilities shall protect cylinders from effects of low or high temperatures.
- D. The Contractor shall accept the final results of tests made by the qualified professional testing organization engaged by the Owner.
- E. Testing required because of changes requested by the Contractor in materials, sources of materials, or mix proportions; and extra testing of concrete or materials because of failure to meet the Specification requirements are to be paid for by the Contractor.
- F. The Contractor shall advise the Testing Agency of intent to place concrete by notification at least twenty (24) hours prior to time of placement.
- G. All materials, measuring, mixing, transportation, placing, and curing shall be subject to inspection by the Owner's representative or by the Testing Agency. However, such inspection, wherever conducted, shall not relieve the Contractor of his/her responsibility to furnish materials and workmanship in accordance with the Contract requirements, nor shall inspector's acceptance of material or workmanship prevent later rejection of same by the Owner's representative, if defects are discovered. Structural tests and inspections shall conform to Chapter 17 of the Massachusetts State Building Code, latest edition.

## **1.05 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

## **PART 2 - PRODUCTS**

### **2.01 CONCRETE**

- A. Concrete shall be standard weight, ready-mixed, conforming to ASTM C94 and having the following properties:
  - 1. Portland Cement shall conform to ASTM C-150 Type II.
  - 2. Fine Aggregates for Concrete shall be natural sand consisting of clean, hard, durable, uncoated particles, conforming to ASTM C33. Organic content shall be determined according to ASTM C40, and supernatant liquid above test sample shall show color no darker than reference standard color solution prepared at same time. The Contractor shall not allow any frozen or partially frozen aggregate in the mix.
  - 3. Coarse Aggregate for Concrete: For regular-weight concrete, the Contractor shall use crushed stone or gravel from approved source conforming to ASTM C33. For



lightweight concrete (115 pcf), the Contractor shall use materials conforming to ASTM C330. Coarse aggregate shall not contain greater amounts of deleterious materials than specified in Table II, ASTM C33. Maximum size of coarse aggregate shall be 3/4 inch.

4. Water shall be from approved source; potable; clean; and free of oils, salt, alkali, organic matter and other deleterious material.
5. All concrete shall have minimum 4,000 p.s.i. compressive strength at 28 days.
6. All concrete shall be air-entrained to provide an air content of 4.5% to 7%, as determined by ASTM C231.
7. Non-vibrated slump of concrete shall be between 2.5 and 4 inches.

B. Admixtures:

1. Water Reducing Agent ASTM C494, Type A: WRDA by W.R. Grace Co. or equal approved by the Owner's representative. Water-reducing agent shall be by same manufacturer as air-entraining agent.
2. Air-entraining agent ASTM C260: Darex by W.R. Grace Co., or equal approved by the Owner's representative. Air-entraining agent shall be by the same manufacturer as water-reducing agent.

C. Concrete Reinforcement:

1. Reinforcing steel shall conform to ASTM Specification A-615 grade 60, deformed bars.
2. Welded wire fabric shall conform to ASTM Specifications A-185. The Contractor shall supply these in flat sheets.
3. Bar supports, metal accessories, and other devices necessary for proper assembly of concrete reinforcing shall be of standardized factory-made wire bar supports. Wire for tying shall be 18 gauge black annealed wire conforming to ASTM Specification A-82.

D. Formwork:

1. Forms: Formwork material shall be exterior plyform Class 1, B-B or as approved by the Owner's representative, not less than 5/8 inch thick.
2. Form Oil: Oil shall be of a non-staining type, specifically manufactured for concrete forms.
3. Form Ties: Factory-fabricated, removable or snap back, of approved design. Wire shall be at least 1-1/2 inch back from surfaces.



4. Design Criteria:
  - a. The Contractor shall design, construct, erect, support, brace, maintain, and remove forms to comply with ACI 318 parts 1, 2, and 3.
  - b. The Contractor shall comply with ACI 347 for loads, lateral pressures, allowable stresses, and wind loads.
- E. Non-shrink grout shall be Embeco 885" by Master Builders, SonogROUT by Sonneborn Building Products, Five Star Grout by U.S. Grout Corporation, or approved equal.
- F. Sleeves shall be standard weight steel pipe conforming to ASTM A53.
- G. Concrete curing membranes shall be:
  1. White polyethylene sheeting 4 mils thick, ASTM C171; or
  2. Waterproof paper, Sisalkraft Type, ASTM C171-69; or
  3. Liquid membrane curing compound of resin or latex bases liquid conforming to ASTM C309 Type I, Class A, except for surfaces to be covered with other surfacing materials. The compound shall be compatible with the adhesive to be used.
- H. Expansion Joint Filler: Joint filler shall be non-extruding, self-expanding filler strips conforming to ASTM D1752, Type II, as manufactured by Celotex Corporation, W.R. Meadows, Inc., W.R. Grace Company, or approved equal. Additional expansion joint materials (sealant, foam backup, steel dowels, and expansions sleeves) are described in the Drawing detail for expansion joints.
- I. Chemical surface sealer/hardener for concrete shall be Home Clear Seal by A.C. Horn Company, Kure-N-Seal by Sonneborn Building Products, Division of Contech, Inc. or approved equal chlorinated rubber base material at 22% solids. The material shall be applied both in accordance with the Manufacturer's recommendations for a curing compound on the wet concrete and as a hardener on fully-cured concrete just prior to the occupancy.
- J. Liquid chemical hardener for concrete shall be Hornolith by A.C. Horn Company; Surfhard by Euclid Chemical Company, or approved equal zinc and/or magnesium silicofluoride with penetrating agent. The material shall be applied in accordance with the manufacturer's written recommendations and shall be compatible with curing techniques.

## **PART 3 – EXECUTION**

### **3.01 STORAGE OF MATERIALS**

- A. All materials shall be stored to prevent damage from the weather elements and other causes.
- B. Cement and aggregates shall be stored in such a manner as to prevent deterioration or



intrusion of foreign mater. Any materials which have deteriorated, or which have been damaged, shall not be used for concrete.

- C. The Contractor shall store reinforcement steel on wood skids to prevent it from weather, oil, earth, and damage from trucking or other construction operations. Reinforcement shall be free from loose mill scale, rust, form oil, concrete splatter, and other extraneous coatings at the time it is embedded in the concrete.

### **3.02 FORMING FOR CAST-IN-PLACE CONCRETE**

- A. Acceptable tolerance shall be as specified in ACI Standard 247, Recommended Practice for Concrete Formwork.
- B. Forms shall be constructed to conform to shapes, lines, and dimensions shown, plumb and straight, and shall be maintained sufficiently rigid to prevent deformation under load. Forms shall be sufficiently tight to prevent leakage. The Contractor shall securely brace and shore forms to prevent their displacement and to safely support the construction loads.
  - 1. The Contractor shall form and set all sleeves, box outs, and passages as required for all existing and proposed utilities and as directed by the Owner's representative.
- C. The Contractor shall treat forms with a form release agent applied according to the manufacturer's instructions, by roller, brush, or spray to produce a uniform thin film without bubbles or streaks. The Contractor shall apply the release agent in two coats for the first use of the form and in one coat for each additional use.
- D. ACI-301-89, Section 13.3 - Forms, is also hereby made a part of this Specification.

### **3.03 MIXING PROCESS FOR CAST-IN-PLACE CONCRETE**

- A. Ready-mixed concrete shall be mixed and transported in accordance with Specification for Ready-Mixed Concrete ASTM C94, Alt No. 3 and ACI STANDARD 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

### **3.04 REINFORCING FOR CAST-IN-PLACE CONCRETE**

- A. ACI 301-89, Specification for Structural Concrete for Buildings, Chapter 5 - Reinforcement, is hereby made a part of this Specification.
- B. For concrete reinforcement, the Contractor shall:
  - 1. Comply with ACI 318 standards for detail and method of placing reinforcement and supports.
  - 2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
  - 3. Place, support, and secure reinforcement against displacement.



4. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
5. Place reinforcement to obtain proper coverage for concrete protection in accordance with A.C.I. standards.
6. Arrange, space, and securely tie bars and bar supports together with the specified tie wire.
7. Set wire ties so twisted ends are directed away from exposed concrete surfaces.
8. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces at least one full mesh.
9. Where lap splices are used, tie securely with specified wire to prevent displacement of splices during placement of concrete.
10. Accommodate placement of formed openings.
11. After reinforcement has been placed and tied together, notify the Owner's representative for inspection before pouring concrete.

### **3.05 JOINTS FOR CAST-IN-PLACE CONCRETE**

- A. ACI 301-89, Specifications for Structural Concrete for Buildings, Sections 6.1, 6.2 and 6.3 are hereby made part of this Specification.
- B. Construction joints shall be formed with keyed bulkheads.
- C. Control joints shall be as shown on the drawings.
- D. Control joints shall be formed using Zip-Cap control joint (Model 832) and Transverse control joint (Model 852) by Greenstreak Plastic Products Company or approved equal. Installation shall be in strict accordance with the manufacturer's recommendations. Reinforcing steel shall have a gap at the joints. Saw-cut control joints may be used as an alternative to Zip Cap and Transverse joint formers.

### **3.06 INSTALLING EMBEDDED ITEMS**

- A. General: The Contractor shall set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. He/she shall use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

### **3.07 PLACING OF CAST-IN-PLACE CONCRETE**

- A. The Contractor shall not place concrete until reinforcing steel, inserts, sleeves, and other work to be built into the concrete have been inspected and approved by the Owner's



representative and by all other trades concerned.

- B. In hot weather, all concreting shall be done in accordance with ACI 305, Recommended Practice for Hot Weather Concreting.
  - 1. When the temperature rises above 70 degrees F., all surfaces of concrete shall be protected against rapid drying.
  - 2. Concrete delivered to the forms shall have a temperature of not over 90 degrees F.
  - 3. The temperature of the forms shall not be over 90 degrees F.
- C. In cold weather, all concreting shall be done in accordance with ACI 306, Recommended Practice for Cold Weather Concreting.
  - 1. When the average daily temperature falls below 40 degrees F., all surfaces of concrete shall be maintained at a temperature of at least 50 degrees F, and not over 90 degrees F, for seven (7) days.
  - 2. Concrete delivered to the forms shall be at least 60 degrees F., and not over 90 degrees F.
  - 3. The temperature of the forms shall be at least 40 degrees F.
  - 4. The Contractor shall maintain a record of temperature of the concrete at the most exposed surfaces of each placement at the beginning and at the end of each day of the curing period, which record shall be available to the Owner's representative.
- D. Conveying: Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is retained.
- E. Depositing: Delivery and placement of concrete shall be programmed so that time lapse between batching and placement shall not exceed 1-1/2 hours. Concrete shall not be allowed a free fall of over 4 feet. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing.
- F. Concrete shall be deposited continuously, in horizontal layers of such thickness (not deeper than 18 inches) that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Placing shall be carried out at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or which has been contaminated by foreign materials shall not be deposited.
- G. Concrete shall be compacted thoroughly by vibrating to produce a dense, homogeneous mass without voids or pockets. Vibrators shall be placed in concrete so as to penetrate approximately 3 inches to 4 inches into the preceding lift so as to blend the two layers. Vibrating techniques shall assure that, when the coarse aggregate reaches the form, it stops and the matrix fills the voids.



- H. Patching: Areas to be patched shall not exceed 1.5 square feet for each 1000 square feet of surface area. Patches shall match in every respect the color and texture of the surrounding surfaces. Mix formulation shall be determined by trial to obtain a color match when both the patch and surrounding concrete are cured and dry. After initial set, surfaces of patches shall be textured manually to obtain a match with the surrounding surfaces. All patching are subject to the Owner's representative's final acceptance as to appearance and quality. At holes formed by withdrawal of ends of steel snap-ties, the Contractor shall wet and pack solidly with patching mortar. The Contractor shall also smooth out projections and fins with wet carborundum stones or power grinders. All voids, honeycombs, and air pockets shall be patched.
- I. Concrete surfaces exposed to view and as directed by the Owner's representative in the finishing walls shall receive a smooth rubbed finish. Such elements include, but are not limited to, exposed portions of foundation walls and other exposed walls. Not later than one day after form removal, the Contractor shall moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. The Contractor shall not apply cement grout other than that created by the rubbing process.

### **3.08 CURING AND PROTECTION**

- A. The Contractor shall protect newly placed concrete against low and high temperature effects and against rapid loss of moisture. He/she shall moist-cure all concrete for at least seven days at a temperature of at least 50 degrees F. by curing methods approved by the Owner's representative.
- B. For vertical or near-vertical surfaces, the Contractor shall moist-cure by keeping the form in contact with the concrete, or by other effective means approved by the Owner's representative. Intermittent wetting and drying does not provide acceptable curing.
- C. The Contractor may submit for the approval of the Owner's representative alternative methods of curing non-exposed concrete surfaces. Approval of alternatives shall not relieve the Contractor of his responsibility for the proper curing of all concrete.
- D. In hot weather, the Contractor shall be adequately prepared to protect the concrete from the adverse influence of heat before the placement of any concrete. He/she shall take special precautions to avoid cracking of the concrete from rapid drying during placement of concrete when air temperature exceeds 70 degrees F., partially when the work is exposed to direct sunlight.
  - 1. The Contractor shall cool forms by fog with water or by protecting them from the direct rays of the sun.
  - 2. If requested by the Contractor, deemed advisable by the testing engineer, and approved by the Owner's representative, a retardant may be used to delay the initial set of the mix.
- E. In cold weather, the Contractor shall be adequately prepared to protect the concrete from the adverse influence of cold before placement of any concrete.



1. When the average daily temperature falls below 50 degrees F., the Contractor shall take special precautions to assure adequate strength gain of the concrete.
2. When the average daily temperature falls below 40 degrees F., the Contractor shall prepare concrete with heated materials such that the concrete delivered to the forms has a temperature of at least 60 degrees F., and not over 90 degrees F. The Contractor shall pre-warm the forms to at least 40 degrees F., to prevent the rapid cooling of the concrete by their contact; and keep forms free of all ice and snow. When heated materials are being used, the Contractor shall combine the water with the aggregate in the mixer and keep the resulting temperature below 90 degrees F. before cement is added to the mix. He/she shall protect all concrete by the use of heated enclosures which shall be sufficiently strong and windproof and within which adequate heaters are properly distributed to maintain all concrete at the required temperatures. The Contractor shall not allow heaters to locally heat or dry the concrete and shall maintain adequate fire precautions.

**3.09 ACCEPTANCE**

- A. When the tests on control specimens of concrete fall below the required strength, the Owner's representative shall have the right to require, at the Contractors expense, mix redesign, load tests, and/or strengthening as directed, and/or removal and replacement of those parts of the structure in which such concrete was used.

**3.10 CLEANING**

- A. The exposed faces of the cast-in-place concrete shall be cleaned of all stains, water marks, and leaked fines.

**END OF SECTION**



**SECTION 10 14 00  
SIGNAGE**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Signage for accessible parking space

**1.02 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ADA: Americans with Disabilities Act, including latest amendments and additions.
  - 2. AAB: Architectural Access Board, Commonwealth of Massachusetts, Chapter 521 CMR, latest edition.

**1.03 REQUIRED SUBMITTALS**

- A. There are no required submittals for this signage.

**1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. The Contractor shall be responsible for timing the delivery of site improvement materials so as to minimize on-site storage time prior to installation. All stored materials shall be protected from weather, careless handling, vandalism, and theft.

**1.05 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 ACCESSIBLE PARKING SIGNAGE**

- A. All aspects of accessible signs shall conform with the following:
  - 1. The Americans with Disabilities Act 28 CFR 36 and the Americans with Disabilities



- Act Accessible Guidelines (ADAAG).
2. The Massachusetts Architectural Access Board (521 CMR).
    - B. Signage for the existing accessible parking space shall include an “accessible” sign and a “van accessible” sign.
    - C. Clamps, brackets, nuts, bolts, screws, and other items used to fasten signs to the existing post shall be corrosion-proof.

### **PART 3 – EXECUTION**

#### **3.01 ACCESSIBLE PARKING SIGNAGE**

- A. The Contractor shall fasten signs to the existing post with fasteners in accordance with the manufacturer’s recommendations, at heights complying with the ADA and AAB.

**END OF SECTION**



**SECTION 11 68 33  
ATHLETIC FIELD EQUIPMENT**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Batting cage netting and cables (add-alternate)
  - 2. Foul poles
  - 3. Baseball infield appurtenances
  - 4. Baseball fence guard
  - 5. Temporary outfield fence
  - 6. Baseball scoreboard (add-alternate)

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 03 30 53 – Cast-in-Place Cement Concrete
- B. Section 26 00 00 – Electrical
- C. Section 32 11 16 – Aggregate Base Courses
- D. Section 32 18 23 – Athletic Surfaces
- E. Section 32 31 13 – Chain Link Fences and Gates

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ASTM: American Society for Testing and Materials

**1.04 REQUIRED SUBMITTALS**

- A. The Contractor shall prepare and submit Shop Drawings to the Owner's Representative for approval prior to ordering the listed materials.
  - 1. The Contractor shall provide complete shop drawings for all items listed below:
    - a. Batting cage netting & cable structure (add-alternate)
    - b. Baseball scoreboard with ad panels and support structure (add-alternate)
  - 2. Shop drawings shall show required sizes, dimensions, sections, profiles of units; the arrangement of and provision for jointing, anchoring, fastening, and support; and



other necessary details.

3. Shop drawings shall include large-scale details of any unique fabrication and setting requirements or any other specified areas seen as necessary or as directed by the Owner's Representative.
  4. Each shop drawing shall reference the section and paragraph of the Specifications that requires the items included.
- B. The Contractor shall provide complete product literature and applicable color samples for approval by the Owner's Representative prior to ordering the following equipment and materials:
1. Foul poles
  2. Baseball appurtenances (bases only)
  3. Baseball fence guard
  4. Temporary outfield fence
  5. Baseball scoreboard (add-alternate)

#### **1.05 QUALITY ASSURANCE**

- A. This work shall be assigned to experienced and qualified subcontractors employing experienced workers who will work under the full-time supervision of a qualified foreman with a minimum of five (5) years of experience on projects comparable to this project. The Contractor shall use an adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work in this Section. The Contractor shall demonstrate that he/she has successfully completed work of similar size and scope.

#### **1.06 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. The Contractor shall be responsible for timing the delivery of site improvement materials so as to minimize on-site storage time prior to installation. All stored materials shall be protected from weather, careless handling, and vandalism.
- B. The Contractor shall store materials under waterproof covers on planking clear of ground and protect from handling damage, dirt, stain, water and wind.
- C. The Contractor shall take all necessary precautions to prevent all items from chipping, cracking, or other damage during the transportation of these materials to the project, unloading and storage on the site. The Contractor shall lift items with wide-belt type slings wherever possible; he/she shall not use wire rope or ropes containing tar or other substances which might cause staining. If required, he/she shall use wood rollers and provide cushioning at end of wood slides. Damaged items will not be allowed to be installed and should any damaged items be found in constructed work, such items shall be removed immediately and replaced, and the Contractor shall assume all expenses incurred therefrom.



- D. Stored materials shall be adequately protected against moisture by one (1) stacking in such a manner as to allow a complete circulation of air under each stack, and two (2) covering each stack, including top and sides, with a waterproof paper or membrane. Coverings shall remain in place at all times, when not working from the particular stack.

#### **1.07 EXAMINATION OF CONDITIONS**

- A. The Contractor shall fully inform his/herself of existing conditions of the site and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. At the beginning of work, the installer shall accept substrates, subgrades, previous work, and conditions. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.
- B. The Contractor shall be solely responsible for judging the potential need for storing materials temporarily and/or re-handling items prior to final installation.

#### **1.08 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

### **PART 2 - PRODUCTS**

#### **2.01 BATTING CAGE NETTING AND CABLES**

- A. Batting cage netting and cables shall comply with the batting cage detail on the Drawings.

#### **2.02 FOUL POLES**

- A. Foul poles shall be a yellow flagged mesh foul pole such as Model # BBCFP-20 as manufactured by Jaypro Sports, Inc., phone # 800-243-0533, [www.jayprosports.com](http://www.jayprosports.com); Model # 1273 as manufactured by P.W. Athletic Mfg. Co, phone # 866-462-7976, [www.pwathletic.com](http://www.pwathletic.com); or approved equal.
- B. The foul poles shall measure 20' height above finished grade, and shall have a telescoping type post with 3-½ inch outside diameter at the base.
- C. Finishing, including priming and powder coating, shall be consistent with the manufacturer's specifications for the particular model.
- D. Quantity of foul poles: 2

#### **2.03 BASEBALL INFIELD APPURTENANCES**



A. Home Plate

1. Home plate will be supplied by the Owner, and will consist of a rubber plate attached to a 5” thick concrete anchor. Quantity: 1

B. Bases

1. Bases shall be disengage-able type meeting Little League requirements, with UV- and slip-resistant rubber top, and low-profile rubber plate from which base can be disengaged. The plate shall include a central post for installation into a sleeve attached to a subgrade anchor. Quantity: 3 complete sets of youth bases (including base tops, base plates, anchor, and anchor plugs); and 3 complete sets of teen bases (including base tops, base plates, anchor, and anchor plugs). Bases and accessories shall be provided by Rogers Break-Away Base System, phone # 800-829-7311, [www.rogersbreakawaybase.com](http://www.rogersbreakawaybase.com); or approved equal.

C. Pitcher’s Plates (Rubbers)

1. Pitcher’s plates will be supplied by the Owner, and will consist of rubber plates attached to 5” thick concrete anchors. Quantity: 2

**2.04 BASEBALL FENCE GUARD**

- A. New fence guard shall be UV-resistant yellow polyethylene, 4 ½” diameter. Zip-ties used to secure guard to fencing shall be yellow, white, or clear color, and shall be UV-resistant.

**2.05 TEMPORARY OUTFIELD FENCE**

- A. Temporary outfield fence shall be MarkSmart fence package, by Markers Inc., phone # 866-617-6275, [www.markersinc.com](http://www.markersinc.com); or approved equal. Fencing shall be 48” high, green or blue color, with yellow banding at the top. The fence package shall include posts and ground sockets, and socket plugs.

**2.06 BASEBALL SCOREBOARD**

The scoreboard shall be model # BA-2518 by Daktronics, phone # 800-325-8766 (local rep. phone # 860-948-8112), [www.daktronics.com](http://www.daktronics.com); or approved equal. It shall also include two ad panels: 1’ high x 9’ long panel above the scoreboard, and a 2’ high x 9’ long panel below the scoreboard. The Contractor shall supply the support system, and Little League (via the Owner) will supply the scoreboard, ad panels, and 2 controllers.

**PART 3 – EXECUTION**

**3.01 BATTING CAGE NETTING AND CABLES**

- A. The Contractor shall install cables and netting in accordance with the Drawings.
- B. The Contractor shall submit a shop drawing of the cable and netting installation to the



Owner's Representative for approval, prior to installation.

### **3.02 FOUL POLES**

- A. The foul poles shall be integrated into the chain link fence as shown on the Drawings.
- B. The foul poles shall be mounted in cement concrete footings. See the Drawing detail and Section 03 30 53 (Cast-in-Place Cement Concrete) for footing requirements.
- C. The Contractor shall place cement concrete around post in a continuous pour, and tamp for consolidation. He/she shall also check and adjust post for vertical and top alignment, as necessary, and hold in position during placement and finishing operation.
- D. The top of the foul pole shall be 20' above finished grade. The wing of foul pole shall be oriented toward the inside of the ball field.
- E. The foul pole locations shall be marked in the field for review and approval by the Owner's Representative prior to installation.

### **3.03 BASEBALL INFIELD APPURTENANCES**

- A. Home Plate and Pitcher's Plate (Rubber): The Contractor shall excavate to the thickness of the concrete anchor, compact the excavation, and install plates/anchors so the bottom edges of the rubber plates are at finished grade.
- B. Bases: The base system shall be installed in accordance with manufacturer's instructions. Concrete to pour in the manufacturer's anchor forms shall meet the requirements of Section 03 30 53 – Cast-in-Place Cement Concrete. The Contractor shall install anchors/sleeves for both 60' and 70' bases, install the youth base plates and tops on the 60' base sleeves, and install plugs in the 70' base sleeves. The 3 teen base tops and plates shall be delivered to the Owner's Representative.
- C. The bases shall be installed so that the outside corner of each base will be located at the point where the base lines intersect. Home plate shall be installed so the pointed end is situated at the point where the base lines meet. Base lines are shown on the Drawings as broken lines. Pitcher's plates shall be installed where indicated on the Drawings.

### **3.04 BASEBALL FENCE GUARD**

- A. The Contractor shall install new and relocated fence guard in accordance with manufacturer's instructions, and shall secure fence guard to fencing with plastic zip-ties through predrilled holes.
- B. Fence guard shall be installed along all 4' high athletic field permanent fencing.

### **3.05 TEMPORARY OUTFIELD FENCE**

- A. The ground sockets and fencing shall be installed in accordance with the manufacturer's written instructions and the Drawing detail.



- B. The Contractor shall deliver the socket plugs to the Owner's Representative.
- C. The Contractor shall install the ground sockets for terminal posts as close to the terminal chain link fence posts as possible.
- D. The Contractor shall mark the layout of the temporary fence for approval by the Owner's Representative prior to installation of the ground sockets.

**3.06 BASEBALL SCOREBOARD**

- A. The Contractor shall submit shop drawings for the scoreboard and support structure, which shall include posts, footings, and electrical connections. Shop drawings shall be stamped and signed by an engineer licensed in Massachusetts.
- B. The Contractor shall install the support structure, scoreboards, ad panels, and electrical connection. The scoreboard shall be mounted on a support system consisting of two (2) posts, with bottom of scoreboard at 10' above finished grade. The Contractor shall verify that the scoreboard, ad panels, and structure are plumb and level.
- C. The posts shall be mounted in cement concrete footings. The design engineer for the shop drawings shall determine depth and diameter of footings. See Section 03 30 53 (Cast-in-Place Cement Concrete) for footing concrete requirements.
- D. The Contractor shall test the two control units by connecting units to all jacks and checking for proper operation of control units and scoreboard. He/she shall deliver the control units in carrying cases and other loose accessories to the Owner's Representative.

**END OF SECTION**



**SECTION 26 00 00  
ELECTRICAL**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Athletic field, walkway, and parking area lighting
  - 2. Security lighting
  - 3. Security camera system
  - 4. PA system
  - 5. Dugout lighting
  - 6. Power to scoreboard and future press box
  - 7. All other work shown on the Drawings and included in these Specifications
- C. The Contractor shall furnish a complete, working finished product, which meets all applicable codes and standards, and the intent and specific requirements of the Drawings and specifications for this project. All materials and all work, which may be reasonably implied as being incidental to the work of this Section, shall be furnished at no extra cost to the Owner.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 26 56 68 – Exterior Athletic Lighting
- B. Section 26 60 00 – Security Camera System
- C. Section 32 12 16 – Bituminous Concrete
- D. Section 03 30 53 – Cast-in-Place Concrete

**1.03 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
- B. The Contractor must be familiar with all other Sections of this specifications and the associated Drawings, which affect the scope of work. The General Conditions, all Supplementary and Special Conditions, and all other sections of this specification shall be adhered to, as they apply to this Section. Where paragraphs of this Section conflict with similar paragraphs elsewhere, the more stringent requirements shall prevail.

**1.04 REFERENCE STANDARDS AND SPECIFICATIONS**



- A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and federal government, and other authorities that have lawful jurisdiction.
- B. All materials and installations shall be in accordance with the latest edition of the Massachusetts Electrical Code, and all applicable local codes and ordinances. Materials and equipment shall be listed by Underwriters Laboratories (UL).
- C. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. American National Standards Institute - ANSI
  - 2. American Society for Testing & Materials - ASTM
  - 3. Illuminating Engineering Society - IES
  - 4. Institute of Electrical & Electronics Engineers - IEEE
  - 5. Insulated Cable Engineers' Association - ICEA
  - 6. National Electrical Code - NEC
  - 7. National Electrical Manufacturer's Association - NEMA
  - 8. National Electrical Safety Code - NESC
  - 9. InterNational Electrical Testing Association - NETA
  - 10. National Fire Protection Association - NFPA
  - 11. Occupational Safety & Health Administration - OSHA
  - 12. Underwriter's Laboratories, Inc. - UL

The above listed codes and standards are referenced to establish minimum requirements and wherever this Section requires higher grades of materials and workmanship than required by the listed codes and standards, this Section shall apply. In the event a conflict occurs between the above listed codes and standards and this Section, the more stringent requirement shall govern.

#### **1.05 SITE VISIT**

- A. Each bidder shall visit the site of the proposed work and fully acquaint himself with the conditions there relating to construction and labor, and should fully inform himself as to the facilities involved, and the difficulties and restrictions attending the performance of the Contract.
- B. The Bidder shall thoroughly examine and familiarize himself with Drawings, Technical Specifications and all other Bid and Contract Documents. The Contractor, by the execution of the Contract, shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal document or to visit the site and acquaint himself with the conditions there existing and the Owner will be justified in rejecting any claim thereof.

#### **1.06 AS-BUILT DRAWINGS:**

- A. After completion of the electrical installation, the Contractor shall furnish an "as-built" drawings showing all conduits, cables, cabinets, transformers, light poles, etc. to scale with dimensions where required. Instruction sheets and parts lists covering all operating



equipment will be bound into a folder and furnished to the Owner in duplicate.

**1.07 INSTRUCTIONS:**

- A. Within 10 days, after completion and testing of the system, the Contractor shall instruct the Owner's personnel in the proper operations and maintenance of the system, in a 2 hour training session.
- B. The Contractor shall furnish at least two (2) complete sets of operating and instruction manuals for the equipment provided under this Contract. These manuals shall detail the operation, testing, and maintenance of the electrical equipment and systems. Manuals shall be provided upon Engineer's request or upon project completion, whichever comes first.

**1.08 GUARANTEE**

- A. Guarantee work of this Section in writing for one year from date of Owner's acceptance. Repair or replace defective materials, equipment, workmanship, and installation that develop within this period, promptly and to Owner's satisfaction and correct damage caused in making necessary repairs or replacements under guarantee with no extra cost to Owner. Contractor shall transfer all equipment warranties for lighting and other systems to Owner.

**1.09 SUBMITTALS**

- A. Within 10 days after Award of General Contract, submit shop drawings and product data on below listed items for approval. Submit copies as requested.
- B. Check, stamp and mark with project name shop drawings and product data before submitting for approval. Specifically indicate on shop drawing transmittal form or by separate letter any deviations from Contract Documents because of standard shop practice or other reason. Rectify with no extra cost to Owner, deviations which escape Engineer's scrutiny and have not been indicated on shop drawings.
- C. List of materials and equipment requiring shop drawings shall include:
  - 1. Conduits and Wiring
  - 2. Panelboards
  - 3. Service Cabinets and Equipment
  - 4. Transformer Foundations
  - 5. Meter Sockets
  - 6. Circuit Breakers
  - 7. Concrete Products and Light Bases
  - 8. Wiring Devices and Receptacles
  - 9. Pathway Lighting
  - 10. Sports Lighting
  - 11. Handholes



The Engineer's review shall be only for conformance with the design concept of the project and compliance with the specifications and Drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and Drawings which may not be indicated on the shop drawings is included under the work of this Section.

#### **1.10 INSPECTIONS AND FEES**

- A. Obtain all necessary permits and licenses, file necessary plans and pay all fees for permits and inspections. Permit fees are the responsibility of the Contractor as part of his bid, as is all coordination with the municipality and the local utility National Grid.

#### **1.11 INTERPRETATION OF DRAWINGS**

- A. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract. Drawings are not intended to specify or show every offset, fitting or component; however, Contract Documents require components and materials whether or not indicated or specified as necessary to make installation complete and operational.
- B. Contractor is responsible for all work shown on both Contract Drawings and these written specifications, including work detailed in the specifications and not shown on the drawings and including work shown on the Drawings and not described in the specifications. All ancillary equipment necessary for a complete installation shall be included, even if not shown, detailed or described. For conflicts between the Contract Drawings, written specifications and other contract information, the more stringent requirement shall apply, and the Engineer may direct the Contractor as to what is the preferred option to be provided.
- C. Any work installed contrary to, or without review by, the Engineer shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
- D. Circuit layouts are not intended to show the number of fittings, or other installation details. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment or local codes.
- E. As work progresses and for duration of Contract, maintain complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately, including work installed as a modification or addition to the original design.

#### **1.12 ELECTRIC UTILITY**

- A. The Electric Utility for this project is National Grid (Massachusetts Electric Company). All coordination with the Electric Utility is the responsibility of the Contractor, All work and materials for the electric service shall be in accordance with the requirements of the Electric Utility, and are to be met under this Section and included in the bid price of the Contractor, (removal of existing service).



## **PART 2 – MATERIALS & PRODUCTS**

### **2.01 GENERAL**

- A. Materials and products furnished shall be designed for the intended use, shall meet all requirements of the latest edition of the National Electric Code (NEC), and all local codes.
- B. Materials shall be manufactured in accordance with the standards indicated in this Section, and typical industry standards and codes for the products specified. Materials and equipment shall be Underwriter's Laboratory (UL) listed.
- C. The materials used shall be new, unused, and of the best quality for the intended use. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information should be marked on durable nameplates that are permanently fastened to the equipment.
- D. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored outside exposed to the elements. If any equipment or apparatus is damaged, such damage shall be repaired at no additional cost, or replaced at no additional cost as directed by the Engineer.

### **2.02 RACEWAYS**

- A. Rigid Metallic Conduit: Listed to Underwriters Laboratories Safety Standard UL6 and ANSI 080.1.
- B. Electrical Metallic Tubing (EMT) Listed to Underwriters Laboratories Safety Standard UL 797 Manufactured in accordance with ANSI C80.3
- C. Flexible Metallic Conduit: UL I. Liquidtight flexible metal conduit shall be used in wet locations.
- D. Polyvinyl Chloride (PVC) Conduit, electrical, gray, Schedule 40 or Schedule 80 as specified, meeting the requirements of UL 651 and NEMA TC-2. If concrete encasement is required, a minimum of 3,000 psi concrete shall be used. All conduits placed under roadways, and subject to vehicular traffic, shall be concrete-encased Schedule 40 (or Schedule 80 as approved).
- E. Minimum size of conduit shall be 3/4". Unless indicated on Drawings, conduit sizes can be sized in accordance with National Electric Code (NEC). Conduit bends shall not have kinks or flats, and shall not be less than standard radii.
- F. Rigid Galvanized Steel (RGS) conduit shall be used for all power, control signal, and instrumentation wiring, except where noted. Conduit shall be fully threaded at both ends and each length shall be furnished with one threaded coupling. All 90 degree conduit sweeps shall be RGS.



- G. Conduits shall be made electrically continuous at coupling and connections to boxes and cabinets by means of joining fasteners or copper bond wires. Conduit shall be connected to grounded structural steel or the ground network. After assembly all conduit locknuts, all EMT coupling fittings, and all bond wire screws shall be set up tight before installation of wiring. Insulated metallic bushings shall be used on all conduits entering panel cabinets, pull-boxes, and wiring gutters, except on branch lighting circuits.
- H. Expansion fittings shall be provided on all conduits as required by the 2020 National Electrical Code, and as required by local and state codes. This includes, but is not limited to, vertical conduit risers coming from below-grade.

### **2.03 WIRE AND CABLE**

- A. Unless otherwise noted, conductors for power, lighting, and grounding above grade shall be No. 12 through No. 8 AWG, NEC type THWN/THHN, meeting the requirements of UL 83. Conductors for power and lighting shall be no smaller than No. 12 AWG.
- B. Conductors for power, lighting, grounding, and control below grade (and in wet locations) shall be No. 2 AWG and larger, NEC type XHHW (or XHHW-2), meeting the requirements of NEMA WC7 and ICEA S-66-524.
- C. All conductors shall be annealed copper, 98% conductivity, Class B stranded, except conductors used for power and lighting circuits No. 10 AWG and smaller which may be solid. All conductors should be rated for 600 volts or less, with a thermal rating of 90° C.

### **2.04 WIRE AND CABLE CONNECTORS AND DEVICES**

- A. Wire and cable connectors and devices shall meet the requirements of UL 486. Connectors, including miscellaneous nuts, bolts, and washers shall be silicon bronze. Ferrous materials shall not be used.

### **2.05 BOXES**

- A. Outlet and Switch Boxes: NEMA OS 1.
- B. Pull Boxes, Junction Boxes, and Equipment Enclosures: NEMA ICS 6. Pull boxes, junction boxes, and equipment enclosures shall be of NEMA Type I construction for indoor use, and NEMA Type 3R construction for outdoor or wet location use, unless otherwise noted.
- C. Box sizes shall not be less than that required by the Massachusetts Electrical Code.

### **2.06 WARNING TAPE**

- A. Warning tape shall be six (6) inches wide, polyethylene not less than 3.5 mil thick with a minimum strength of 1,500 psi. Install 8 inches below final grade. Tape shall be red for electric conduit, and red or yellow for communication conduit. Tape shall have black lettering on two lines as indicated below:



- B. For Electric conduit:

**CAUTION CAUTION CAUTION  
BURIED ELECTRIC LINE BELOW**

- C. For Telephone, Fire Alarm and Communication conduit:

**CAUTION.CAUTION.CAUTION  
BURIED COMMUNICATION LINE BELOW**

## **2.07 PANELBOARDS**

- A. Panelboards: NEMA PBI, and UL 67. Panelboards shall be door-in-door construction with copper bus. Circuit breakers shall be molded case, thermal magnetic, bolt-on type rated as noted, and rated to match panelboard voltage and interrupting rating. Provide circuit breaker sizes as shown on panel schedules. Provide spare breakers in sizes as directed by Owner or Engineer to fill each panel with spare breakers, above those indicated on panel schedules.
- B. The Contractor shall provide the following panelboards:

Panelboard P-1 120/240V, 1-phase, 3-wire, 250A main circuit breaker, 22kA A1C 30 circuit panelboard, (NEMA 1 enclosure with the number and size of circuit breakers as listed on the panel schedules provided in the Contract Drawings.

## **2.08 ELECTRICAL ENCLOSURE & CABINETS**

- A. The Contractor shall provide outdoor NEMA 3R stainless steel, to contain 120/240V panelboards, receptacles, etc. for power, with space for future equipment.
- B. Contractor shall size cabinet to coordinate with sizes of panelboard and equipment to be installed within cabinets. Dimensions shown are typical and are for reference only. Cabinet shall be similar to cabinets installed at the recently renovated Parks (list provided upon request). Cabinet shall include all equipment shown or implied and all equipment shall be installed inside of cabinet without physical conflicts and per NEC, Cabinet shall be sized for all necessary conduits, whether active, spare or future as listed on panelboard schedules.
- C. Cabinets shall be manufactured from 11 gauge minimum stainless steel with 12 gauge steel panel, mounted inside. Cabinets to have integral keyed locking mechanism, keyed alike, with provision for pad-lock. Cabinets shall be ventilated type and factory painted black powder-coat. Cabinets shall have door hold-open latches.

## **2.09 ELECTRIC HANDHOLES**

- A. Electric Handholes shall be strong, precast concrete and provided in the dimensions as shown on the Contract Drawings. Electric Handholes shall be unaffected by moisture, freezing temperatures, soil, and sub-soil chemicals.



- B. Handholes shall be provided with skid-resistant surface covers, with an Electric or Communications label for power, audio, etc. Handholes and Covers shall be designed for street-rated, heavy duty applications, meeting the requirements of the either: AASHTO HS-20 or ANSI/SCTE 77-2002 Tier 15 loading, with a minimum design load of 15,000 lbs. for both the handhole box and cover. Covers shall include recessed stainless steel captive bolts of a penta-head design. The nuts for the bolts shall be self-centering and corrosion resistant. Handholes shall meet the requirements of the latest edition of the National Electric Code (2020 or later) with regards to structural integrity, installation methods, grounding of the cover and metallic parts, etc. Handholes shall be UL listed for the intended use.
- C. . Handholes shall be installed flush with final grade.

**2.10 CAST-IN-PLACE CONCRETE FOUNDATIONS**

- A. The Contractor shall provide the materials, labor, and equipment necessary for the installation of cast-in-place concrete foundations, in accordance with these Specifications, Contract Drawings, City requirements, and all applicable codes & regulations.

**2.11 PRE-PACKAGED SPORTS LIGHTING SYSTEM**

- A. The Contractor shall provide a pre-packaged sport lighting system in accordance with Section 26 56 68 (Exterior Athletic Lighting).

**2.12 SECURITY CAMERA SYSTEM**

- A. The Contractor shall provide a security camera system in accordance with Section 26 00 00 – Security Camera System Requirements.

**PART 3 - EXECUTION**

**3.01 GENERAL**

- A. This Section covers the requirements for installation of materials, proper workmanship, testing, cleaning, grounding, and work methods to be followed by the Contractor. This Section also includes specific instructions and to be used in conjunction with the contract Drawings.
- B. Contractor is responsible for coordinating work with other trades, Owner, and Architect's schedule. Work will be coordinated such that systems can be properly located, and conflicts and delays are avoided. Contractor shall consider commencement of work acceptance of existing conditions.

**3.02 MATERIALS AND WORKMANSHIP**

- A. Work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Do not run raceway exposed unless shown exposed on Drawings. Material and equipment shall be new and installed according to



manufacturer's recommended best practice so that complete installation shall operate safely and efficiently.

### **3.03 TESTING, INSPECTION AND CLEANING**

- A. Test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required at not less than 500 volts. Insulation resistance between conductors and grounds for secondary distribution systems shall meet National Electrical Code (NEC) and InterNational Electrical Testing Association (NETA) requirements.
- B. Verify and correct as necessary: voltages, tap settings, trip settings and phasing on equipment from secondary distribution system to point of use. Test secondary voltages at transformers, bus in panelboards, and at other locations on distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.
- C. Test lighting fixtures with specified lamps in place for 100 hours. Replace lamps that fail within 90 days after acceptance by Owner at no extra cost to Owner (no exceptions).
- D. Provide necessary testing equipment and testing services.
- E. Failures or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested. Replace defective Material.
- F. Clean panels and other equipment, Panelboard interiors shall be cleaned and vacuumed. Equipment with damage to painted finish shall be repaired to Engineer's or Architect's satisfaction. After completion of project, clean exterior surfaces of electrical equipment.

### **3.04 WIRING METHODS**

- A. Install wire and cables in approved raceways as specified and as approved by authorities that have jurisdiction.
- B. Follow homerun circuit numbers and/or notes as shown on drawings to connect circuits to panelboards. Where homerun circuit numbers are not shown on Drawings, divide similar types of connected leads among phase buses so that currents are approximately equal in normal usage.
- C. Run concealed conduit in as direct lines as possible with a minimum number of bends, longest possible radius. Run exposed conduit parallel to or at right angles to building/field lines. Bends shall be free from dents or flattening. The exact locations and routing shall be determined by the Contractor subject to the approval of the Owner and Engineer.
- D. Polarity of all electrical connections shall be observed in order to preserve phase relationship in all feeders and equipment.
- E. Splices shall be made in neat, workmanlike manner using approved mechanical connectors. After splicing, insulation equal to that on the spliced wires shall be applied at



each splice. Splices are permitted only in junction boxes, outlet boxes, or other permanently accessible locations. Splices installed in electric handholes shall be weather and waterproof, pre-molded polymer splices. Hand taping of splices below-grade is not acceptable.

### **3.05 GROUNDING**

- A. Bond and ground equipment and systems connected under this Section in accordance with standards of the NEC and other applicable regulations and codes.
- B. Conduit system shall be electrically continuous throughout, grounded at service entrance. Equipment frames, enclosures, boxes, etc. shall be grounded by use of green-jacketed (or bare copper) ground sized as per Table 250-95 oldie NEC.
- C. Copper fittings for ground connections shall conform to the requirements of ASTM B 30. All bolts, u-bolts, cap screws, nuts, and lock washers for copper fitting shall be of approved corrosion-resisting material. Compression connectors required for all below-grade grounding connections.
- D. Ground Rods shall be 5/8" diameter and 8' in length, copperweld as required by applicable codes (NEC, NESC). Bonding connections to ground rods shall be permanent, welded or crimped, with copper connectors. All wire used for grounding shall be no smaller than #4 Awg copper, stranded conductor.

### **3.06 INSTALLATION OF ELECTRICAL EQUIPMENT**

- A. Contractor shall furnish and install the following major electrical components, and all necessary minor and expected accessories.
- B. Provide, furnish and install all products and work outlined in Part 1 of this Specification Section.
- C. Provide new conduit system for lighting and electrical work, in locations as shown on Contract Drawings. Utilize existing empty conduits (installed by others) where possible and install new conduits for a complete and functional system. Provide all new cabling for all electrical equipment listed.
- D. Install all equipment in locations as shown on Contract Drawings. All deviations must be approved, in advance by Owner, Architect, and Engineer.
- E. Install all equipment per manufacturer's instructions.
- F. Balance the lighting, receptacle, and electrical load evenly on all circuits and on all phases of each circuit.
- G. Clean-up excavated areas, and restore with new loam & seed, as directed by Owner.
- H. Provide complete "As-Built" drawings to Engineer & Owner.



**3.07 INSTALLATION OF SECURITY CAMERA SYSTEM**

- A. The security camera system shall be installed in accordance with Section 26 60 00 – Security Camera System Requirements, and with the Drawings and this Section.

**3.08 GUARANTEE AND ACCEPTANCE**

- A. Any defective elements shall be replaced in part or whole by the Contractor at no cost to the Owner.

**END OF SECTION**



**SECTION 26 56 68**  
**EXTERIOR ATHLETIC LIGHTING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. New Lighting System with LED Light Source

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 26 00 00 – Electrical
- B. Section 32 12 16 – Bituminous Concrete
- C. Section 03 30 53 – Cast-in-Place Concrete

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. American Society of Civil Engineers – ASCE
  - 2. American Association of State Highway and Transportation Officials - AASHTO
  - 3. American Society for Testing & Materials – ASTM
  - 4. International Building Code – IBC
  - 5. Illuminating Engineering Society of North America - IESNA
  - 6. Institute of Electrical & Electronics Engineers - IEEE
  - 7. International Organization for Standardization – ISO
  - 8. National Fire Protection Association - NFPA
  - 9. Underwriter's Laboratories, Inc. - UL

**1.04 SUMMARY**

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans, as well as state and local codes.
- B. The purpose of these specifications is to define the lighting system performance and design standards for the Mulcahy Field lighting project using an LED lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- C. Lighting shall be for the following venues:



1. Baseball (and associated bullpens and batting cage)
2. Security
3. Walkway/Parking

D. The primary goals of this sports lighting project are:

1. **Guaranteed Light Levels:** Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore light levels are guaranteed to not drop below specified target values for a period of 25 years.
2. **Environmental Light Control:** It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
3. **Control and Monitoring:** To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields shall be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

## 1.05 LIGHTING PERFORMANCE

A. **Illumination Levels and Design Factors:** Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period.

| Area of Lighting          | Average Target Illumination Levels | Maximum to Minimum Uniformity Ratio | Grid Points                  | Grid Spacing |
|---------------------------|------------------------------------|-------------------------------------|------------------------------|--------------|
| Baseball                  | 50FC (infield)<br>30FC (outfield)  | 2:1 (infield)<br>2.5:1 (outfield)   | 25 (infield)<br>77(outfield) | 20' x 20'    |
| Batting Cage and Bullpens | > 25FC                             | 2.5:1                               |                              |              |
| Parking                   | > 4FC                              | 6.5:1                               | 49                           | 10' x 10'    |
| Walkway                   | 5FC                                | 15:1                                | 495                          | 5' x 5'      |



- B. Color: The lighting system shall have a minimum color temperature of 5700K and a CRI of 70+.
- C. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

| # of Poles | Pole Designation   | Pole Height |
|------------|--------------------|-------------|
| 12         | P3-P10 & P16-P19   | 16'         |
| 2          | P14 – P15          | 20'         |
| 4          | A1, A2, B1, and B2 | 70'         |

**1.06 ENVIRONMENTAL LIGHT CONTROL**

- A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.
- B. Spill Light and Glare Control: To minimize impact on adjacent properties, spill light and candela values must not exceed the following levels taken at 3 feet above grade.

| Property Line          | Maximum |
|------------------------|---------|
| Horizontal Footcandles | < 31 FC |

- C. Spill Scans: Spill scans shall be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.
- D. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years of experience or by a manufacturer’s laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

**PART 2 - PRODUCTS**

**2.01 SPORTS LIGHTING SYSTEM CONSTRUCTION**



- A. **Manufacturing Requirements:** All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.
- B. **Durability:** All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.
- C. **System Description:** Lighting system shall consist of the following:
  1. Galvanized steel poles and cross-arm assembly
  2. Non-approved pole technology:
    - a. Square static cast concrete poles will not be accepted.
    - b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long term performance concerns.
  3. Lighting systems shall use concrete foundations. See 2.04 for details.
    - a. For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill shall bear on and against firm undisturbed soil.
    - b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or reinforced pier design, pole erection may occur after 7 days, or after a concrete sample from the same batch achieves a certain strength.
  4. Manufacturer shall supply all drivers and supporting electrical equipment.
    - a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure shall be located in the enclosure. Integral drivers are not allowed.
    - b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2\_2002.
  5. Wire harness shall be complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.



6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.
  7. Control cabinet shall provide remote on-off control, monitoring, and entertainment features of the lighting system. See 2.03 for further details.
  8. Contactor cabinet shall provide on-off control.
  9. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
    - a. Integrated grounding shall be via concrete encased electrode grounding system.
    - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.
- D. **System Description: Security lighting system shall consist of the following:**  
Approved technology: Musco's CREE product. No other distributors will be considered LED-high bay light capable of a direct mount. High bay fixture shall have CRI of 70 and a color temperature of 5700k
- E. Safety: All system components shall be UL listed for the appropriate application

## 2.02 ELECTRICAL

- A. Electric Power Requirements for the Sports Lighting Equipment:
  1. Electric power: 120/240 Volt, 1 Phase
  2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
- B. Energy Consumption: The kW consumption for the field lighting system shall be 41kW or less.

## 2.03 CONTROL

- A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
- B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
- C. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP



communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

- D. The owner may assign various security levels to schedulers by function and/or fields. This function shall be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.
- E. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.
- F. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
- G. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application shall be provided suitable for IOS, Android, and Blackberry devices.  
  
Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.
  - 1. Cumulative hours: shall be tracked to show the total hours used by the facility
  - 2. Report hours saved by using early off and push buttons by users.
- H. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.
- I. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

#### **2.04 STRUCTURAL PARAMETERS**

- A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 130 mph and exposure category C.
- B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).
- C. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. If no geotechnical report is available, the foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2015 IBC Table 1806.2.
- D. Foundation Drawings: Project specific foundation drawings stamped by an engineer licensed in Massachusetts are required. The foundation drawings shall list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings shall be submitted at time of bid to allow for accurate pricing.



## **PART 3 - EXECUTION**

### **3.01 SOIL QUALITY CONTROL**

- A. It shall be the Contractor's responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:
1. Providing engineered foundation embedment design by a registered engineer in the State of Massachusetts for soils other than specified soil conditions;
  2. Additional materials required to achieve alternate foundation;
  3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

### **3.02 DELIVERY TIMING**

- A. Delivery Timing Equipment On-Site: The equipment shall be on-site 6-8 weeks from receipt of approved submittals and receipt of complete order information.

### **3.03 FIELD QUALITY CONTROL**

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.
- B. Field Light Level Accountability
1. Light levels shall be guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels shall be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.
  2. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
  3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.
- C. Correcting Non-Conformance: If, in the opinion of the Owner's Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

### **3.04 WARRANTY AND GUARANTEE**



- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

#### **PART 4 – DESIGN APPROVAL**

##### **4.01 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)**

- A. Design Approval: The owner / engineer will review pre-bid submittals per paragraph 4.01 B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.
- B. Approved Product: Musco’s Light-Structure System™ with TLC for LED™ is the approved product. All proposed substitutions shall include a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.
- C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.
- D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner’s representative. Bids received that do not utilize an approved system/design, will be rejected

##### **REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID:**



All items listed below are mandatory, shall comply with the specification, and be submitted according to pre-bid submittal requirements. Bidders shall complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. **Submit checklist below with submittal.**

| Yes/<br>No | Tab      | Item                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------|----------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <b>A</b> | Letter/<br>Checklist            | Listing of all information being submitted shall be included on the table of contents. List the name of the manufacturer’s local representative and his/her phone number. Signed submittal checklist shall be included.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|            | <b>B</b> | Equipment<br>Layout             | Drawing(s) showing field layouts with pole locations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|            | <b>C</b> | On Field<br>Lighting<br>Design  | Lighting design drawing(s) showing:<br>a. Field Name, date, file number, prepared by<br>b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), Illuminance levels at grid spacing specified<br>c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics<br>d. Height of light test meter above field surface.<br>e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaires, total kilowatts, average tilt factor; light loss factor. |
|            | <b>D</b> | Off Field<br>Lighting<br>Design | Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | <b>E</b> | Photometric<br>Report           | Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years of experience.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|            | <b>F</b> | Performance<br>Guarantee        | Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|            | <b>G</b> | Structural<br>Calculations      | Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



|  |          |                               |                                                                                                                                                                                                                                                                                                                  |
|--|----------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |          |                               | foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Massachusetts, if required by owner. (May be supplied upon award).                                                                                                                         |
|  | <b>H</b> | Control & Monitoring System   | Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system. They shall also provide ten (10) references of customers currently using proposed system in the state of Massachusetts.                                                          |
|  | <b>I</b> | Electrical Distribution Plans | Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Massachusetts.                                                                             |
|  | <b>J</b> | Warranty                      | Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Massachusetts.                                                                                                                              |
|  | <b>K</b> | Project References            | Manufacturer shall provide a list of ten (10) projects where the technology and specific fixture proposed for this project has been installed in the state of Massachusetts. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number. |
|  | <b>L</b> | Product Information           | Complete bill of material and current brochures/cut sheets for all product being provided.                                                                                                                                                                                                                       |
|  | <b>M</b> | Delivery                      | Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.                                                                                                                                                                                     |
|  | <b>N</b> | Non-Compliance                | Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.                                                                                                                                                                                         |
|  | <b>O</b> | Cost of Ownership             | Document cost of ownership as defined in the specification. Identify energy costs for operating the luminaires. Maintenance cost for the system must be included. All costs should be based on 25 Years                                                                                                          |

The information supplied herein shall be used for the purpose of complying with the specifications for the Mulcahy Field lighting project. By signing below I agree that all requirements of the specifications have been met and that the manufacturer shall be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

**Manufacturer:** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_ **Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_

**Contractor:** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**END OF SECTION**



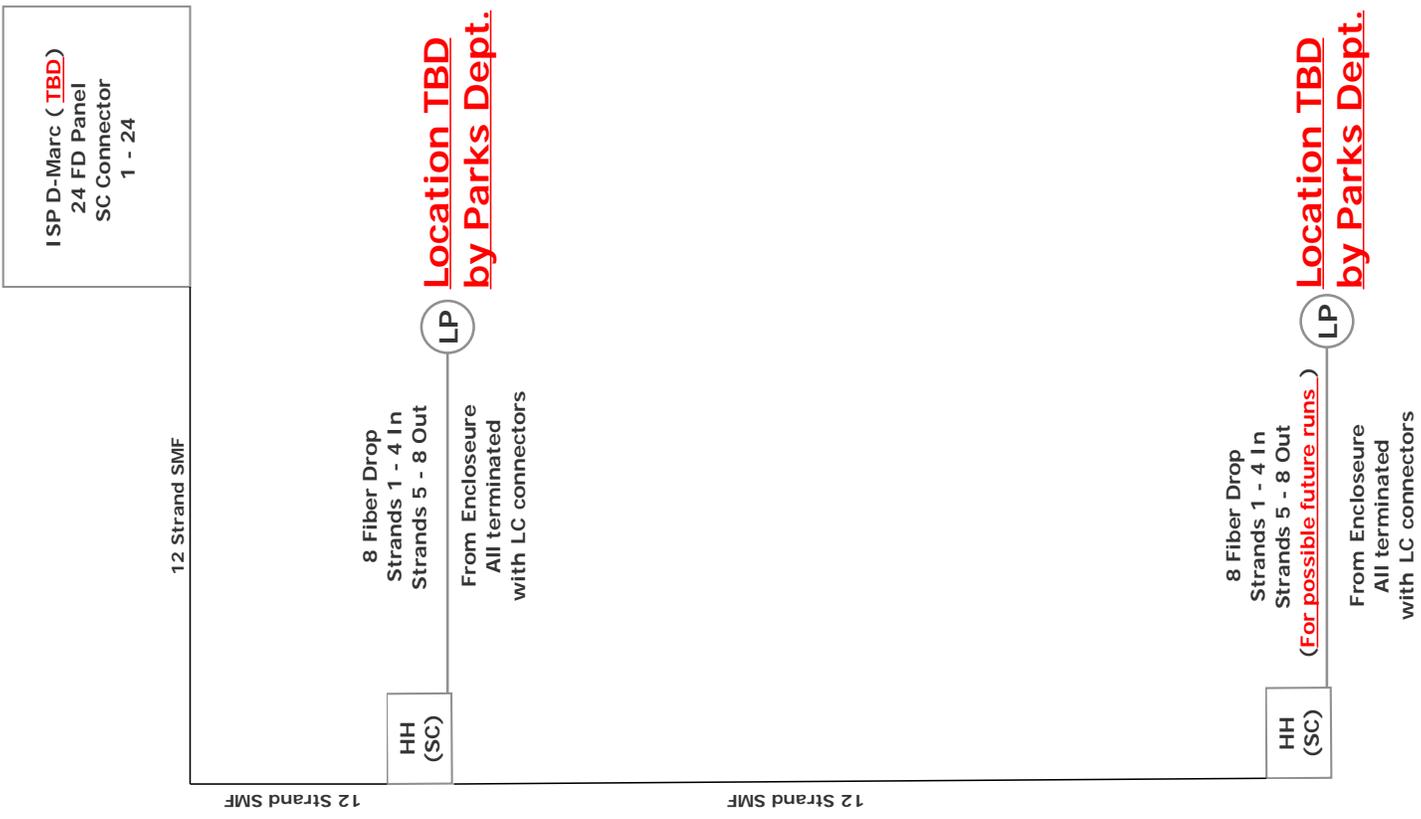
## **SECTION 26 60 00**

### **SECURITY CAMERA SYSTEM REQUIREMENTS**

The Contractor shall include and utilize the services and equipment of Presidio, Siemens and HIQ as subcontractors for the Security Camera System as applicable. The Security Camera System requirements, including equipment lists and appurtenances, are included in the following pages.

The Contractor shall also comply with all requirements of Section 26 00 00 – Electrical.

A



**NOTES:**

- 1) HH = Hand Hole / LP = Light Pole
- 2) SC = Coyote runt butt splice closure
- 3) Where Noted, 8 fiber OSP cables each terminated with LC connectors run from enclosure on pole to HH
- 4) OTDR and create test results
- 5) Provide 'As-Builts' (PDF & CAD)
- 6) Conduit is roped and ready for cable placement
- 7) Single mode fiber



HIQ COMPUTERS  
 477 Riverside Ave.  
 Medford, MA 02155  
 617-951-4650  
 617-951-4651

Quote No: 30064  
 Date: 05/21/20  
 Page: 1

Sold To: CITY OF WORCESTER  
 1 SKYLINE DRIVE - BUILDING A  
 WORCESTER, MA 01605

Customer No: 7  
 Phone No: 508-799-1272

Ship To: LINDA RADULA  
 1 SKYLINE DRIVE - BUILDING A  
 WORCESTER, MA 01605

Salesperson: #23 - David

| Item Description                                                        | Qty | Unit Price | Amount |
|-------------------------------------------------------------------------|-----|------------|--------|
| Hubbell REBOX RE4XB Enclosure                                           | 1   | 965.00     | 965.00 |
| Hubbell NEXTSPEED CAT6 24 Port P                                        | 1   | 300.00     | 300.00 |
| Room Alert 3E w/PWR supply                                              | 1   | 300.00     | 300.00 |
| Room Alert Room Entry Sensor                                            | 1   | 45.00      | 45.00  |
| Room Alert 3E Temperature & Envi                                        | 1   | 225.00     | 225.00 |
| 3m LC-SC 9/125 OS2 Duplex Single                                        | 1   | 30.00      | 30.00  |
| 3m LC-SC 9/125 OS2 Duplex Single-Mode PVC<br>Fiber Optic Cable - Yellow |     |            |        |

Sub-Total: 1865.00

Shipping: 0.00

Tax [ 0 ]: EXEMPT\*

Total: 1865.00

This quote is valid for 30 days

T h a n k  
 Y o u

**TO:** City of Worcester  
 Brian Pham  
 1 Skyline Dr. Building A  
 Worcester, MA 01605  
  
 phamb@worcesterma.gov  
 (p) .

**FROM:** Presidio Networked Solutions  
 Tim Tryder  
 10 Sixth Road  
 Woburn, MA 01801  
  
 ttryder@presidio.com  
 (p) 781.970.6562

**Customer#:** CITYO094  
**Account Manager:** Ryan Visconti  
**Inside Sales Rep:** Tim Tryder  
**Title:** Mulcahy Field Quote  
**Comments:** The terms and conditions of this procurement shall be governed by the Commonwealth of MA ITT50 contract

**Contract Vehicle:** Massachusetts ITT50

| #  | Part #             | Description                                                  | Unit Price | Qty                  | Ext Price  |
|----|--------------------|--------------------------------------------------------------|------------|----------------------|------------|
| 1  | IE-4000-16T4G-E    | IE4000 switch with 16 FE Copper and 4 GE combo uplink ports  | \$3,034.35 | 3                    | \$9,103.05 |
| 2  | IOT-SMART-CITIES   | Smart Cities Solutions; For tracking only.                   | \$0.00     | 3                    | \$0.00     |
| 3  | IOT-CITIES-INFRA   | DNA for Cities Infrastructure; For tracking only.            | \$0.00     | 3                    | \$0.00     |
| 4  | PWR-IE170W-PC-AC   | IE family power supply 170W. AC to DC                        | \$907.50   | 3                    | \$2,722.50 |
| 5  | CON-SSSNT-IE400016 | SOLN SUPP 8X5XNBD IE 4000 16 x RJ45 10/100M, 4 x 1G Combo ,  | \$519.40   | 3<br>for 12 mo(s)    | \$1,558.20 |
| 6  | PAN-PA-220         | Palo Alto Networks PA-220                                    | \$812.50   | 1.00                 | \$812.50   |
| 7  | PAN-PA-220-TP      | Threat prevention subscription year 1, PA-220                | \$160.00   | 1.00                 | \$160.00   |
| 8  | PAN-SVC-PREM-220   | Premium support year 1, PA-220                               | \$179.56   | 1.00<br>for 12 mo(s) | \$179.56   |
| 9  | SMX1500RMI2UNC     | APC Smart-UPS X 1500VA Rack/Tower w/ NC                      | \$1,496.58 | 1.00                 | \$1,496.58 |
| 10 | GLC-SX-MM-RGD=     | 1000Mbps Multi-Mode Rugged SFP                               | \$312.95   | 4                    | \$1,251.80 |
| 11 | L-ISE-PLS-LIC=     | Cisco ISE Plus License                                       | \$0.00     | 100                  | \$0.00     |
| 12 | L-ISE-PLS-1Y-S1    | Cisco ISE Plus License, 1Y, 100 - 249 Sessions               | \$4.75     | 100                  | \$475.00   |
| 13 | AIR-AP1562I-B-K9   | 802.11ac W2 Low-Profile Outdoor AP, Internal Ant, B Reg Dom. | \$1,039.50 | 2                    | \$2,079.00 |
| 14 | SWAP1560-MESH-K9   | Cisco 1560 Series Unified Mesh Mode Software                 | \$0.00     | 2                    | \$0.00     |
| 15 | LIC-CT5508-UPG     | Primary SKU for all upgrade options on the Cisco 5508 WC     | \$0.00     | 1                    | \$0.00     |
| 16 | LIC-CT5508-5A      | 5 AP Adder License for the 5508 Controller                   | \$1,372.25 | 1                    | \$1,372.25 |
| 17 | CON-ECMU-LICCT55A  | SWSS UPGRADES 5 AP Adder License for the 5508 Controll       | \$265.68   | 1<br>for 12 mo(s)    | \$265.68   |
| 18 | CON-ECMU-LCTUPG    | SWSS UPGRADES Primary SKU for all upgrade options on t       | \$0.00     | 1<br>for 12 mo(s)    | \$0.00     |
| 19 | PS-SVC-TM          | Hourly for Presidio employee labor                           | \$225.00   | 16.0000              | \$3,600.00 |

|                     |                    |
|---------------------|--------------------|
| <b>Sub Total:</b>   | <b>\$25,076.12</b> |
| <b>Grand Total:</b> | <b>\$25,076.12</b> |

TERMS AND CONDITIONS OF THE REFERENCED CONTRACT SHALL GOVERN THIS QUOTE

Customer hereby authorizes and agrees to make timely payment for products delivered and services rendered, including payments for partial shipments

\_\_\_\_\_  
Customer Signature

\_\_\_\_\_  
Date

**PROPOSAL**

COW Mulcahy Field Camera Adds Phase 1

**PREPARED BY**

Siemens Industry, Inc.

**PREPARED FOR**

CITY OF WORCESTER

**DELIVERED ON**

May 22, 2020



# Table of Contents

- SIEMENS PROPOSAL ..... 3
  - Contact Information ..... 3
  - Scope of Work ..... 4
  - Inclusions ..... 4
  - Exclusions ..... 4
  - Clarifications ..... 4
  - Pricing Summary ..... 6
  - Equipment List ..... 7
  - Payment Terms..... 8
  
- Terms and Conditions..... 9
  - Terms & Conditions Link(s) ..... 9
  
- Signature Page ..... 10
  - Signature Page ..... 10

**Contact Information**

|             |              |
|-------------|--------------|
| Proposal #: | 4863725      |
| Date:       | May 22, 2020 |

|                  |                                              |
|------------------|----------------------------------------------|
| Sales Executive: | Jon Hipsh                                    |
| Branch Address:  | 150 Royall St Suite 201<br>Canton, MA, 02021 |
| Telephone:       | 857-205-7598                                 |
| Email Address:   | Jonathan.Hipsh@Siemens.com                   |

|                                |                                   |
|--------------------------------|-----------------------------------|
| Customer Contact:              | CITY OF WORCESTER                 |
| Customer:                      | CITY OF WORCESTER                 |
| Address:                       | 455 MAIN ST<br>WORCESTER MA 01608 |
| Services shall be provided at: | Mulcahy Field<br>Worcester        |

## Scope of Work

This is an ITC71 Contract Proposal. Siemens Vendor No. 00037043

Mulcahy Field Phase 1: Siemens proposal to add cameras to two poles at Mulcahy Field in Worcester, MA.

This proposal includes parts, smarts and install of the cameras, plus the devices that will be in the cabinets. Please see plans for estimated locations of cameras.

This proposal includes a man Lift rental.

This proposal includes all the Genetec licenses plus Advantage for all cameras.

Important Notes: Worcester will be responsible to provide the cabinets for both poles, plus the backplanes. Cabinets, once Siemens populates backplanes with devices (including Worcester provided Cisco Switches), will be returned to the Worcester EC for them to mount cabinets and terminate AC on the poles.

### **Siemens will be responsible for the following:**

On each of the 2 poles, Siemens will provide, install and program an Axis 360 degree camera with a PTZ combo. Siemens will install the devices on the customer provided cabinet backplanes, and return to the customer's EC.

### **Worcester will be responsible for:**

Cabinets and backplanes for all poles. Install of all project pole cabinets, and power.

Will be responsible for the network and network connectivity.

Cisco switches and power for switches, IP address.

Wiring from the poles to network and power.

Providing full and uninterrupted access to all device locations to facilitate efficient installation.

## Inclusions

1. Freight
2. Engineering
3. Project Management for Siemens Scope of work
4. System Commissioning and Final Pretest

## Exclusions

1. Provision or installation of wire, fiber, electrical distribution components, conduit and boxes.
2. Installation of system control cabinets.
3. Painting and patching.
4. Dedicated Telephone lines, network connectivity or monitoring services for systems listed above.
5. 120 VAC connections and supply to be done by others as required.
6. Performance or Payment bonds.

## Clarifications

1. Siemens will furnish material cut sheets for submittal, for Siemens provided materials.
2. Siemens will furnish system shop drawings for areas and schematics affected by new equipment.

3. Pricing includes project management for the duration of the tentative project schedule.
4. Pricing includes one (1) year warranty on Siemens provided materials and labor.
5. Work is assumed to be completed during normal business hours Monday – Friday (7am-5pm).
6. Pricing includes standard ground shipping.

### Pricing Summary

| Pricing Summary          | Sell Price         |
|--------------------------|--------------------|
| Equipment                | \$10,175.28        |
| Project Management Labor | \$859.63           |
| Engineering Labor        | \$804.40           |
| Specialist Labor         | \$4,215.86         |
| <b>Total Quote Price</b> | <b>\$16,055.17</b> |

## Equipment List

### 2 Poles 360 plus PTZ combo

| Qty | Ref #        | Description                                                                                                                             | Unit Sell  | Ext Sell   |
|-----|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|------------|
| 2   | XRDI-WS3P-NA | Control by Web XRDI-WS3P-NA Plug Strip                                                                                                  | \$338.01   | \$676.02   |
| 2   | C6PCBL25     | CAT6 BLUE 25FT PATCH CABLE                                                                                                              | \$5.17     | \$10.33    |
| 2   | W-DIN11      | DIN RAIL MOUNTING BRACKET FOR GH/GF ADAPTORS                                                                                            | \$5.75     | \$11.49    |
| 4   | GSC-OM-E-1C  | SC-OMN ENT 1 CAM LICENSE                                                                                                                | \$219.75   | \$879.01   |
| 4   | ADV-CAM-E-1Y | Genetec™ Advantage for 1 Omnicast Enterprise Camera – 1 year                                                                            | \$43.95    | \$175.80   |
| 2   | 01234-004    | AXIS COMMUNICATIONS 01234-004 Q6125-LE IP CAMERA, HIGH-SPEEDPTZ WITH OPTIMIZED IR                                                       | \$2,616.45 | \$5,232.90 |
| 2   | 01006-001    | AXIS Q6000-E, OUTDOOR-READY 360SITUATIONAL AWARENESS CAMERA, 4 2MP SENSORS, SD SUPPORT, MIDSPAN INCLUDED, MOUNTED BRACKETS NOT INCLUDED | \$1,395.04 | \$2,790.08 |
| 2   | 5801-721     | AXIS T91L61 WALL-&-POLE MOUNT FOR AXIS PTZ/MULTI                                                                                        | \$88.91    | \$177.83   |
| 2   | 5800-811     | 5800-811, ORIG SS STRAPS                                                                                                                | \$20.28    | \$40.57    |
| 2   | 5901-301     | Axis T94A01C ATTACHMENT KIT, FOR ATTACHING Q61 PTZ TO Q6000-E MKII                                                                      | \$90.62    | \$181.24   |

## Payment Terms

### Payment Terms Acceptance Agreement

The total price of: \$16,055.17 and the estimated return on investment are based on the items outlined in this proposal. ANY statements made herein regarding savings that may be achieved by implementing the services offered in this proposal are estimates only. No warranty, either expressed or implied, shall be construed to arise from such statements, nor shall such statements be construed as constituting a guarantee by Siemens that such savings will occur if the services are implemented.

### Terms and Conditions Disclaimer

The Customer acknowledges that when approved by the Customer and accepted by Siemens Industry, Inc.: (i) the Proposal and the Contract Terms and Conditions, (together with any other documents incorporated into the forgoing) shall constitute the entire agreement of the parties with respect to its subject matter (collectively, hereinafter referred to as the "Agreement") and (ii) in the event of any conflict between the terms and conditions of the Proposal and the terms and conditions of The Contract Terms and Conditions, the Contract Terms and Conditions shall control.

BY EXECUTION HEREOF, THE SIGNER CERTIFIES THAT (S)HE HAS READ ALL OF THE TERMS AND CONDITIONS AND DOCUMENTS, THAT SIEMENS OR ITS REPRESENTATIVES HAVE MADE NO AGREEMENTS OR REPRESENTATIONS EXCEPT AS SET FORTH THEREIN, AND THAT (S)HE IS DULY AUTHORIZED TO EXECUTE THE SIGNATURE PAGE ON BEHALF OF THE CUSTOMER.

*This Proposal is based on the Siemens Industry, Inc. Standard Terms and Conditions and the "Scope of Work" and are to be considered part of this proposal. Proposal is valid for thirty (30) days from the delivery date of May 22, 2020. Payment is due within 30 days of invoice date.*

**Total: \$16,055.17**

## Terms & Conditions Link(s)

### Terms and Conditions (Click to download)

[Terms & Conditions](#)

([www.siemens.com/download?A6V10946842](http://www.siemens.com/download?A6V10946842))

As a result of the global Covid-19 Virus outbreak, temporary delays in delivery, labor or services from Siemens and its sub-suppliers or subcontractors may occur. Among other factors, Siemens' delivery is subject to the correct and punctual supply from sub-suppliers or subcontractors, and Siemens reserves the right to make partial deliveries or modify its labor or services. While Siemens shall make every commercially reasonable effort to meet the delivery or service or completion date mentioned above, such date is subject to change.

## Attachment A

### Riders (Click on rider below to download)

[SI Mass Notification Rider](#)

([www.siemens.com/download?A6V10946167](http://www.siemens.com/download?A6V10946167))

[SI Monitoring Rider](#)

([www.siemens.com/download?A6V10946171](http://www.siemens.com/download?A6V10946171))

[SI Online Backup and Data Protection](#)

([www.siemens.com/download?A6V10946174](http://www.siemens.com/download?A6V10946174))

[SI Software License Warranty](#)

([www.siemens.com/download?A6V10946180](http://www.siemens.com/download?A6V10946180))

[SI Consulting Rider](#)

([www.siemens.com/download?A6V10946838](http://www.siemens.com/download?A6V10946838))

## Signature Page

### Proposed by:

Siemens Industry, Inc.

\_\_\_\_\_  
Company

Jon Hipsh

\_\_\_\_\_  
Name

4863725

\_\_\_\_\_  
Proposal #

\$16,055.17

\_\_\_\_\_  
Proposal Amount

May 22, 2020

\_\_\_\_\_  
Date

### Accepted by:

CITY OF WORCESTER

\_\_\_\_\_  
Company

\_\_\_\_\_  
Name (Printed)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

\_\_\_\_\_  
Purchase Order #

Mulcahy Field

| Quantity | Item                                                                  | Vendor   | Quote Number     | Price        | Total              |
|----------|-----------------------------------------------------------------------|----------|------------------|--------------|--------------------|
| 3        | Cisco IE-4000-16T4G-E Switch                                          | Presidio | 2001720011098-01 | \$3,034.35   | \$9,103.05         |
| 3        | Cisco IE-4000 Power Supply 170W AC to DC                              | Presidio | 2001720011098-01 | \$907.50     | \$2,722.50         |
| 3        | Cisco Switch License + Support                                        | Presidio | 2001720011098-01 | \$519.40     | \$1,558.20         |
| 1        | Palo Alto PA-220 Firewall w/ Premium Support + Global Protect         | Presidio | 2001720011098-01 | \$1,152.06   | \$1,152.06         |
| 1        | APC 1500VA SmartUPS X w/ Network Management Card                      | Presidio | 2001720011098-01 | \$1,496.58   | \$1,496.58         |
| 4        | Cisco GLC-LX-SM-RGD Modules                                           | Presidio | 2001720011098-01 | \$312.95     | \$1,251.80         |
| 100      | ISE Plus Licenses                                                     | Presidio | 2001720011098-01 | \$4.75       | \$475.00           |
| 2        | Cisco 1562i Wireless Access Point                                     | Presidio | 2001720011098-01 | \$1,039.50   | \$2,079.00         |
| 1        | 5-Pack License for 5508 Wireless LAN Controller                       | Presidio | 2001720011098-01 | \$1,637.93   | \$1,637.93         |
| 2        | Services                                                              | Presidio | 2001720011098-01 | \$1,800.00   | \$3,600.00         |
|          |                                                                       |          |                  | <b>Total</b> | <b>\$25,076.12</b> |
| 1        | Siemens - Cameras, Enclosure, Backplanes, Labor, Etc.                 | Siemens  | 4863725          | \$16,055.17  | \$16,055.17        |
|          |                                                                       |          |                  | <b>Total</b> | <b>\$16,055.17</b> |
| *        | <b>Depending on installation location these items may be required</b> | *        | *                | *            | *                  |
| 1        | Hubbell REBOX RE4XB                                                   | HiQ      | 30064            | \$965.00     | \$965.00           |
| 1        | Hubbell NEXTSPEED Patch Panel                                         | HiQ      | 30064            | \$300.00     | \$300.00           |
| 1        | Room Alert 3E                                                         | HiQ      | 30064            | \$300.00     | \$300.00           |
| 1        | Room Alert Door Sensor                                                | HiQ      | 30064            | \$45.00      | \$45.00            |
| 1        | Room Alert Temperature Sensor                                         | HiQ      | 30064            | \$225.00     | \$225.00           |
| 1        | 3M LC-SC Single Mode Fiber Patch Cable Yellow                         | HiQ      | 30064            | \$30.00      | \$30.00            |
|          |                                                                       |          |                  | <b>Total</b> | <b>\$1,865.00</b>  |

| Vendor Breakdown |                    |
|------------------|--------------------|
| Presidio         | \$25,076.12        |
| Siemens          | \$16,055.17        |
| HiQ              | \$1,865.00         |
| Fiber            | TBD                |
| <b>Total:</b>    | <b>\$42,996.29</b> |

Fiber and power work and material (i.e. fiber, iu, splice can...) is part of electrical scope



## **SECTION 31 23 10 EARTHWORK**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Excavation of all existing material for site improvements to the depth required in the plans and specifications to meet the required lines and grades.
  - 2. Providing, placing, and compacting ordinary borrow for site improvements specified herein and/or indicated within the Drawings.
  - 3. Providing, placing, and compacting all other specified borrow materials at locations specified herein and/or indicated within the Drawings.
  - 4. Compaction of all disturbed and undisturbed surfaces which are to receive new foundations, footings, slabs, and other load-bearing elements, to ensure against any weak areas in the substrate.
  - 5. Performing all operations and providing such equipment as necessary to maintain excavated areas free from water from any source whatsoever and to avoid the disturbance of the subgrade.
  - 6. Installation of sheeting, shoring, and bracing; and protection of adjacent properties, streets utilities and structures as may be required due to the earthwork performed.
  - 7. Rough and fine grading.
  - 8. Dust control.
  - 9. Removal and disposal of excavated fill and other waste materials

#### **1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 02 41 13 – Site Preparation and Demolition
- B. Section 31 25 00 – Erosion and Sedimentation Controls
- C. Section 32 91 13 – Loam
- D. Special Conditions and Specifications

#### **1.03 DEFINITIONS**



- A. Excavation consists of the removal of material encountered to sub-grade elevations and the reuse or disposal of materials excavated.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Owner's Representative. Unauthorized excavation, as well as remedial work directed by the Owner's Representative, shall be at Contractor's expense.
  - 1. The Contractor shall backfill and compact unauthorized excavations with structural fill as specified for authorized excavations, unless otherwise directed by the Owner's Representative.
- C. Additional Excavation consists of the removal of material as directed by the Owner's Representative beyond the required subgrade that is determined as unsuitable. The Contractor shall continue excavation until suitable bearing materials are encountered. If unsuitable materials are removed that aren't indicated on the Drawings, the Contract Sum shall be adjusted by an appropriate Contract Modification. The following constitute unsuitable materials:
  - 1. Topsoil and loam (beneath areas to receive pavement)
  - 2. All peat, organic soil, or soil containing sod, roots, or any other material subject to decomposition or decay.
  - 3. All soft, spongy or compressible soil, including, but not limited to, silt and loose fine sand.
  - 4. All buried building material, which may include but is not limited to the following:
    - a. Concrete rubble
    - b. Re-bars
    - c. Asphalt
    - d. Electrical materials and debris
    - e. Wood
    - f. Brick, block, tile (ceramic/quarry)
    - g. Pipe
    - h. Ashes
    - i. Metal pieces/parts
    - j. Insulation
- D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base.
- E. Structure: Foundations, footings, slabs, or other man-made stationary features occurring above or below ground surface.
- F. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.



#### **1.04 SUBMITTALS**

- A. Test Reports: The Contractor shall submit the following test reports directly to the Owner’s representative from the testing services.
  - 1. Test reports on borrow material.
  - 2. Test reports on sub-base material.

#### **1.05 QUALITY ASSURANCE**

- A. Codes and Standards: The Contractor shall perform earthwork complying with all local and state regulations, laws, and ordinances and with requirements of authorities having jurisdiction.
- B. Testing and Inspection Services: The Contractor shall coordinate and submit all tests as specified herein.
  - 1. Owner’s Responsibility: The Owner will employ a qualified environmental professional to perform the following services:
    - a. Conduct additional investigations to assess the extent of soil containing lead above TCLP thresholds near B-4 (in report included with these bid documents), to confirm whether the lead concentration and its corresponding TCLP result are anomalies or an MCP reportable condition that warrants further response actions.
    - b. Evaluate soil contaminant concentrations for the soil that will be disposed on City property, compared to the receiving location, to confirm they are consistent with the anti-degradation provisions of the MCP and do not create a reportable condition.
    - c. Oversee the segregation of soil in the field from different depths and locations from the site and confirm soil within each soil disposal category is shipped to the correct facility.
  - 2. Contractor’s Responsibility: The Contractor shall employ a qualified environmental professional and a qualified geotechnical testing agency, both approved by the Owner, to verify that soils comply with specified requirements and to perform required contaminated soil testing as follows:

Contaminated soil characterization:

- a. Characterize contaminated soil to obtain acceptance at licensed off-site disposal facilities. This includes collecting ex-situ composite soil samples from contaminated soil stockpiles. Each composite sample will include an appropriate number of sub-samples. The testing shall be collected at a frequency consistent with each respective licensed off-site disposal facility acceptance requirements. The samples shall be submitted to a Massachusetts-certified laboratory for analysis of the acceptance parameters applicable to each respective licensed off-site disposal facility selected by the Contractor. The Contractor shall submit a



- sampling plan to the Owner for review prior to initiating the soil characterization.
- b. Collect composite soil samples ex-situ from contaminated soil determined to contain contaminants less than RCS-1 thresholds to be transported to a City Property. This includes collecting ex-situ composite soil samples from contaminated soil stockpiles. Each composite sample will include an appropriate number of sub-samples. The samples shall be collected at a frequency of one per 500 cubic yards of contaminated soil. The composite soil samples shall be submitted to a Massachusetts Certified Laboratory for analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), total and toxicity characteristic leaching procedure (TCLP) RCRA 8 metals, organochlorine pesticides, organochlorine herbicides, conductivity, pH, flashpoint and reactivity (cyanide and sulfide).
  - c. Prepare waste profiles and shipping documentation for each respective licensed off-site licensed disposal facility proposed by the Contractor for disposal of contaminated soil. The profiles shall be made available to the Owner for review and certification prior to submittal to the licensed off-site disposal facilities.

Geotechnical field work and testing (described in further detail under “Field Quality Control” in Part 3 of this Specification Section):

- a. Field in-place density tests
- b. Optimum moisture-maximum density curve for each type of soil encountered
- c. Bearing tests
- d. Test reports on borrow material
- e. Test reports on sub-base material
- f. Re-testing of all tests which are found in non-compliance to the Specifications.

## **1.06 PROJECT CONDITIONS**

- A. The Contractor shall fully inform himself of existing conditions both surface and sub-surface before submitting his bid, and shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for additional compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed. The Owner shall not be responsible for interpretations or conclusions drawn from data or interpretations by the Contractor.
  1. Additional test borings (other than those required herein) and other exploratory operations may be performed by Contractor, at the Contractor’s option; however, no change in the Contract Sum will be authorized for such additional exploration.
- B. Existing Utilities
  1. All locations of existing utilities shown on the plan have been developed from existing utility records and/or above ground inspection of the site. Completeness or accuracy of locations or depth of underground utility or structures cannot be guaranteed. The Contractor shall verify the location and depth of all underground utilities or structures prior to the start of work.



2. The Contractor shall locate all existing underground utilities in areas of excavation work. He/she shall disconnect, seal and/or protect, as required, all existing utilities, including but not limited, to water, gas, sewerage, storm, electrical, and telephone in accordance with the regulations concerned. If utilities are indicated to remain in place, the Contractor shall provide adequate means of support and protection during earthwork operations.
  - a. The Contractor shall be responsible for all on-site coordination with utility companies and public agencies and for obtaining all required permits and paying all required fees. In accordance with M.G.L., Chapter 82, Section 40, including amendments; the Contractor shall notify all utility companies and government agencies in writing prior to such excavation, (exclusive of Saturday, Sundays and Holidays). The Contractor shall also call “Dig Safe” at 1(888) 344-7233 no less than 72 hours prior to such excavation.
  - b. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the Contractor shall consult utility owner immediately for directions. The Contractor shall cooperate with Owner and utility companies in keeping respective services and facilities in operation. The Contractor shall repair damaged utilities to satisfaction of utility owner.
  - c. The Contractor shall not interrupt existing utilities servicing facilities occupied by Owner or others, during occupied hours, except when permitted in writing by the Owner’s representative and then only after acceptable temporary utility services have been provided.
  - d. The Contractor shall provide a minimum of forty-eight (48) hours’ notice to the Owner’s representative, and receive a written notice to proceed, before interrupting any utility.
  - e. The Contractor shall place markers to indicate location of disconnected services. The Contractor shall also identify service lines and capping locations on Project Record Documents.
- C. Use of Explosives: Use of explosives is not permitted.
- D. Protection of Persons and Property:
  3. The Contractor shall barricade open excavations occurring as part of this work and post with warning lights. He/she shall operate the warning lights as recommended by authorities having jurisdiction.
  4. The Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
  5. The Contractor shall perform excavation by hand within drip line of large trees to remain. He/she shall protect root systems from damage or dry-out to the greatest



extent possible. He/she shall maintain moist conditions for root system and cover exposed roots with moistened burlap.

- E. Adjoining Properties: No construction work, temporary or permanent, shall take place on adjoining properties. The Contractor shall be fully responsible for monitoring and maintaining that no construction activities trespass onto adjoining properties for the duration of the Contract.

#### **1.07 BENCH MARKS, LINES, AND GRADES**

- A. The Contractor shall engage a professional land surveyor, registered in the Commonwealth of Massachusetts, and submit the name, address and registration number of such persons to the Owner's representative for approval to perform the following work:
  - 1. Furnish all stakes, pins, and grade markings, and lay out all lines and grade work, required to implement the work in accordance with Drawings.
  - 2. Establish permanent bench marks, maintain all established bounds and bench marks, and replace as directed any which are destroyed or disturbed.
  - 3. Establish all lines and vertical and horizontal alignment grades for the work and verify all locations, property lines, work lines, and other dimensioned points indicated on the Drawings for the existing site.
  - 4. Submit to the Owner's Representative a written confirmation of locations of all lines, and any discrepancies between conditions and locations as they actually exist and those indicated on the Drawings. Such confirmation shall bear the surveyor's registration stamp.
- B. The Contractor shall inform the Owner's Representative when the general layout is completed and shall not begin excavation until the various alignments are approved. Any discrepancies encountered in field conditions shall be reported to the Owner's representative immediately.

#### **1.08 WORK IN THE PUBLIC WAYS**

- A. The Contractor shall notify the appropriate municipal officials at least seven (7) calendar days in advance of commencing any work in the public ways. The Contractor shall pay for and obtain all required permission and permits to perform this work. The Contractor shall perform all work in the public ways in a manner required by the municipal authorities.
- B. Should there be any conflict between requirements specified in the Contract Documents and those of the municipal authorities, the municipal requirements shall govern.
- C. The Contractor shall not close or obstruct any streets or sidewalks unless and until they have been discontinued by the appropriate municipal authority or unless and until the Contractor has first secured all necessary or other permits therefor. No materials whatsoever shall be placed or stored in the streets. The Contractor shall conduct all operations to interfere as little as possible with the use ordinarily made of roads, driveways,



sidewalks, or other facilities near enough to the work to be affected thereby.

- D. The Contractor's attention is directed to the fact that the work on this project is to be performed in areas which are utilized by pedestrians as well as by vehicles. The Contractor shall be responsible for the installation of adequate precautions and other safety measures and controls deemed necessary by the authorities having jurisdiction, for the general public, and for his own personnel.
  - 1. The Contractor shall without additional compensation be required to provide safe and convenient access during the execution of the work. Necessary areas for fire apparatus and other emergency vehicles shall be maintained at all times.

### **1.09 CODES AND STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. Standard Specifications and Details: City of Worcester, Public Works and Parks Department
  - 2. Standard Specification: Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges, supplemental specifications latest edition.
  - 3. AASHTO: American Association of State Highway and Transportation Officials, latest edition.
  - 4. ASTM: American Society of Testing and Materials, latest edition.
  - 5. ADA: Americans with Disabilities Act, latest edition.
  - 6. ABB: Architectural Barriers Board, Commonwealth of Massachusetts Regulation Chapter 521 CMR, latest edition.

### **1.10 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Compacted Gravel Borrow: See Special Conditions and Specifications.
- B. Ordinary Borrow shall be well graded, natural inorganic soil, approved by the Owner's representative and meeting the following requirements:



1. It shall be free of organic or other weak or compressible materials, of frozen materials, and of stones larger than six (6) inches maximum dimension.
  2. It shall be of such nature and character that it can be compacted to the specified densities.
  3. It shall be free from highly plastic clays, from all materials subject to decay, decomposition, or dissolution and from cinders or other material which will corrode piping or other metal.
  4. It shall have maximum dry density of not less than one hundred (100) pounds per cubic foot.
  5. Material from excavation on the site may be used as ordinary fill if it meets the above requirements and is approved by the Owner's Representative.
- C. Infield Mix: See Section 32 18 23 – Athletic Surfacing.
- D. Loam for athletic field root zone mix and for general turf and planting areas: See Section 32 91 13 – Loam
- E. Sand used for backfilling irrigation trenches shall be coarse sand as defined by ASTM D2487.
- F. Excavated Materials: Material from on-site excavation may be utilized as borrow for subgrade fill in areas that will not be paved or include structures, provided that this material can be compacted as required in Part 3, and does not contain any of the unsuitable materials listed in 1.03C of this Section. For areas that will not be paved, excavated soil that exceeds a contamination level of RSC-1 or RCS-2 (in accordance with the report from Beta Group included in the bid/specifications package) may be used for fill up to 12" below finished grade, with 6" above that filled with soil with a contamination level below RCS-1, and 6" of loam or topsoil above that. For areas to receive pavement, Soil that exceeds RCS-1 or RCS-2 may be used for fill up to the subgrade. However, any soil that qualifies as hazardous waste shall not be used as fill.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. The Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. The Contractor shall protect sub-grades and foundation soils against freezing temperatures or frost. He/she shall provide protective insulating materials as necessary.
- C. The Contractor shall provide erosion control measures in accordance with Section 31 25 00 to prevent erosion or displacement of soils and discharge of soil-bearing water runoff,



and he/she shall prevent airborne dust from falling on adjacent properties and walkways.

- D. The Contractor shall provide tree protection as specified in Section 02 41 13 Site Preparation.

### **3.02 DUST CONTROL**

- A. The Contractor shall refer to Section 02 41 13 Site Preparation for dust control requirements.

### **3.03 DEWATERING**

- A. The Contractor shall refer to Section 31 23 19 for dewatering and drainage control requirements.

### **3.04 EROSION CONTROL**

- A. The Contractor shall install and maintain erosion control measures as indicated in Section 31 25 00 Erosion and Sedimentation Control, and shall do the following:
1. Schedule the delivery and placement of fill materials, obtained from off-site sources, in a manner which will minimize the length of time such fill materials would be stored on site and subject to erosion.
  2. Limit new embankment slopes to three (3) horizontal to one (1) vertical, maximum unless indicated as steeper on plans.

### **3.05 FROST PROTECTION**

- A. The Contractor shall not excavate to full indicated depth when freezing temperatures may be expected, unless footings or slabs can be poured immediately after the excavation has been completed. The Contractor shall protect the excavation from frost if placing of the concrete is delayed. Should protection fail, remove frozen materials and replace with concrete or gravel fill, as directed, at no cost to the Owner. Once footings or slabs are placed, protect same from frost.
- B. The Contractor shall keep the operations under this Contract clear and free of accumulations of snow as required to carry out the work.

### **3.06 SHEETING, SHORING AND BRACING, AND PROTECTION**

- A. The Contractor shall furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of the excavation and to prevent any movement of earth which could in any way diminish the width of the excavation below that necessary for proper construction, or otherwise injure or delay the work or endanger adjacent structure or personnel. If the Owner's representative is of the opinion that at any point sufficient or proper support has not been provided, he/she may order additional supports put in at the expense of the Contractor.



1. Prior to installation of sheeting, the Contractor and the Owner's representative shall notify and consult with adjacent residents who may be affected by vibrations caused by equipment installing the sheeting.
- B. Whenever possible, sheeting shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting will be driven. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled with sand and compacted.
- C. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing which the Owner's representative may direct him to leave in place at any time during the progress of the work, for the purpose for preventing injury to structure, personnel, utilities, or property at no additional cost. Timber or steel sheeting and bracing to be left in place shall be cut-off at least two feet below finish grade. This shall not constitute a waiver of the Contractor's responsibility to use his own judgment in where sheeting shall be left in place.
- D. All sheeting and bracing not to be left in place shall be carefully removed in such a manner as not to endanger the construction or other structures. All voids left or caused by withdrawal of sheeting shall be immediately backfilled with approved material and compacted by ramming with tools especially adapted to that purpose, by watering, or otherwise as may be directed.
- E. The Contractor shall comply with local safety regulations or in the absence thereof, with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.
  1. The Contractor shall submit sheeting and shoring design for review to the Owner's representative. The sheeting and shoring design shall be prepared by a professional engineer licensed in the Commonwealth of Massachusetts and in the employ of the Contractor.

### **3.07 EXCAVATION: GENERAL**

- A. Classified Excavation: Excavation is classified and includes excavation to required sub-grade elevations indicated, regardless of character of materials and obstructions encountered. Excavation will be classified as earth excavation or rock excavation as follows:
  1. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
    - a. Intermittent drilling or ripping to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
    - b. All excavation shall be done with a backhoe whose bucket is equipped with a



wedge plate across the teeth to provide a smooth bottom profile or equivalent equipment approved by the Owner's Representative.

2. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or equivalent track-mounted loader, rated at not less than 210 HP flywheel power and developing minimum of 45,000-pound breakout force (measured in accordance with SAE J732).
  3. Rock excavation for trenches includes removal and disposal of materials and obstructions encountered that cannot be excavated with a track-mounted power excavator, equivalent to Caterpillar Model No. 215C LC, and rated at not less than 115 HP flywheel power and 32,000-pound drawbar pull and equipped with a short stick and a 42-inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.
- B. Material, encountered in the excavation, to qualify as rock, must be two (2) cubic yards or more in undisturbed size in open excavation and in trenches. To be considered for classification as rock, material shall be any one of the following:
1. Rock, stone, or shale (in original ledge) and all other material, including buried building foundations, which cannot be broken and removed by power excavation equipment and requires the use of drills.
  2. Boulders.
- C. When, during the progress of excavation, rock is encountered, the Contractor shall uncover and expose the material, and notify the Owner's Representative before proceeding further. He/she shall not proceed with the excavation of material claimed as rock until the material has been classified by the Owner's Representative. Failure on the part of the Contractor to uncover such material or notify the Owner's Representative, and take cross-sections, will forfeit the Contractor's right-of-claim to any additional compensation or extension of time.
1. The Contractor shall employ qualified personnel, acceptable to the Owner's Representative, to take cross-sections of rock three (3) feet on center before removal of same; and to provide computations of cross-sections.
- D. See Special Conditions and Specifications for additional excavation requirements (under "Demolition, Site Excavation and Preparation").

### **3.08 STABILITY OF EXCAVATIONS**

- A. Excavation of slopes shall be constructed to comply with all OSHA regulations and with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations. The Contractor shall notify the Massachusetts Department of Labor and Industries of the start of excavation work.



### **3.09 EXCAVATION FOR STRUCTURES**

- A. The Contractor shall excavate to designated elevations and dimensions as indicated within the Drawings within a tolerance of plus or minus 0.10 foot. He/she shall extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: The Contractor shall not disturb bottom of excavation. He/she shall excavate by hand to final grade just before placing concrete reinforcement. He/she shall trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Excavation for Mechanical or Electrical Appurtenances: The Contractor shall excavate to elevations and dimensions indicated on the Drawings within a tolerance of plus or minus 0.10 foot. He/she shall not disturb bottom of excavations intended for bearing surface.

### **3.10 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. The Contractor shall excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades, as indicated within the Drawings.
- B. All unsuitable material that is present in the subgrade, including topsoil, silty soil, and organic materials, shall be removed down to the layer of existing urban fill, and replaced with Ordinary Borrow to sub-grade level prior to compaction and proof-rolling.

### **3.11 EXCAVATION FOR UTILITY TRENCHES**

- A. The Contractor shall excavate trenches to indicated slopes, lines, depths, and below invert elevations as indicated in the Drawings.
- B. The Contractor shall excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. He/she shall excavate trench walls vertically from trench bottom to twelve (12) inches higher than top of pipe or conduit, unless otherwise indicated.
- C. Trench Bottoms: The Contractor shall excavate and shape trench bottoms to receive bedding for pipes and conduit. He/she shall shape bedding to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. He/she shall remove stones and sharp objects to avoid point loading.
  - 1. Where rock is encountered, the Contractor shall excavate six (6") inches below required elevations and backfill with compacted gravel fill to required elevations.

### **3.12 APPROVAL OF SUBGRADE**

- A. The Contractor shall maintain foundation excavations at least twelve (12) inches above design bearing level until final excavation immediately before footing construction, or placing fill. If footings will not be constructed within the same day as final excavation to subgrade level, a three (3) inch thick lean concrete mud slab shall be cast over the exposed



bearing surface immediately after approval of the subgrade bearing surface by the geotechnical engineer.

- B. The Contractor shall notify the Owner's Representative when excavations have reached required subgrade for inspection of conditions and approval to proceed with construction.
- C. If the Owner's Representative determines that unforeseen unsuitable material is present, he/she may direct the Contractor to continue excavation until suitable bearing materials are encountered.
- D. The Contractor shall re-construct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owner's Representative, at no cost to the Owner.
- E. The Contractor shall not place fill material until the subgrade is approved by the Owner's Representative.

### **3.13 UNAUTHORIZED EXCAVATION**

- A. The Contractor shall fill unauthorized excavation with structural fill material as directed by the Owner's Representative. Flowable fill may be used to bring elevations to proper position when acceptable to the Owner's Representative.
- B. Where indicated widths of utility trenches are exceeded, the Contractor shall provide stronger pipe, or special installation procedures, as required by Owner's Representative at no additional cost to the Owner.

### **3.14 STORAGE OF SOIL MATERIALS**

- A. The Contractor shall stockpile excavated materials approved as backfill materials, including acceptable borrow materials. He/she shall stockpile soil materials without intermixing. He/she shall place, grade, and shape stockpiles to drain surface water. He/she shall cover to prevent erosion and install siltation controls.
  - 1. The Contractor shall stockpile soil materials away from edge of excavations. He/she shall not store the materials within drip line of remaining trees.
  - 2. Intermixed stockpiles as determined and directed by the Owner's Representative shall be re-tested by the Contractor for compliance to specified requirements or removed from site immediately, at no additional cost to the Owner.
- B. The Contractor shall place all stockpiles of contaminated soil on 6-mil. polyethylene sheeting, and also cover these stockpiles with the same sheeting, to prevent erosion and mixing with non-contaminated materials at the site.

### **3.15 SUBGRADE AND BACKFILL COMPACTION REQUIREMENTS**

- A. Percentage of Maximum Dry Density Requirements: The Contractor shall compact soil to not less than the following percentages of maximum dry density according to ASTM D



1557 and in place density in accordance with ASTM D 1556. All fill and backfill material shall be compacted in layers not to exceed 6 inches.

1. Under structures, pavements, and utilities, the Contractor shall compact the sub-grade and each layer of backfill or fill material at 95 percent maximum dry density. Where compaction with large equipment is not possible due to the narrow widths of excavations, a plate compactor or walk-behind drum roller shall be used to achieve the required level of compaction of the sub-grade.
2. Under planting areas or unpaved areas, the Contractor shall compact the sub-grade and each layer of backfill or fill material at 90 percent maximum dry density.

### **3.16 PROOF COMPACTION**

- A. The Contractor shall proof-compact the bottom of excavations or existing subgrade, for all areas to be paved, in addition to the base of the underground detention system excavation. Proof compaction shall consist of making ten (10) passes with a ten ton vibratory roller or by a minimum of three (3) coverages from the rear wheel assembly of a fully loaded ten-wheel dump truck or by a minimum of three (3) coverages from the treads of a tractor dozer weighing at least 30,000 pounds and observing the subgrade for any soft or weaving areas. All proof-compaction work shall be supervised by either the Owner's Representative, or a geotechnical engineer hired by the Owner.

### **3.17 PLACEMENT OF FILLS**

- A. General: The Contractor shall backfill excavations as promptly as work permits, but not before completing the following:
  1. Acceptance by the Owner's Representative of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
  2. Coordinating drainage systems installation.
  3. Surveying locations of underground utilities for record documents.
  4. Testing, inspecting, and approval of underground utilities.
  5. Concrete formwork removal.
  6. Removal of trash and debris from excavation.
  7. Removal of temporary shoring and bracing, and sheeting.
  8. Removal of vegetation, topsoil, wet and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
- B. When sub-grade or existing ground surface to receive fill has a density less than that required for fill, the Contractor shall break up ground surface to depth required, pulverize, moisture-condition or aerate soil and re-compact to required density.



- C. The Contractor shall notify the Owner's Representative when areas to receive fill are ready for inspection. All sub-grades to receive fill shall be compacted as noted previously in this Section of the Specifications.
- D. The Contractor shall place approved fill materials in layers not exceeding six (6) inches compacted thickness and compact as specified below for various fill conditions.
- E. Placing Compacted Gravel Fill: The Contractor shall place Gravel Fill and compact to specified densities as indicated within the Drawings, and for all exterior site construction requiring filling and backfilling operations as a result of excavation operations and/or filling to required subgrades from existing grades.
- F. Placing Crushed Stone: The Contractor shall place Crushed Stone and compact to specified densities as indicated within the Drawings and/or specified herein.
- G. Placing Sand Borrow: The Contractor shall place Sand Borrow and compact to specified densities as indicated within the Drawings and/or specified herein.
- H. Placing Ordinary Borrow:
  - 1. Ordinary Borrow may be utilized, if approved by the Owner's Representative, as fill and backfill material beneath pavements, structures, and beneath loam in lawn and planting areas.
  - 2. The Contractor shall place Ordinary Borrow and compact to specified densities as indicated within the Drawings and specified herein.
- J. The Contractor may use excavated material that doesn't qualify as Ordinary Borrow as subgrade fill in areas that will not be paved or include structures, provided that this material can be compacted as required above, in lifts not exceeding 6 inches, and does not contain any of the unsuitable materials listed in 1.03C of this Section. All remaining excavated material shall be removed and legally disposed off-site.

### **3.18 UTILITY TRENCH BACKFILL**

- A. The Contractor shall place bedding course on bearing surfaces and to fill unauthorized excavations. He/she shall shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits to spring line.
- B. The Contractor shall place concrete in backfill trenches that carry below or pass under footings and that are excavated within eighteen (18) inches of footings. He/she shall place concrete to level of bottom of footings.
- C. The Contractor shall provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, he/she shall completely encase piping or conduit in a minimum of four (4) inches of concrete before backfilling or placing roadway sub-base.



- D. The Contractor shall place and compact backfill material to a minimum height of twelve (12) inches over the utility pipe or conduit and as indicated within the Drawings.
  - 1. The Contractor shall carefully compact material and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- E. The Contractor shall coordinate backfilling with utilities testing.
- F. The Contractor shall fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.
- G. The Contractor shall place and compact backfill material to final sub-grade of areas to be paved, or finished grade in areas to be seeded or sodded. Trenches shall be backfilled and compacted so that settling of soil does not occur.
- H. The Contractor shall install warning tape directly above utilities, in accordance with the Drawings.

### **3.19 ROUGH GRADING**

- A. General: The Contractor shall uniformly grade areas to a smooth surface, free from irregular surface changes. He/she shall comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. The Contractor shall provide a smooth transition between existing adjacent grades and new grades.
  - 2. The Contractor shall cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Sub-grades: The Contractor shall finish sub-grades to required elevations within the following tolerances:
  - 1. Lawn or Unpaved Areas: Plus or minus 0.05 foot.
  - 2. Walks: Plus or minus 0.05 foot.
  - 3. Pavements: Plus or minus 0.05 foot.

### **3.20 FIELD QUALITY CONTROL**

- A. Geotechnical Testing Agency Services: The Contractor shall allow testing agency to inspect and test each sub-grade and each fill or backfill layer. He/she shall not proceed until test results for previously completed work verify compliance with requirements.
  - 1. The Contractor shall perform field in-place density tests according to ASTM D 1556 (sand cone method).



- a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, the Contractor shall check the calibration curves furnished with the moisture gauges according to ASTM D 3017.
  - b. When field in-place density tests are performed using nuclear methods, the Contractor shall make calibration checks of both density and moisture gauges at beginning of work, on each different type of material encountered, and at intervals as directed by the Owner's representative.
2. Footing Sub-grade: At footing sub-grades, the Contractor shall perform at least one (1) test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing sub-grades may be based on a visual comparison of each sub-grade with related tested strata when acceptable to the Owner's representative.
  3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, the Contractor shall perform at least one (1) field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three (3) tests.
  4. Foundation Wall Backfill: In each compacted backfill layer, the Contractor shall perform at least one (1) field in-place density test for each 100 feet or less of wall length, but no fewer than two (2) tests along a wall face.
  5. Trench Backfill: In each compacted initial and final backfill layer, the Contractor shall perform at least one (1) field in-place density test for each 100 feet or less of trench, but no fewer than two (2) tests.
- A. When testing agency reports that sub-grades, fills, or backfills are below specified density, the Contractor shall scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and re-test until required density is obtained, at no additional cost to the Owner.

### **3.21 FINISHED GRADING**

- A. All athletic field areas shall be laser-graded, using a grading mechanism equipped with an automated control. The contractor who finish-grades the fields shall have experience with this type of fine grading.
- B. For fine grading and loaming, see Section 32 91 13 – Loam.

### **3.22 PROTECTION**

- A. Protecting Graded Areas: The Contractor shall protect newly graded areas from traffic, freezing, and erosion. He/she shall keep these areas free of trash and debris.
- B. The Contractor shall repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or loosely compacted due



to subsequent construction operations or weather conditions.

1. The Contractor shall scarify or remove and replace material to depth directed by the Owner's representative; and shall re-shape and re-compact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, the Contractor shall remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
1. The Contractor shall restore appearance and quality of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- D. All additional repairing, removing, and restoring work shall be completed at no additional cost to the Owner.

### **3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Disposal: The Contractor shall remove and legally dispose of surplus or excavated materials not required to complete construction, including unsatisfactory soil, trash, and debris, and legally dispose of it off the park property.
- B. Excess excavated soil containing contaminants below RCS-1 levels shall be managed in accordance with the anti-degradation provisions of the MCP (Massachusetts Contingency Plan) at 310 CMR 40.0032(3). Soil to be disposed off-site that is below RCS-1 levels of contamination shall be deposited on another City-owned site (meeting 310 CMR 40.0000 requirements), if directed by the Owner to do so.
- C. Excess soil containing contaminants above RCS-1 levels shall be disposed of at appropriately licensed, off-site soil management facilities.
- D. The Contractor shall submit a list of proposed licensed disposal facilities for contaminated soils, prior to disposal, to the Owner's Representative for approval.
- E. See Special Conditions and Specifications for additional disposal requirements (under "Demolition, Site Excavation and Preparation").

**END OF SECTION**



**SECTION 31 23 19  
DEWATERING AND DRAINAGE CONTROL**

**PART 1—GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. This Section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems and the requirements for control of surface water within the site.
- C. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Control of surface water runoff to prevent flooding of excavations, trenches and adjacent properties, and the loosening and saturation of soils.
  - 2. Removal and disposal of subsurface water from excavations and trenches as required to lower and control water levels during construction.
  - 3. Provision of equipment and facilities to remove sediment and control the rates and volumes of disposal of surface and subsurface waters removed from the work areas.

**1.02 RELATED SECTIONS**

- A. Sections which directly relate to the work of this Section include:
  - 1. Section 02 41 13—Site Preparation and Demolition
  - 2. Section 31 23 19—Earthwork
  - 3. Section 31 25 00—Erosion and Sedimentation Control

**1.03 DEWATERING SYSTEM REQUIREMENTS**

- A. The Contractor shall design the dewatering systems to:
  - 1. Effectively reduce the hydrostatic pressure and lower the groundwater levels to a minimum of 2 feet below the bottom of excavations;
  - 2. Develop a substantially dry and stable subgrade for the proposed work;
  - 3. Prevent damage to adjacent properties, buildings, structures, utilities and other facilities;
  - 4. Ensure that, after 12 hours of initial pumping, no soil particles will be present in the discharge.
- B. The Contractor shall locate dewatering facilities where they will not interfere with utilities and construction work to be done by others.



- C. The Contractor shall modify dewatering equipment and procedures when operations threaten to cause damage to new or existing facilities.
- D. The Contractor shall be solely responsible for the proper design and execution methods for controlling surface and groundwater. Design review and/or field monitoring activities by the Owner's representative shall not relieve the Contractor of his responsibilities for the work specified herein.

#### **1.04 SUBMITTALS**

- A. Prior to installation of the dewatering system and at least two weeks prior to performing any excavation in areas that require dewatering, the Contractor shall submit working drawings and design data for review by the Owner's representative with the following information:
  - 1. The proposed type of dewatering system;
  - 2. Arrangement, location and depths of system components;
  - 3. Complete description of equipment and instrumentation to be used including installation, operation and maintenance procedures;
  - 4. Types and sizes of filters;
  - 5. Design calculations demonstrating adequacy of the proposed system and equipment; and provisions and methods of sediment removal and disposal of water.
- B. It is anticipated that the initial dewatering plan will have to be modified to suit the variable soil/water conditions encountered during construction. The Contractor shall modify the dewatering plan as often as necessary to meet the Specifications.

#### **1.05 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

### **PART 2—PRODUCTS**

#### **2.01 MATERIALS AND EQUIPMENT**

- A. The Contractor shall furnish pumps, pipe, appliances, and equipment of capacity capable to keep the excavations free from water as necessary to complete the work as specified herein.
- B. The Contractor shall provide all necessary materials for environmental protection including construction fencing and erosion control barriers.



## **PART 3—EXECUTION**

### **3.01 SURFACE WATER CONTROL**

- A. The Contractor shall intercept and divert surface water runoff away from excavations through the use of dikes, curb walls, ditches, pipes, sumps or other approved means.
- B. The Contractor shall provide and maintain ditches of adequate size to collect and prevent surface and subsurface water seepage from entering the excavations. He/she shall divert the water to settling basins or other approved equipment required to reduce the amount of fine particles before discharge into drainage pipes and natural watercourses. If a drainage system or watercourse becomes blocked due to dewatering operation, the Contractor, at no additional cost to the Owner, shall clean it.

### **3.02 DEWATERING EXCAVATIONS**

- A. The Contractor shall accomplish dewatering in accordance with the means and methods submitted as required and approved by the Owner's representative. The Contractor shall keep the Owner's representative advised of any changes required to accommodate field conditions and, on completion of the dewatering system installation, revise and resubmit the information required to show the installed system.
- B. The Contractor shall perform dewatering operations to lower the groundwater level in excavations as required to provide a stable, dry subgrade for the prosecution of the proposed work.
- C. The Contractor shall maintain dewatering operations in a manner that prevents buildup of excessive hydrostatic pressure and damage to structures, and the subgrade.
- D. The Contractor shall not allow water to accumulate in excavations. He/she shall provide and maintain at all times ample means and devices to remove promptly, and to dispose of properly, all water entering excavations and to keep them dry until the proposed work is completed.
- E. If the Contractor's method of dewatering does not properly dewater the excavation as specified, then the Contractor shall install groundwater observation wells, as directed by the Owner's representative, and implement a revised dewatering plan that lowers the groundwater a minimum of 6 inches below the bottom of final excavation elevation, at no additional cost to the Owner.
- F. No pipe shall be laid in water. No masonry shall be laid in water, and no water shall be allowed to rise over concrete and brick masonry within 24 hours after being placed. Water shall not be allowed to rise over any concrete and masonry for four days. The Contractor shall constantly guard against the possibility of flotation of pipe or structures after installation. Backfill or other means shall be placed promptly to prevent this occurrence.
- G. Dewatering units used in the work shall be surrounded by suitable filter sand such that no fines shall be removed by pumping. Pumping shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.



- H. Dewatering flows shall be disposed of in an approved area. Sanitary sewer systems shall not be used to dispose of dewatering flows.

**END OF SECTION**



**SECTION 31 25 00  
EROSION AND SEDIMENTATION CONTROLS**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Installation, maintenance and removal of erosion and sediment controls.
- C. All work described above shall be marked out in the field for review and approval by the Owner's representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. 02 41 13 – Site Preparation and Demolition
- B. 31 23 10 - Earthwork

**1.03 GENERAL PROVISIONS**

- A. This specification applies to work depicted on the Civil Drawings prepared by Quinn Engineering, Inc., herein referred to as the "Drawings" and specifically consisting of:
  - 1. Sheets C-1 through C-4.
  - 2. Blanket for Swales Outside of Athletic Fields depicted on plans by EarthDesign Landscape Architecture LLC
- B. Attention is directed to PROJECT SPECIAL CONDITIONS which are hereby made a part of this Section of the Specifications.
- C. All work conducted in association with this section shall conform to the applicable requirements of the Occupational Safety and Health Administration (OSHA).
- D. In accordance with MA General Law Chapter 82 Section 40A and prior to construction, the Contractor shall contact DIGSAFE and other utility providers in order to determine the location of existing utilities within the project area. The Contractor is responsible for coordinating the work with the existing utilities so that disruption to the existing utilities is minimized.
- E. Prior to construction, the Contractor shall notify and coordinate any planned disruptions to existing utilities that are required to perform the work with the appropriate utility provider and with the Owner's representative. Disruptions to existing utilities shall be planned so that the time of disruption is minimized.



#### **1.04 INDUSTRY STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. Commonwealth of Massachusetts, Department of Public Works, Standard specifications for Highways and Bridges, Supplemental Specifications, latest edition.
  - 2. AASHTO: American Association of State Highway and Transportation Officials
  - 3. ASTM: American Society for Testing and Materials
  - 4. Mass DOT: Massachusetts Department of Transportation, Highway Division
  - 5. MSSHB: Massachusetts Standard Specifications for Highways and Bridges

#### **1.05 SUBMITTALS**

- A. Submit for approval prior to ordering and shipment technical information regarding
  - 1. Silt fence / stakes
  - 2. Catch basin inserts
  - 3. Erosion control fabric
  - 4. Blankets for swales outside of athletic fields

#### **1.06 SITE CONDITIONS**

- A. The Contractor is responsible for verifying the layout of all materials prior to installation in relation to the locations specified on the Drawings and in relation to the existing conditions.
- B. The Contractor shall provide barricades or barriers to protect the public from construction activities.
- C. The work specified herein shall take place under weather conditions so as not to cause erosion or negatively impact any portion of the site.

#### **1.07 QUALITY ASSURANCE**

- A. The Contractor is responsible for the timely and proper installation and maintenance of all sediment and erosion control devices necessary to prevent the movement of sediment from the construction site to off site areas or into, adjacent drainage systems, or into unwanted areas of the site. The Contractor shall be responsible for implementing additional measures to those shown on the Drawings as necessary to prevent the movement of sediment into the above mentioned areas. All erosion control measures, including any additional measures necessary, shall be installed, maintained, removed, and cleaned at the expense of the Contractor.
- B. All materials for each product shall be produced and obtained from a single manufacturer.
- C. Installation shall be performed by qualified personnel.



- D. Coordinate the work shown on the Drawings and specified herein with all other trades in order to provide a complete installation.
- E. The Contractor shall provide all necessary miscellaneous items and appurtenances not identified on the Drawings or specified herein to provide a complete installation.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. All commercially obtained material shall be delivered in the original unopened packaging with labels intact.
- B. All commercially obtained materials shall be stored in a location that is protected from weather and temperatures not less than 40 degrees Fahrenheit.

**1.09 COORDINATION**

- A. The work specified in this section shall be coordinated with all work shown/described on the Drawings and in the specifications with other portions of the work for the entire project.
- B. The Contractor shall give the Engineer at least 48 hour notice when requesting inspections on site.

**1.10 EXISTING UTILITIES**

- A. Existing utility information depicted on the Drawing has been provided to Quinn Engineering, Inc. unless otherwise noted. The Contractor is responsible for coordinating the locations of all existing utilities with the utility provider and “DIGSAFE”. Quinn Engineering, Inc. does not warrant that all existing utilities have been depicted on the Drawings.
- B. The Contractor shall take every precaution to limit disruption to existing utilities. Any existing utilities disrupted or affected by the Contractor as a result of his/her work shall be repaired at least to the condition that existed prior to construction. The Contractor shall coordinate repair of any utilities with the utility providers and any costs associated with the repair shall be borne by the Contractor.

**1.11 DRAWINGS**

- A. The Contractor is responsible for reviewing the Drawings and existing site conditions with respect to this section.
- B. The information depicted on the Drawings is believed to reflect the current site conditions unless otherwise noted on the Drawings. The Contractor is responsible for reviewing the existing site conditions in the areas of the proposed work and notify the Owner’s representative as soon as possible if any discrepancies exist between the two.
- C. The existing conditions depicted on the Drawings have been provided to Quinn Engineering, Inc. Quinn Engineering, Inc. does not warrant that all existing conditions, structures, utilities, etc. have been depicted.

**1.12 COORDINATION WITH THE WORCESTER CONSERVATION COMMISSION**

- A. An Order of Conditions from the Worcester Conservation Commission is required for this work.
- B. The Contractor is responsible for conducting the work in accordance with the Order of Conditions issued by the Worcester Conservation Commission.



- C. The Order of Conditions is to be considered part of this specification and the contract documents.

### **1.13 COORDINATION WITH THE CONSTRUCTION GENERAL PERMIT PROGRAM THROUGH THE US EPA**

- A. The work depicted on the Drawings will result in greater than 1.0 acre of land disturbance and therefore the CGP is applicable to this work.
- B. Under the US EPA's Construction General Permit (CGP) program, the Contractor (Operator) must submit a Notice of Intent to the EPA and a prepare a Stormwater Pollution Prevention Plan.
- C. The Contractor is responsible for compliance with the US EPA CGP in accordance with these specifications and with the US EPA's CGP program.

## **PART 2 - PRODUCTS**

### **2.01 SILT FENCE**

- A. Silt Fence shall be as manufactured by TENCATE Mirafi of 365 South Holland Drive Pendergrass, GA 30567 or approved equal.

### **2.02 WOODEN STAKES & STAPLES**

- A. Wooden stakes shall be hardwood with dimensions approximately 1"x1"x36".
- B. Staples shall be metal and suitable for exterior applications. Staples shall be capable of fastening the silt fence to the wooden stakes.

### **2.03 CATCH BASIN FILTER INSERT**

- A. Catch basin filter inserts shall be "Silt Sack" as manufactured by ACF Environmental Inc. 2831 Cardwell Road, Richmond, VA 23234 (800)-448-3636 , [www.acfenvironmental.com](http://www.acfenvironmental.com) or approved equal.
- B. Catch basin filter insert must be manufactured to fit the opening of the catch basin, area drain or drop inlet. Catch basin filter insert will have the following features:
  - 1. Two dump straps attached at the bottom to facilitate the emptying of catch basin filter insert;
  - 2. Lifting loops as an integral part of the system to be used to lift catch basin filter insert from the basin;
  - 3. A restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls, this cord also serves as a visual means of indicating when the sack should be emptied. Once the cord is covered with sediment, catch basin filter insert should be emptied, cleaned and placed back into the basin.
- C. Catch basin filter insert material and properties shall be as specified by the manufacturer.

### **2.04 BLANKET FOR SWALES OUTSIDE OF ATHLETIC FIELDS**

- A. This shall be a straw/net blanket with accelerated photodegradable netting, at the minimum width indicated on the Drawings. Coconut fiber or materials other than straw are not allowed.



## **2.05 WATER**

- A. Dust control shall be done using sprayed water.

## **PART 3 - EXECUTION**

### **3.01 SILT FENCE BARRIER**

- A. Staked silt fence shall be provided and installed by the Contractor to control the movement of sediment produced by construction activities on site.
- B. Silt fence shall be trenched into the ground as indicated on drawings.
- C. Install silt fence according to the details shown on the Drawings and per the manufacturer's instructions.
- D. Backfill trench with excavated material and compact.
- E. Once installed, remove accumulated sediment once it builds up to 1/4 of the height of the fence.
- F. Replace damaged silt fence, or patch with a 2-ft minimum overlap.
- G. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

### **3.02 CATCH BASIN FILTER INSERT**

- A. Catch basin filter insert installation shall be provided and installed by the Contractor to control to movement of sediment produced by construction activities into the onsite drain system and/or drain system located downstream of the work area.
- B. Obtain permission from the municipality if catch basin filter inserts are to be installed within public right of ways.
- C. Installation and maintenance shall conform to the manufacturer's specifications.

### **3.03 BLANKET FOR SWALES OUTSIDE OF ATHLETIC FIELDS**

- A. Install in accordance with the Drawings.

### **3.04 DUST CONTROL**

- A. The frequency of dust control operations shall be determined by the Contractor.
- B. Water shall be applied under the control of the Contractor and shall be applied in the amounts and at locations designated by the Contractor.
- C. All equipment used for the application of water shall be equipped with a positive means of shut-off.
- D. At least one mobile unit with a minimum capacity of 1,000 gallons shall be available for applying water on the project, unless otherwise permitted by the Contractor, or all the water is applied by means of pipe lines.
- E. Water shall be applied by means of pressure-type distributors or pipe lines equipped with a spray system or hoses with nozzles that will insure a uniform application of water.



- F. See Section 02 41 13 (Site Preparation and Demolition) for additional dust control requirements.

**3.05 REMOVAL AND FINAL CLEANUP**

- A. Upon complete stabilization of the site, all erosion and sediment control devices (except for swale blankets) and any accumulated sediment shall be removed from the site. All devices and sediment shall be disposed of in a manner according to good practice. Any areas disturbed by removal of the devices or sediment removal shall be graded and stabilized as required on the Drawings.

**END OF SECTION**



**SECTION 32 11 16  
AGGREGATE BASE COURSES**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. This Section specifies requirements for the preparation and placement of granular pavement base materials. The base courses shall consist of approved granular materials placed on the subgrade and in close conformity with the lines and grades on the plans or as established by the Owner's representative.
- C. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Fine grading and compaction of pavement subgrade.
  - 2. Furnishing, placing, and compacting of base materials.

**1.02 RELATED SECTIONS**

- A. Other specification sections that directly relate to the work of this Section include:
  - 1. Section 03 30 53 – Cast-in-Place Cement Concrete
  - 2. Section 31 23 10 – Earthwork
  - 3. Section 32 12 16 – Bituminous Concrete
  - 4. Special Conditions and Specifications (additional requirements for gravel)

**1.03 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 AGGREGATE MATERIALS**

- A. Gravel borrow: Gravel for pavement base courses, mow strip bases, and footing bases shall meet the following gradation requirements. See Project Special Conditions & Specifications for gradation requirements for gravel borrow specified for other construction.



| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 3"                | 100                    |
| 1/2"              | 50-85                  |
| #4                | 40-75                  |
| #10               | 30-60                  |
| #40               | 10-35                  |
| #100              | 0-8                    |
| #200              | 0-8                    |

The Contractor shall comply with additional requirements for all gravel borrow in the Project Special Conditions and Specifications.

**2.02 GEOTEXTILE FABRIC**

- A. Fabric shall be a non-woven polyester or polypropylene geotextile fabric with a weight of 4 to 6 ounces per square yard.

**PART 3 - EXECUTION**

**3.01 SUBGRADE PREPARATION**

- A. All subsurface utility construction shall be completed before fine grading is begun.
- B. The pavement and curb subgrade shall be fine graded to the locations, elevations and cross slopes shown on the Drawings.
- C. Subgrades in in-situ soils in excavation areas and in embankment areas shall be compacted in conformance with Section 31 23 10 - Earthwork.

**3.02 GEOTEXTILE FABRIC PLACEMENT**

- A. Fabric shall be placed on compacted subgrade prior to placement of aggregate base course. Fabric shall overlap between 18 and 24 inches.
- B. No construction equipment shall be allowed directly on the fabric.

**3.03 BASE AND SUB-BASE MATERIAL PLACEMENT**

- A. Base course material shall not be placed until the Owner’s Representative has approved the fine grading, compaction, and condition of the subgrade.
- B. Base course material shall be placed and spread on the approved subgrade in layers not exceeding six (6) inches in thickness by approved self-spreading equipment. Any displacement of the compacted subgrade material by the equipment shall be restored to the required grade and re-compacted before placement of the base course material.
- C. Aggregate base material for pavements and footings/foundations shall be compacted to 95 percent maximum dry density of the material as determined by the Standard AASHO Test



Designation T99 compaction test Method C at optimum moisture content.

- D. The surface of the base course material shall be fine graded to the locations, elevations, and cross slopes shown on the Drawings during final layer compaction operations.

### **3.04 PROOF COMPACTION**

- A. The Contractor shall proof-compact the aggregate base courses for all areas to be paved (asphalt and concrete). Proof compaction shall consist of making ten (10) passes with a ten ton vibratory roller for walkway areas; and by a minimum of three (3) coverages from the rear wheel assembly of a fully loaded ten-wheel dump truck for all other paved areas including athletic courts. All proof-compaction work shall be supervised by either the Owner's Representative, or a geotechnical engineer hired by the Owner.

**END OF SECTION**



**SECTION 32 12 16  
BITUMINOUS CONCRETE**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Provide hot-mixed asphalt paving and curbs over prepared base, in accordance with Section 460 Class I Bituminous Concrete Paving Type I-1, of the Standard Specifications for Highways and Bridges, Massachusetts Department of Transportation, as amended to date.
  - 2. Pavement markings for parking lots
- C. The boundaries of all paved areas shall be marked out in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 31 23 10 – Earthwork (for preparation of the subgrade)
- B. Section 32 11 16 – Aggregate Base Courses

**1.03 SUBMITTALS**

- A. The Contractor shall submit the following in accordance with conditions of Contract and the Special Conditions:
  - 1. Material certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

**1.04 SITE CONDITIONS**

- A. Weather Limitations: The Contractor shall apply hot-mixed asphalt surface course when atmospheric temperature is above 40 degrees F and when base is dry. Base course may be placed when air temperature is above 30 degrees F and rising.
- B. Grade Control: The Contractor shall establish and maintain required lines and elevations.

**1.05 INDUSTRY STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:



1. Commonwealth of Massachusetts, Department of Public Works, Standard specifications for Highways and Bridges, Supplemental Specifications, latest edition.
2. AASHTO: American Association of State Highway and Transportation Officials
3. ASTM: American Society for Testing and Materials.
4. Mass DOT: Massachusetts Department of Transportation, Highway Division
5. MSSHB: Massachusetts Standard Specifications for Highways and Bridges

## **1.06 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

## **PART 2 - PRODUCTS**

### **2.01 BITUMINOUS MATERIAL FOR PAVEMENT, GENERAL**

- A. Bituminous materials shall conform to Section M3 *Bituminous Materials* of the Standard Specifications for Highways and Bridges, Massachusetts Department of Transportation, hereinafter referred to as Mass. Specifications.

1. TYPE I-1 Binder
2. TYPE I-1 Top Course

### **2.02 BITUMINOUS MATERIAL FOR BERMS**

- A. Bituminous material for berms shall be the same composition as TYPE I-1 Top Course, as described in 2.01A above.

### **2.03 PAVEMENT MARKING PAINT FOR PARKING LOTS**

- A. Pavement markings for parking lots shall conform to the Federal Highway Administration Manual of Uniform Traffic Control Devices, MA DOT Specification M7.01.23 *Fast Drying White Water-Borne Traffic Paint*, Architectural Access Board regulations 521 CMR, ADA Standards for Accessible Design 28 CFR Part 36.

## **PART 3 – EXECUTION**

### **3.01 GENERAL**

- A. General: The Contractor shall comply with provisions of Massachusetts Specifications for installation of Class I bituminous concrete. The Contractor shall also comply with the Special Conditions & Specifications for this project, for additional requirements for sports court pavement.

### **3.02 SURFACE PREPARATION**



- A. The Contractor shall proof-roll prepared base surface to check for unstable areas and areas requiring additional compaction.
- B. The Contractor shall not begin paving work until deficient base areas have been corrected and are ready to receive paving.

**3.03 PLACING MIX**

- A. The Contractor shall place mix in accordance with provisions of the Standard Specifications for Highways and Bridges, Massachusetts Department of Transportation, as amended to date.

**3.04 PLACING BITUMINOUS BERMS**

- A. Bituminous concrete curb shall be set in accordance with MSSHB Section 501 *Curb, Curb Inlets, Curb Corners, and Edging*.
- B. Bituminous concrete curb shall be installed to provide the reveal indicated on the Drawings.

**3.05 ROLLING, REPAIR, AND VISUAL INSPECTION OF SURFACE COURSE**

- A. The Contractor shall perform rolling and repair work in accordance with provisions of the Standard Specifications for Highways and Bridges, Massachusetts Department of Transportation, as amended to date.
- B. Before completing operations, the Contractor shall notify the Owner's Representative to inspect the top course. Inspection shall be for visual appearance of even regular finish texture with no projections, ridges, or honeycombed areas. Contractor shall correct unacceptable areas.

**3.06 PAVEMENT MARKINGS FOR PARKING LOTS**

- A. Pavement Markings shall be applied in accordance with MA DOT Specification Section 860 *Reflectorized Pavement Markings*.

**END OF SECTION**



**SECTION 32 18 23  
ATHLETIC SURFACING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Infield mix surfacing
- C. The boundaries of all athletic surfaces shall be marked out in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 02 41 13 – Site Preparation
- B. Section 31 23 10 – Earthwork

**1.03 SUBMITTALS**

- A. Test Reports on Infield Soil Mix: At least two (2) weeks prior to ordering the infield mix material, the Contractor shall submit to the Owner's Representative, at the Contractor's expense, a representative sample of the material to be used, and a copy of a soils analysis from an accredited laboratory classifying the mixture and tabulating the sieve analysis. If the mixture is disapproved by the Owner's Representative, the Contractor shall continue to obtain other sources of material and have them tested, at his own cost, until the Owner's Representative approves the mixture to be utilized for the infield mix surface.

**1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. The Contractor shall be responsible for timing the delivery of surfacing materials so as to minimize on-site storage time prior to installation. All stored materials shall be protected from weather, careless handling, and vandalism.
- B. The Contractor, sub-contractors, and suppliers are all individually required to furnish their own equipment necessary to get workers, material, and equipment from the point of delivery at the project site to the point of use or installation within the project site. All crane and rigging services required are the responsibility of each individual Contractor or trade.
- C. The Contractor shall deliver materials in original sealed containers marked with name of manufacturer and identification of contents. The Contractor shall store materials under



waterproof covers on planking clear of ground and protect from handling damage, dirt, stain, water and wind.

**1.05 EXAMINATION OF CONDITIONS**

- A. The Contractor shall fully inform his/herself of existing conditions of the site and shall be fully responsible for carrying out all 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.

**1.06 STANDARDS**

- A. Except as modified by governing code and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ASTM: American Society for Testing and Materials, latest edition.

**1.07 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 INFIELD MIX**

- A. Infield mix shall be Native Infield Mix (distributed by Read Custom Soils - 800-924-5335), or approved equal

**PART 3 – EXECUTION**

**3.01 AREAS TO RECEIVE INFIELD MIX SURFACING**

- A. Subgrade shall be compacted to 90 percent.
- B. Infield mix shall be placed in lifts of 2 inches and compacted with a minimum 1-ton vibratory roller until an optimum compaction between 90 and 95 percent is achieved. The surface of each lift shall be scarified to facilitate bonding of the next lift. This process shall be repeated until surface of mix is at finished grade.
- C. If unable to achieve optimum compaction, a light amount of water may be applied.
- D. The finished surface of the infield shall be smooth and free from any visible dips, bumps, or other blemishes which would hinder the removal of water through surface drainage.
- E. The edges of the infield mix shall meet the grades of adjacent turf and paved areas. No



ridges or depressions will be permitted at edges.

**END OF SECTION**



**SECTION 32 31 00  
STEEL VEHICULAR GATES**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Steel vehicular gates
- C. The locations of all vehicular gates shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 03 30 53 – Cast-in-Place Cement Concrete (for footings)

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ASTM: American Society for Testing and Materials, latest edition
  - 2. ASCE: American Society of Civil Engineers
  - 3. AWS: American Welding Society
  - 4. SSPC: The Society for Protective Coatings

**1.04 REQUIRED SUBMITTALS**

- A. Product data for paint
- B. Shop Drawings for fabrication and installation of gates

**1.05 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 PERFORMANCE REQUIREMENTS**



- A. Structural Performance of gates: The Contractor shall provide gates capable of withstanding structural loads required by ASCE 7 without exceeding allowable design working stresses of materials for gates and connections.
- B. Thermal Movements: The Contractor shall provide gates that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. The fabricator shall base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg. F (67 deg. C) ambient; 180 deg. F (100 deg. C) material surfaces.
- C. Control of Corrosion: The Contractor shall prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

## **2.02 METALS**

- A. General: The Contractor shall provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
- B. Steel: The Contractor shall provide steel in the form indicated, complying with the following requirements:
  - 1. Steel Pipe: Type, weight class, and finish as follows:
    - a. ASTM A53 Type F, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
    - b. Galvanized finish complying with ASTM A123
  - 2. Brackets, Flanges, and Other Hardware: Cast or formed steel, galvanized in accordance with ASTM A153

## **2.03 WELDING MATERIALS**

- A. Welding Electrodes and Filler Material: The Contractor shall provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

## **2.04 PRIMER**

- A. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

## **2.05 PAINT AND FINISHING MATERIALS**



- A. Paint shall be exterior-grade enamel, black color, of the highest grade supplied by one of the following manufacturers.
  - 1. Sherwin Williams Co.
  - 2. Benjamin Moore & Co.

## **PART 3 – EXECUTION**

### **3.01 INSTALLATION, GENERAL**

- A. The Contractor shall fit exposed connections together to form tight, hairline joints.

### **3.02 FABRICATION**

- A. General: The Contractor shall fabricate gates to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. The Contractor shall assemble gates in the shop to greatest extent possible to minimize field splicing and assembly. He/she shall disassemble units only as necessary for shipping and handling limitations. Units shall be clearly marked for reassembly and coordinated installation. The Contractor shall use connections that maintain structural value of joined pieces.
- C. Welded Connections: The Contractor shall fabricate gates for connecting by welding. He/she shall cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. He/she shall weld connections continuously to comply with the following:
  - 1. Welding shall be in conformance with AWS codes. All connections shall be formed with fish-mouthed joints, full seam welds, ground smooth and sanded.
  - 2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 3. Obtain fusion without undercut or overlap.
  - 4. Remove flux immediately.
  - 5. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- D. The Contractor shall shear and punch metals cleanly and accurately. Burrs shall be removed from exposed cut edges.
- E. The Contractor shall ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated.
- F. The Contractor shall provide weep holes or another means to drain entrapped water in hollow sections of gates.



- G. The Contractor shall fabricate joints in a watertight manner.
- H. The Contractor shall close exposed ends of gates with prefabricated end fittings.

### **3.03 STEEL FINISHES AND SHOP PRIMING**

- A. Galvanizing: The Contractor shall hot-dip galvanize items as indicated to comply with applicable standard listed below:
  - 1. ASTM A 123, for galvanizing steel and iron products
  - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware
- B. The Contractor shall fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For gates, the Contractor shall provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- D. Preparation for Shop Priming: After galvanizing, the Contractor shall thoroughly clean gate components of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- E. The Contractor shall apply shop primer to prepared surfaces of gate components, unless otherwise indicated. He/she shall comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1", for shop painting. Primer does not need to be applied to surfaces that will be embedded in concrete.

### **3.04 WELDED CONNECTIONS**

- A. The Contractor shall use fully-welded joints for permanently connecting gate components. He/she shall comply with requirements for welded connections in 3.02 (Fabrication), whether welding is performed in the shop or in the field.

### **3.05 GATE INSTALLATION**

- A. All gates shall be set plumb and level, within a tolerance of 1/16 inch in 3 feet (2 mm. in 1 m), and in accordance with the Drawings.
- B. Gates shall be free to open a minimum of 95 degrees from closed position (in direction as indicated on the Drawing plans).
- C. Cement concrete footings shall be installed in accordance with the Drawings and Section 03 30 53 – Cast-in-Place Cement Concrete.

### **3.06 CLEANING**

- A. General: Immediately after erection, the Contractor shall clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- B. Galvanized Surfaces: The Contractor shall clean field welds, bolted connections, and



abraded areas and repair galvanizing to comply with ASTM A780.

**3.07 REPAIR**

- A. The Contractor shall restore finishes damaged during installation and construction period so no evidence remains of correction work. He/she shall return items that cannot be refinished in the field to the shop; and make required alterations and refinish entire unit, or provide new units.

**3.08 PAINTING**

- A. The Contractor shall touch up primer prior to paint application.
- B. The Contractor shall apply 2 coats of paint to all surfaces.
- C. When stain, dirt, or undercoats show through the final coat of paint, the Contractor shall correct the defects and cover the surfaces with additional coats until the coating or paint film is of uniform finish, color, appearance and coverage, without additional cost to the Owner.
- D. The Contractor shall brush all coats on metals.
- E. The Contractor shall allow each coat of paint to dry thoroughly before applying succeeding coats.

**3.09 PAINT TOUCH-UP**

- A. At the completion of work of other trades, The Contractor shall touch up and restore all damaged or defaced painted surfaces.
- B. If touch-up color does not match the background, the Contractor shall repaint entire surface to nearest corner.

**END OF SECTION**



**SECTION 32 31 13  
CHAIN LINK FENCES AND GATES**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Chain link fencing and gates
  - 2. Backstop
  - 3. Futsal goals
- C. All fencing lines, backstop lines, gate locations, and futsal goals shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 03 30 53 – Cast-in-Place Cement Concrete
- B. Section 32 12 16 – Bituminous Concrete
- C. Section 32 18 23 – Athletic Surfacing
- D. Section 32 32 23.13 – Segmental Concrete Retaining Walls
- E. Special Conditions and Specifications (additional requirements for chain link fencing)

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ASTM: American Society for Testing and Materials

**1.04 REQUIRED SUBMITTALS**

- A. The Contractor shall provide complete product literature and color samples for approval by the Owner's representative prior to ordering the materials listed below:
  - 1. Chain-link fabric, posts, rails, and fittings
- B. The Contractor shall submit a shop drawing for the futsal goal to the Owner's Representative for approval.
- C. The Contractor shall submit to the Owner's representative a notarized certificate of compliance from the galvanizer with all galvanizing requirements including ASTM number and weight of coatings in ounces per square foot. Certificate of compliance shall



also contain the following:

1. Sole Source Responsibility: A statement that galvanizer accepts sole responsibility for coatings under this Section. Galvanizer who does not accept this responsibility is not acceptable and will be rejected.
  2. Evidence that Galvanizer meets requirements of ANSI Q90.
  3. Certification of Compliance with Current Environmental Regulations: Galvanizer shall certify that coatings proposed for use comply with applicable environmental regulations. Contractor and galvanizer shall be responsible for penalties assessed by governmental or environmental authorities for coatings that do not comply with current environmental regulations. All coatings shall be lead-free.
- D. A notarized mill certification from fence manufacturer that all materials used have been tested and fully comply with the requirements specified herein.

#### **1.05 QUALITY ASSURANCE**

- A. Chain link fence work shall be assigned to experienced and qualified subcontractors employing experienced workers who shall work under the full-time supervision of a qualified foreman with a minimum of five (5) years of experience on projects comparable to this project. The Contractor shall use an adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work in this Section. The Contractor shall demonstrate that he/she has successfully completed work of similar size and scope.

#### **1.06 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

### **PART 2 - PRODUCTS**

#### **2.01 CHAIN LINK FENCE**

- A. Fence Fabric (General): All fence mesh shall have knuckled selvage on both the top and bottom edge. All fabric shall be installed on inside of line posts.
- B. Galvanized Steel Fabric: Fabric shall be number 9 gauge commercial quality steel wire having a minimum tensile strength of 80,000 psi after zinc coating, except for fabric on lower part of backstop which shall be 6 gauge (see Drawings). Fabric shall be hot dip galvanized after fabrication. The weight of the zinc coating shall not be less than 1.2 oz. per sq. ft. of actual surface covered and equal to ASTM Specification BG-58 and National Chain Link Fence manufacturer's Institute Specifications. Wire shall be woven in a 2" inch mesh.
- C. PVC Coating: All parts of the chain fencing shall be PVC-coated, as specified under 2.03 of this Section. The color shall be black.



- D. Posts: All corner, intermediate and gate posts shall be high carbon steel pipe hot dip galvanized. Post size and weight shall be as follows:
- |                                                                                               |                                         |
|-----------------------------------------------------------------------------------------------|-----------------------------------------|
| 1. End, corner, and pull posts<br>(up to 12' height)                                          | 2.875" o.d. @ 4.64 pounds per lin. foot |
| 2. End, corner, and pull posts<br>for athletic courts, batting<br>cage, bull pens, & backstop | 4" o.d. @ 6.56 pounds per lin. foot     |
| 3. Line posts (up to 12' height)                                                              | 2.375" o.d. @ 3.12 pounds per lin. foot |
| 4. Line posts for athletic courts                                                             | 2.875" o.d. @ 4.64 pound per lin. foot  |
| 5. Line posts for batting cage,<br>bull pens, and backstop                                    | 4" o.d. @ 6.56 pounds per lin. foot     |
| 6. Gate posts, up to 6' height                                                                | 2.875" o.d. @ 4.64 pound per lin. foot  |
| 7. Gate posts, over 6' to 13' ht.                                                             | 4" o.d. @ 6.56 pounds per lin. foot     |
- E. Line and Terminal Post Caps: These shall be heavy galvanized pressed steel, sized to fit tightly over posts to prevent entry of moisture.
- F. Fence Rails: All rails shall be hot dipped galvanized steel pipe 1.66 inch o.d. at 1.82 pounds per lineal foot minimum.
- G. Stretcher Bars: These shall not be less than 3/16" thickness x 3/4" width, and length shall be within 1" of full height of fabric.
- H. Post Brace Assembly: Same material and size as top rail for brace, and 3/8-inch diameter galvanized steel truss rods with adjustable tightener.
- I. Fabric Fasteners: Band-its or approved equal. Ties shall be 0.020" thickness, 200/300 series stainless steel, 1/2" wide bands, with a minimum breaking strength of 850 lbs. 1/2" band capacity ear-lokt design buckles shall be manufactured with 0.050" thick material, 201/301 series stainless steel.
- J. Miscellaneous Fittings: All fittings shall be hot-dip galvanized pressed steel.
- K. Boulevard clamps or sleeve-type 3- and 4-way connectors shall be used to connect rails at top of futsal goals
- L. Non-Shrink, Non-Metallic Grout: Premixed, factory-packaged, non-corrosive, non-staining, non-gaseous, exterior grout approved by the Owner's Representative.
- M. For additional requirements, see Special Conditions and Specifications.



## **2.02 CHAIN LINK GATES**

- A. Single and Double Swinging Gate and Hardware: Swing gates and hardware shall be manufactured to meet the requirements of ASTM F900.
- B. Hinges: Industrial butt hinges, size and material as required for the gate size, non-lift-off type
- C. Latch (for both single and double gates): Pressed steel, industrial series gate latch, straight fork type. For double gates, provide latch catch designed to permit operation from either side of gate, with padlock eye as integral part of latch catch.
- D. Gate Cross-Bracing: 3/8-inch diameter galvanized steel truss rods and adjustable tightener
- E. Gate posts: See chain link fence requirements in 2.01 of this Section.
- F. Gate frames shall comply with ASTM F 900-94.
- G. PVC Coating: All parts of the chain link gates shall be PVC-coated, as specified under 2.03 of this Section. The color shall be black.
- H. For additional requirements, see Special Conditions and Specifications.

## **2.03 POLYVINYL CHLORIDE (PVC) COATINGS**

- A. PVC coating shall be applied in accordance with ASTM F668 Class 2a.
- B. The chain link fencing and gate framework shall be subjected to a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The material used for the base coat shall be a zinc-rich (gray color) thermosetting epoxy; and the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting "no-mar" TGIC polyester powder; and the minimum thickness of the finish coat shall be two (2) mils. The stratification-coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the crosshatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.
- C. Painted framework and accessories are not acceptable, and welded joints shall be top-coated to match frame color.
- D. Color of the PVC-coated framework and accessories shall be black and in accordance with ASTM F934.

## **2.04 OTHER MATERIALS**

- A. Grout for core-drilled installations shall be a non-shrinking type, meeting the following



ASTM standards: C109/C109M, C827, C939, C1090, C1107, and E448.

- B. Concrete for footings and mow strips (where applicable) shall comply with Section 03 30 53 – Cast-in-Place Cement Concrete.

### **PART 3 – EXECUTION**

#### **3.01 CHAIN LINK FENCE AND GATE INSTALLATION**

- A. The Contractor shall locate and install all posts in concrete footings, plumb and true to line and grade and to the height as indicated in the Drawings.
- B. Cement concrete footings and mow strips (where applicable) shall be installed in accordance with the Drawings and Section 03 30 53 – Cast-in-Place Cement Concrete.
- C. For fence posts installed directly in retaining walls, the non-shrinking grout shall be filled to the tops of the core-drilled holes, surrounding the posts.
- D. Post spacing shall not exceed ten (10) feet on center, except where fencing is located on tops of segmental concrete block walls. For fencing on walls, post spacing shall be approximately 92 inches on center, with each post located in center of every other top block.
- E. All posts shall have continuous horizontal braces at the top, middle, and bottom. In addition, all end and corner posts shall be braced to the nearest line post with center brace rails. Outside sleeve type top rail couplings shall be placed a maximum of twelve (12) inches from posts.
- F. Chain link fence shall have continuous top and bottom rails.
- G. All fences shall have a top and bottom rail. Six, eight, and ten foot fence shall have a center brace rail. Twenty foot fence shall have three intermediate horizontal brace rails, spaced five (5) feet apart and five (5) feet from top and bottom rails. Backstop rails shall be spaced in accordance with the Drawing detail, with an additional rail 2'-6" above the bottom rail.
- H. Outside sleeve type couplings at least 6" long shall be provided approximately every 20' in a given "run" of fencing; one coupling in every five shall contain a heavy spring to compensate for expansion and contraction.
- I. The top rail shall pass through the loops of line post caps and form a continuous brace from end to end of each stretch of fence. The top rail shall be securely fastened to terminal posts by pressed steel connections.
- J. Bottom rail shall be joined to line posts with boulevard clamps.
- K. Stretcher bars shall be arranged for attaching the fabric to all terminal posts by threading through fabric. One stretcher bar shall be provided for each gate and terminal post and two for each corner and pull post.
- L. Fabric shall be stretched uniformly taut and as tight as possible, true to line and grade and



complete in all details. The Contractor shall install tension bars at corners. Bands and clips to tie fabric to rails and posts shall be spaced as indicated in the Drawings or these Specifications.

- M. All chain link fence fabric shall be fastened on the outside of the posts unless directed otherwise by the Owner's representative. The fabric shall be properly stretched and securely fastened to the posts, and between posts the top and bottom of the fabric shall be fastened to the horizontal braces, where applicable, as specified, herein.
- N. The fabric shall be fastened to end and corner posts with tension bars and stretcher bar bands, with fasteners spaced at twelve (12) inch intervals. All fabric shall be aligned so that top row of the fabric mesh is tied to the top rail every twelve (12) inches on center and so that the bottom of the fabric mesh stands one (1) inch above the finish grade and that the bottom row of the fabric mesh is tied to the bottom rail every twelve (12) inches on center. When applicable, all fabric shall be tied to the middle rails at twelve inches (12) on center. Fabric shall also be fastened to line posts at twelve (12) inches on center.
- O. Fabric shall be aligned so that top and bottom extend one half the height of the "diamond" beyond outer edge of top and bottom of the horizontal rail. Horizontally-overlapping fence fabric sections shall overlap one full height of the "diamond" and be centered on the horizontal rail.
- P. All fastener bands shall be pulled tight and raw ends of steel bands shall be secured in buckle by folding ear tabs around steel bands as per manufacturer's recommended installation procedure. No sharp edges shall protrude from band-it buckles.
- Q. Rolls of wire fabric shall be joined by weaving strands into the ends of the rolls to form a continuous mesh.
- R. Corner posts (as described above) shall be used wherever a change of direction occurs.
- S. Futsal goal tops shall include intermediate rails in two directions as shown on the Drawing detail, attached to each other with boulevard clamps or sleeve-type 3- and 4-way connectors.
- T. Gate hinges shall be offset to permit 180 degree gate opening. Contractor shall provide one pair of hinges for each leaf. Gates eight feet and taller in nominal height shall have three hinges per leaf. Hinges shall be spot-welded to post.
- U. Double gates shall include two latches/catches.
- V. All gates shall be equipped with one gate stop.
- W. Gate framework joints shall be welded and coated in accordance with ASTM A780, employing zinc-rich paint.
- X. For additional requirements, see Special Conditions and Specifications.

**END OF SECTION**



**SECTION 32 31 19  
ORNAMENTAL FENCES AND GATES**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Ornamental fencing and gates
- C. The layout of all ornamental fencing and gates shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 03 30 53 – Cast-in-Place Cement Concrete

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ASTM: American Society for Testing and Materials, latest edition

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. The Contractor shall protect fencing and fence components under cover and in a dry location during storage.

**1.05 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 FENCING AND GATES**

- A. The fence and gate system shall be Montage Plus Majestic, by Ameristar Fence Products, Inc. (Phone # 888-333-3422, [www.ameristarfence.com](http://www.ameristarfence.com)), or approved equal. Fences and gates shall be black color-coated steel; with rails, pickets, and posts as detailed on the



Drawings.

**2.02 CONCRETE**

- A. Concrete for footings and mow strips (where applicable) shall comply with Section 03 30 53 – Cast-in-Place Cement Concrete.

**PART 3 - EXECUTION**

**3.01 FENCE ASSEMBLY AND INSTALLATION**

- A. The Contractor shall assemble and install the fencing in accordance with the Drawings and manufacturer's instructions. Posts shall be spaced no further than eight (8) feet on center.
- B. Cement concrete footings and mow strips (where applicable) shall be installed in accordance with the Drawings and Section 03 30 53 – Cast-in-Place Cement Concrete.
- C. When cutting/drilling rails or posts, the Contractor shall adhere to the following steps. Spray cans or paint pens supplied by the fence manufacturer shall be used to prime and finish exposed surfaces.
  - 1. Remove all metal shavings from cut area.
  - 2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
  - 3. Apply 2 coats of custom finish paint matching fence color.

**END OF SECTION**



**SECTION 32 31 29  
WOOD GUARDRAIL**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. New wood guardrail
- C. All wood guardrail locations shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 32 12 16 – Bituminous Concrete

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. AASHTO M 133: Preservatives and Pressure Treatment Processes for Timber
  - 2. AASHTO M 168: Wood Products
  - 3. AASHTO Standard Specifications for Highways and Bridges
  - 4. American Wood-Preservers' Association (AWA) Book of Standards
  - 5. ASTM: American Society for Testing and Materials, latest edition

**1.04 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 WOOD GUARDRAILS**

- A. All timber shall be Southern Yellow Pine, and shall be of the finest structural appearance. No planer chips are allowed in dressing. To minimize slivering, timbers of this grade shall be free of wave, and edges shall be eased with 112" bevel 45' radius (square edges are not allowed). Except as otherwise noted, characteristics and limiting provisions are in



accordance with paragraph 13 1-A, Standard Grading Rules for West Coast Lumber. Timbers shall be of the sizes indicated on the Drawings.

- B. After all fabrication processes are complete, each wood member shall be treated with an ACQ pressure preservative treatment in compliance with industry standards for structural wood specified for exterior use, Only preservatives deemed suitable by the U.S. Environmental Protection Agency for skin contact may be used in the wood members.
- C. All hardware shall conform to ASTM A307 requirements and shall be hot-dipped galvanized per ASTM A153.
- D. An "ASSOCIATION INSPECTION CERTIFICATE" shall be furnished by the Contractor, at his own expense, certifying that the grade and quality is fully in accordance with the requirements of the specifications. This certificate shall be issued by the association whose grading rules govern this particular class of wood. Wood that is "GRADE MARKED" by an accredited association will be accepted in lieu of the "ASSOCIATION INSPECTION CERTIFICATE".

### **PART 3 - EXECUTION**

#### **3.01 WOOD GUARDRAILS**

- A. The installation of the wood guardrails shall be in accordance with the dimensions and details indicated on the Drawings and with these Specifications. All cuts made in the field shall be painted with two (2) brush coats of the wood preservative as specified.
- B. Prior to installation, the Contractor shall field locate limits of the wood guardrail. Once the Owner's Representative has approved the location, the Contractor shall install the wood guardrail.
- C. Posts shall be set plumb, in hand- or mechanically-dug holes. Post holes shall be backfilled with approved materials placed in layers no greater than 12 inches and compacted to 95% density.
- D. Rails shall be installed as shown in the Drawing details.
- E. Guardrail shall be painted with two coats of paint in accordance with the Drawing details.

#### **3.02 GUARANTEE AND ACCEPTANCE**

- A. Any defective elements shall be replaced in part or whole by the Contractor at no cost to the Owner.

**END OF SECTION**



**SECTION 32 32 23.13  
SEGMENTAL CONCRETE RETAINING WALLS**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Retaining walls
- C. The layout of all retaining walls shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 32 31 13 – Chain Link Fences and Gates
- B. Section 33 42 00 – Stormwater Conveyance

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ASTM: American Society for Testing and Materials, latest edition
  - 2. NCMA: National Concrete Masonry Association

**1.04 SUBMITTALS**

- A. Required submittals include:
  - 1. Shop drawing with retaining wall construction details for this project, stamped and signed by a Professional Engineer licensed in Massachusetts, and conforming to the wall details in the Drawings (for block type, cap locations, and other general requirements) and these specifications.
  - 2. Product data for each type of product required
  - 3. Samples of concrete units in selected color and texture
  - 4. Sample of grout for filling lifting holes in exposed top freestanding block
  - 5. List of five (3) previously-constructed walls of similar length and height which have been successfully constructed by the wall installer, with contact names and telephone numbers for each project

**1.05 QUALITY ASSURANCE**



- A. The Contractor shall obtain segmental concrete masonry units from one manufacturer.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Masonry units shall be delivered, handled, and stored by means which prevent damage and deterioration of the units due to moisture, temperature changes, and contamination by other materials.

**1.07 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURER AND BLOCK TYPE**

- A. The block manufacturer shall be Redi-Rock International (Phone # 866-222-8400, [www.redi-rock.com](http://www.redi-rock.com), phone # for local representative: 617-620-1667); or approved equal.
- B. All walls shall be gravity walls. Top block layer of each wall shall be “freestanding” wall block, with finished pattern on both front and back faces.
- C. Wall faces pattern shall be “Cobblestone” if block is obtained from Redi-Rock; if block is from another approved source, Owner’s Representative shall select wall face pattern.
- D. Cap Units (for some walls as indicated on the Drawing details) shall be the same color as the segmental wall units, and shall have smooth top surfaces without holes or lugs.
- E. Special Units: The Contractor shall provide corner units, end units, and other shapes as needed to produce segmental retaining walls of dimensions indicated on the Drawings.

**2.02 INSTALLATION MATERIALS:**

- A. Leveling base stone shall conform to manufacturer-supplied, engineer-sealed shop drawing noted in 1.04.A.1 of this specification section.
- B. Drainage stone in layer with piping (behind some walls) shall be washed, crushed # 57 stone conforming to ASTM C 33 and gradation requirements of ASTM D 448. Other drainage stone behind retaining wall shall be determined by wall designer and included in shop drawings for walls.
- C. Geotextile fabric for drainage wall stone shall be non-woven fabric composed of polypropylene fibers, which are formed into a stable network so that the fibers retain their relative position, and inert to biological degradation, resisting naturally-encountered chemicals, alkalis, and acids.



- D. Mortar for securing caps to walls shall be Type N, consisting of 1 part Portland cement, 1 part lime, and 6 parts sand. The Contractor shall not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Calcium chloride shall not be used in mortar. Mortar components shall have the following properties:
  - 1. Portland Cement shall comply with ASTM C 150, Type I or III.
  - 2. Hydrated Lime shall comply with ASTM C 207.
  - 3. Aggregate for Mortar shall comply with ASTM C 144.
  - 4. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.
  - 5. Water shall be clean and potable, non-alkaline, free of salts and other harmful elements.
- E. Grout for filling lifting holes in exposed top level freestanding blocks shall be non-shrinking type, with color matching the block.
- F. Perforated pipe behind some retaining walls – see Section 33 42 00 (Stormwater Conveyance).

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. The Contractor shall examine conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of segmental retaining walls. Installation shall not take place until unsatisfactory conditions have been corrected.

#### **3.02 RETAINING WALL INSTALLATION**

- A. General: The Contractor shall place units according to NCMA’s “Segmental Retaining Wall Installation Guide” and segmental retaining wall unit manufacturer’s written instructions. Lay units in running bond pattern.
- B. Leveling base: The Contractor shall place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.
- C. The Contractor shall install courses of segmental masonry units in accordance with manufacturer’s written instructions.
- D. Cap units: The Contractor shall place cap units and secure with mortar according to manufacturer’s written instructions.
- E. Weep holes shall be installed at the intersection of each block along base of wall.

#### **3.03 SOIL FILL PLACEMENT, GENERAL**

- A. The Contractor shall comply with requirements of NCMA’s “Segmental Retaining Wall Installation Guide”, and segmental retaining wall unit manufacturer’s written instructions.

#### **3.04 DRAINAGE FILL PLACEMENT, GENERAL**



- A. The Contractor shall comply with requirements of NCMA’s “Segmental Retaining Wall Installation Guide”, and segmental retaining wall unit manufacturer’s written instructions.

**3.05 CONSTRUCTION TOLERANCES**

- A. Variation from Level: The bed-joint lines along walls shall not exceed 1-1/4 inches in 10 feet from level; and 3 inches maximum along entire length of wall.
- B. Variation from Indicated Batter: The slope of the wall face shall not vary from indicated slope by more than 1-1/4 inches in 10 feet.

**3.06 REMOVAL AND REPLACEMENT**

- A. The Contractor shall remove and replace segmental retaining wall construction that is broken, chipped, stained, or otherwise damaged. Units may be repaired if methods and results are approved by the Owner’s Representative.
- B. The Contractor shall remove and replace segmental retaining walls that do not match approved samples, and that do not comply with other requirements indicated herein.

**END OF SECTION**



**SECTION 32 33 00  
SITE FURNISHINGS**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Benches with backrests
  - 2. Trash receptacle
- C. The locations of all site furnishings shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 03 30 53 – Cast-in-Place Cement Concrete

**1.03 REQUIRED SUBMITTALS**

- A. The Contractor shall provide complete product literature and applicable color samples for all site furnishings, for approval by the Owner's Representative, prior to ordering the furnishings.

**1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. The Contractor shall be responsible for timing the delivery of site furnishing materials so as to minimize on-site storage time prior to installation. All stored materials shall be protected from weather, careless handling, and vandalism.
- B. The Contractor shall store materials under waterproof covers on planking clear of ground and protect from handling damage, dirt, stain, water and wind.
- C. The Contractor shall take all necessary precautions to prevent all items from chipping, cracking, or other damage during the transportation of these materials to the project, unloading and storage on the site. The Contractor shall lift items with wide-belt type slings wherever possible; he/she shall not use wire rope or ropes containing tar or other substances which might cause staining. If required, he/she shall use wood rollers and provide cushioning at end of wood slides. Damaged items will not be allowed to be installed and should any damaged items be found in constructed work, such items shall be removed immediately and replaced, and the Contractor shall assume all expenses incurred therefrom.



- D. Stored materials shall be adequately protected against moisture by one (1) stacking in such a manner as to allow a complete circulation of air under each stack, and two (2) covering each stack, including top and sides, with a waterproof paper or membrane. Coverings shall remain in place at all times, when not working from the particular stack.

#### **1.05 EXAMINATION OF CONDITIONS**

- A. The Contractor shall fully inform his/herself of existing conditions of the site and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. At the beginning of work, the installer shall accept substrates, subgrades, previous work, and conditions. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.
- B. The Contractor shall be solely responsible for judging the potential need for storing materials temporarily and/or re-handling items prior to final installation.

#### **1.06 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

### **PART 2 - PRODUCTS**

#### **2.01 BENCHES WITH BACKRESTS**

- A. Benches with backrests shall be surface-mounted model # 117-60, black color, with central armrest # 94-00AR, by DuMor Site Furnishings, Inc., phone # 800-598-4018, [www.dumor.com](http://www.dumor.com); or approved equal.
- B. Quantity of benches with backrests: 1 in base bid, 1 part of add-alternate

#### **2.03 TRASH RECEPTACLES**

- A. Existing trash receptacle (to be relocated) is surface-mounted model 84-32-BT by DuMor Site Furnishings, Inc., phone # 800-598-4018, [www.dumor.com](http://www.dumor.com).
- B. Quantities of trash receptacles: 1 relocated

### **PART 3 – EXECUTION**

#### **3.02 BENCHES WITH BACKRESTS**



- A. Benches with backrests and central armrest shall be assembled and installed in accordance with manufacturer's written instructions and the Drawing detail.
- B. The Contractor shall surface-mount benches to concrete surface with 1/2" x 3-3/4" galvanized expansion anchor bolts and steel plates provided by manufacturer.

**3.03 TRASH RECEPTACLES**

- A. Trash receptacle shall be secured to concrete surface in accordance with manufacturer's written instructions and the Drawing detail.

**END OF SECTION**



**SECTION 32 84 00  
IRRIGATION SYSTEM**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. New automatic irrigation system
- C. All sprinkler, pipe and valve locations shall be marked out in the field for review and approval by the Owner's representative prior to installation.
- D. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective drawings pertaining to other work.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Carefully examine all of the Contract Documents for requirements that affect the Work of this Section.
  - 1. Grading
  - 2. Excavating and Backfilling for Utilities
  - 3. Planting
  - 4. Electrical Power Supply

**1.03 WORK TO BE DONE**

- A. Work to be done includes furnishing all labor, materials, equipment and services required to complete all irrigation work indicated on the drawings, as specified herein, or both.
- B. The mechanical point of connection for the irrigation system shall be the existing domestic water supply provided.
- C. The electrical point of connection for the irrigation system shall be to a 120-volt, 20-amp building electrical circuit provided.



- D. The drawings and specifications must be interpreted and are intended to complement each other. Furnish and install all parts, which may be required by the drawings and omitted by the specifications, or vice versa, just as though required by both. Should there appear to be discrepancies or question of intent, the matter shall be referred to the Owner's Representative for decision, and his interpretation shall be final, conclusive and binding.
- E. All necessary changes to the drawings to avoid any obstacles shall be made with the approval of the Owner's Representative.
- F. Trench excavation, back filling and bedding materials, together with the testing of the completed installation shall be included in this work.
- G. The Work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the drawings and specifications. All parts necessary for the proper and complete execution of the Work, whether the same may have been specifically mentioned or not, or indicated on the drawings, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.
- H. Record drawing as well as Operating & Maintenance Manual generation, in accordance to these specifications shall also be included in this work.

**1.04 SCOPE**

- A. The irrigation system shown on the drawings and described within these specifications represents a single controller, turf irrigation system supplied from potable water. The system is designed for 40 gallons per minute. Minimum 75-psi dynamic pressure at full system flow is required from the irrigation point of connection.

**1.05 ORDINANCES, PERMITS AND FEES**

- A. The Work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction.
- B. Any and all 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.
- D. Include in the bid any charges by the Water Department, Utility Company, or other authorities for work done by them.



## 1.06 EXAMINATION OF CONDITIONS

- A. Be fully informed of existing conditions on the site before submitting bid, and shall be fully responsible for carrying out all 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.

## 1.07 QUALITY ASSURANCE

- A. Installer: A firm which has at least five (5) years' experience in work of the type and size required by this Section and which is acceptable to the Owner's Representative.
- B. References: Supply three 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: D1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
    - b. ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and C1200.
    - c. ASTM: D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
    - d. ASTM: D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
    - e. ASTM: D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
    - f. ASTM: B43-98 Brass pipe.
    - g. ASTM: B88-99 Seamless Copper Water Tube
    - h. ASTM: B828-00 Soldered Copper Joints.
  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)



## 1.08 TESTS

- A. Observation: The Owner's Representative will be on site at various times to insure 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 all irrigated areas are being adequately covered. Furnish and install materials required to correct inadequacies of coverage due to deviations from the drawings or where the system has been willfully installed when it is obviously inadequate or inappropriate. (See Part 3 - Execution).
- C. The Owner's Representative shall be notified 7 days in advance for observations.

## 1.09 SHOP DRAWINGS

- A. Provide copies of product specification sheets on all 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. Prefabricated Swing Joints
  - 3. Valves: Manual and Automatic
  - 4. Controller
  - 5. Valve Boxes
  - 6. Valve Box Lockable Lids
  - 7. Pipe and Fittings
  - 8. Wire and Connectors
  - 9. Quick Coupling Valves
  - 10. Rain Sensor
  - 11. Grounding Equipment
  - 12. Backflow Preventer
  - 13. Miscellaneous Equipment
- 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, rain sensor, quick coupling valves and all



other equipment shall be indicated on the drawings. All wire routing, wire size and splices shall be indicated. Main line pipe and wire route shall have two (2) distinctly different graphic symbols (line types). This redlined record set of drawings shall be kept at job site and shall be used only as a record set.

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 this 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.

#### **1.10 DELIVERY, STORAGE AND HANDLING**

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

#### **1.11 GUARANTEE**

- A. Obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Company performing the work under contract may have by law.
- B. In addition to the manufacturers guarantees the entire irrigation system shall be warrantied, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.
- C. As part of the one-year warranty the first year-end winterization and spring start-up for the 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 at all times shall be coordinated closely with the Owner's Representative to avoid misunderstandings and to efficiently bring the project to completion. The Owner's Representative shall be notified as to the start of work, progression and completion, as well as any changes to the drawings before the change is made. Coordinate work with those of other trades.
- B. Be responsible and pay for all damage to other work caused by work or workmen. Repairing of such damage shall be done by the Company who installed the work 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 Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The 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 PROJECT MULCAHY FIELD IMPROVEMENTS, PHASE 1 IRRIGATION SYSTEM, shall be submitted to the Owner's Representative office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:
  - 1. Table of Contents
  - 2. Written description of Irrigation System.
  - 3. System drawings:
    - a. One (1) copy of the original irrigation plan;
    - b. One (1) copy of the Record Drawing;
    - c. One (1) 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 all irrigation equipment;
    - b. Operation:
    - 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 all city departments and/or public utility owners concerned, of the time and location of any work that may affect them. Cooperate and coordinate with them in the protection and/or repairs of any utilities.
- B. Provide and install temporary support, adequate protection and maintenance of all structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Owner's Representative.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material overages at the completion of the installation shall be removed from the site.
- B. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and acceptance from the Owner's Representative.

#### **2.02 PVC IRRIGATION PIPE**

- A. All pipe shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.
- B. All pipe in sizes 2-1/2 inches and smaller shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241 as manufactured by Certainteed, Carson, JM Eagle or equal.

#### **2.03 COPPER PIPE AND FITTINGS**

- A. Copper pipe shall be Type K, hard tempered ASTM B88.
- B. Copper fitting shall be wrought copper, solder joint type in accordance with ASTM B828-00.



- C. Joints shall be soldered with silver solder ASTM B32, Grade 95TA up to 250 degree using non-corrosive flux.
- D. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

#### **2.04 BRASS PIPE AND FITTINGS**

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

#### **2.05 PVC PIPE SLEEVES**

- A. All pipe sleeves beneath non-soil areas shall be PVC, Class 160 water pipe as manufactured by Certainteed, Cresline, JM or equal. Minimum sleeve size to be 3-inch.

#### **2.06 WIRE CONDUIT**

- A. Conduit for wiring beneath non-soil areas shall be PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Cresline, Carson, 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 rain sensor and controller shall be galvanized, rigid metallic conduit.

#### **2.07 PVC IRRIGATION FITTINGS**

- A. Fittings for solvent weld PVC pipe, 2-inch and smaller in size, shall be Schedule 40 solvent weld PVC fittings as manufactured by Dura, Lasco, Spears or equal.
- B. Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.
- C. All PVC threaded connections in and out of valves shall be made using Schedule 80 tee nipples and Schedule 40 couplers or socket fittings. Schedule 40 threads will not be approved for installation.
- D. 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. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Heavy Duty Cement or equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM



F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68 Clear, Oatey Clear Primer for PVC and CPVC, or equal.

E. All nipples to be schedule 80 PVC.

**2.08 MEDIUM ROTARY SPRINKLERS**

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

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

D. Sprinklers shall be manufactured by Toro model T5P-COM, Rain Bird model 5004-PL-SAM, Hunter Industries model I20-04 or approved equal.

E. Approved Performance Chart (25' Spacing):

| Model                 | Pressure | Arc      | Nozzle  | Flow | Radius |
|-----------------------|----------|----------|---------|------|--------|
| Toro T5P-COM          | 45psi    | 90 Deg.  | 1.5LA   | 1.05 | 29'    |
| Toro T5P-COM          | 45psi    | 180 Deg. | 2.5LA   | 2.02 | 32'    |
| Rain Bird 5004-PL-SAM | 45psi    | 90 Deg.  | MPR 25Q | 1.00 | 26'    |
| Rain Bird 5004-PL-SAM | 45psi    | 180 Deg. | MPR 25H | 1.98 | 27'    |
| Hunter I20-04         | 50psi    | 90 Deg.  | .75SR   | 0.75 | 25'    |
| Hunter I20-04         | 50psi    | 180 Deg. | 1.5SR   | 1.5  | 25'    |



F. Approved Performance Chart (35' Spacing):

| Model                 | Pressure | Arc      | Nozzle | Flow | Radius |
|-----------------------|----------|----------|--------|------|--------|
| Toro T5P-COM          | 55psi    | 180 Deg. | 4.0    | 4.44 | 42'    |
| Rain Bird 5004-PL-SAM | 55psi    | 180 Deg. | 3.0    | 3.47 | 40'    |
| Hunter I20 -ADV       | 50psi    | 180 Deg. | 4.0    | 4.2  | 41'    |

**2.09 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. All sprinkler parts shall be removable through the top of the unit by removing a heavy-duty threaded cap. The sprinkler shall have a one- inch (1") IPS water connection on the bottom of the sprinkler.
- C. Sprinklers shall be manufactured by Toro model TR70XT, Hunter Industries model I25-04-SS, Rain Bird model 8005-SS or approved equal.
- D. Approved Performance Chart (50' Spacing):

| Model             | Pressure | Arc          | Nozzle | Flow | Radius |
|-------------------|----------|--------------|--------|------|--------|
| Toro TR70XT       | 60psi    | 90 Deg.      | 9      | 8.7  | 48'    |
| Toro TR70XT       | 60psi    | 180/360 Deg. | 16     | 16.0 | 55'    |
| Rain Bird 8005-SS | 60psi    | 90 Deg.      | 6      | 6.1  | 45'    |
| Rain Bird 8005-SS | 60psi    | 180/360 Deg. | 10     | 10.1 | 53'    |
| Hunter I25-04-SS  | 60psi    | 90 Deg.      | 7      | 7.5  | 48'    |
| Hunter I25-04-SS  | 60psi    | 180/360 Deg. | 13     | 12.3 | 54'    |



## **2.10 ELECTRIC CONTROL VALVES**

- A. Electric control valves shall be one, one and one half remote control, diaphragm type, fiberglass or reinforced nylon body plastic valves with manual flow control, manual bleed screw and 200 psi pressure rating.
- B. Valves shall be manufactured by Toro model P220, Rain Bird model PEB, Hunter Industries model ICV or approved equal.

## **2.11 VALVE BOXES**

- A. All valve boxes shall be manufactured from unformed resin with a tensile strength of 3,100-5,500 psi conforming to ASTM D638. All boxes shall be green in color.
- B. Valve boxes for isolation valves and quick coupling valves shall be 10-inch round valve boxes with metal detection, t-tops, and bolt down covers.
- C. Valve boxes for single 1 inch and 1-1/2 inch electric valves shall be 12-inch standard valve boxes with metal detection, t-tops, and bolt down covers.
- D. Valve boxes for wire splices shall be 10 inch round valve boxes with detectable disks. All splices shall be in separate valve boxes and not included with isolation valves.
- E. Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer.
- F. Valve boxes shall be manufactured by Highline Products, Olde Castle Specifications Grade, NDS Pro Series or approved equal.

## **2.12 AUTOMATIC CONTROLLER**

- A. Controller shall be electronic in construction with capability of up to 10 hour run times per zone in increments of 1 or 10 minutes. Controllers to have minimum four independent programs, auto/off switch and be capable of manual, semi-automatic and automatic operation. Controller shall have water budgeting feature, cycle and soak feature, sensor input terminal, locking, weather resistant cabinet and internal transformer. Terminal strip connection shall be easily accessible. The controller shall be U.L. listed, 120 volt, 60 Hertz, A.C. type.
- B. Controller shall be as manufactured by Toro model CC-P-24, Rain Bird model ESP-24LXM, Hunter Industries model I-Core-2400PL or approved equal.
- C. Station quantity shall be minimum of 24.



### 2.13 QUICK COUPLING VALVES

- A. The valve body shall be of cast brass construction with a working pressure of 125 psi. The valve seat disc plunger body shall be spring loaded so that the valve is normally closed under all conditions when the key is not inserted.
- B. The top of the valve body receiving the key shall be equipped with ACME threads and smooth face to allow the key to open and close the valve slowly. The quick coupling valve shall be equipped with a vinyl cover.
- C. The valve body construction shall be such that the coupler seal washer may be removed from the top for cleaning or replacement without disassembling any other parts of the valve.
- D. Keys shall be ACME with 1-inch male thread and 3/4-inch female thread at the top.
- E. Quick coupling valves, keys and swivels shall be manufactured by Toro models 100-ATLVC, 100-AK and 075-MHS, Hunter Industries, model HQ-44RC-AW, HK-44A and HS-1 or approved equal.

### 2.14 WIRE

- A. All valve control wire shall be minimum #14-awg, common #14-awg, single strand, solid copper, UL- approved direct burial AWG-U.F. 600V and shall meet all state and local codes for this service. Individual wires must be used for each zone valve. Common wire shall be white in color, control wire for rotor zones shall be red in color, and spare wires, installed where indicated on the drawings shall be blue. White color shall be used for common wire only.
- B. In ground wire connections shall be UL listed, manufactured by 3M, model DBR/Y-6 splice kits. All wire splices shall be made in valve boxes, at controller, or at valves.
- C. 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.

### 2.15 ISOLATION VALVES

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

### 2.16 SWING JOINTS

- A. Medium rotary sprinklers shall be installed on 3/4-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 Lasco, or approved 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 Lasco, or approved equal.
- 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 Lasco, or approved equal.

**2.17 AUTOMATIC RAIN SENSOR**

- A. Rain sensor shall be plastic in construction with adjustable interruption point, 1/2-inch IPS threads with quick trip mechanism. Rain sensor shall be manufactured by Hunter Industries, model Rain-Click or approved equal with sensor guard.

**2.18 BACKFLOW PREVENTION DEVICE**

- A. Back flow prevention device shall be 1-1/2-inch Reduced Pressure Assembly as per Worcester, MA, Cross Connection Department requirements. Back flow prevention device shall have maximum 12-psi pressure loss at system flow.
- B. Back flow prevention device shall be as manufactured by Watts, Febco, Wilkins or approved equal.

**2.19 CRUSHED STONE**

- A. Crushed stone shall be as specified in SECTION: EARTHWORK. Crushed stone shall be used under valve boxes.

**2.20 SAND**

- A. Sand used for backfilling of trenches; under, around and over PVC lines shall be as specified in SECTION: EARTHWORK.

**2.21 GROUNDING EQUIPMENT**

- A. The field controller installed inside of the Park Building 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 plate as outlined below. Minimum 20-foot separation between rod and plate. Minimum 12-foot separation between controller and ground rod. The connection to rod shall be with Cadweld or approved equal connector as specified. The connection to plates shall be performed by the plate manufacturer (Paige #182199L) or approved equal with 25-feet of bare copper wire already attached. The 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 ADS or approved equal 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 ADS or approved equal drainage pipe. Ground rod and plate shall be UL listed.

- B. The controller shall be grounded to one rod and one plate. The 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 Power Set or approved equal ground enhancement material spread evenly below the plate and 50 lbs spread evenly above the plate in accordance with manufacturer's requirements. The grounding electrodes shall be installed at least 10 feet from wires connected to the field controllers.

## **2.22 SPARE PARTS**

- A. Supply the following tools and equipment to the Owner's Representative before final observation:
  - 1. Two (2) wrenches or keys for disassembling and adjusting each type of sprinkler provided.
  - 2. Two (2) quick coupler key assemblies.
  - 3. Five (5) of each type sprinkler and pattern (PC & FC) used in the project.
  - 4. Five (5) of each type nozzle used in the project.
- B. Before final observation can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Before work is commenced, hold a conference with the Owner's Representative to discuss general details of the work.
- B. Examine all contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.
- C. All works indicated on drawings shall be provided whether or not specifically mentioned in the specifications.



- D. If there are ambiguities between drawings and specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by Owner's Representative, and compliance with the decisions shall be required. In the event the installation contradicts the directions given, the installation shall be corrected at no additional cost to Owner.
- E. Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details, legend or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of the Owner's Representative.
- F. Make all field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the Irrigation Plans, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Owner's Representative prior to proceeding.
- G. Layout of sprinkler lines indicated on drawings is diagrammatic. Location of sprinkler equipment is contingent upon and subject to integration with all other underground utilities. Employ all data contained in the Contract Documents and verify this information at the construction site to confirm the manner by which it relates to the installation.
- H. During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Owner's Representative. The superintendent shall not be changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. Directions given to the superintendent shall be binding.
- I. At all times, protect existing irrigation, landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.
- J. Replace, or repair to the satisfaction of the Owner, all existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to removed paving.

### **3.02 PIPE AND FITTINGS INSTALLATION**

- A. Using proper width trencher chain, excavate a straight (vertical) and true trench to a depth of 2-inch of pipe invert elevation.
- B. Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths as shown on the drawings



and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and no additional compensation will be allowed therefore.

- C. Pipe shall be laid on undisturbed trench bottom provided suitable base is available - no rock larger than 1-inch or sharp edges; if not, excavate to 2-inch below pipe invert and provide and install sand base or crushed stone upon which to lay pipe.
- D. Back filling shall be accomplished as follows: backfill material shall contain no foreign matter and no rock larger than 1-inch in diameter. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.
- E. Make all solvent-weld joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of primer or solvent, and wiping off excess solvent from each connection. Allow welded joints at least 15 minutes set-up/curing time before moving or handling. When the temperature is above 80° F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80° F, follow manufacturer's recommendations. Provide and install for expansion and contraction as recommended. Wire shall be laid in same trench as mainline and at pipe invert (see Wire Installation).
- F. Mainline pipe shall have minimum 22 inches of COVER (excavate to invert as required by pipe size). Lateral pipe shall have minimum 16 inches of COVER for PVC (excavate to invert as required by pipe size).
- G. Cut plastic pipe with handsaw or pipe-cutting tool, removing all burrs at cut ends. All pipe cuts are to be square and true. Bevel cut end as required to conform to Manufacturer's Specifications.
- H. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the piping is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. All piping, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the piping, no additional piping may be installed or back filled until all water is removed from the trench. Pipe shall not be installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40° F or below. Pipe installed at temperatures below 40° F shall be removed and replaced at no cost to the Owner. PVC pipe



shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.

- I. Maintain 6-inch minimum clearance between sprinkler lines and lines of other trades. Do not install sprinkler lines directly above another line of any kind.
- J. Maintain 1-inch minimum between lines which cross at angles of 45 to 90 degrees.
- K. Throughout the guarantee period refill any trenches that have settled due to incomplete compaction.
- L. Pulling of pipe will be allowed provided soil is suitable and specified depth of bury can be maintained.

### **3.03 ELECTRICAL WIRE CONDUIT INSTALLATION**

- A. Electrical conduit shall be installed in all non-soil areas, as well as for all above ground wiring where wire passes under or through walls, walks and paving to controller and rain sensor.
- B. Conduit shall extend 18 inches beyond edges of walls and pavement.

### **3.04 PIPE SLEEVING INSTALLATION**

- A. Sleeving shall be installed wherever piping is going under hardscape areas where indicated on the drawings. Minimum cover over all sleeving pipe shall be 24 inches as shown on the detail.
- B. Sleeving shall extend 18 inches beyond edges of hardscapes. Prior to the installation of irrigation piping and wiring, the ends of all sleeving shall be field marked with a vertical wood stake extending above grade to allow field location at the time of irrigation installation.
- C. Ensure all required sleeving is installed prior to starting any pavement operations. Review all sleeve locations in the field to confirm that sleeves are properly located for the required irrigation pipe runs. In no case will sawcutting into newly installed pavements or jacking under new pavements be permitted to install sleeving which was not installed in proper sequence or in the required orientations or locations.

### **3.05 ISOLATION VALVE INSTALLATION**

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



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

### **3.06 VALVE BOX INSTALLATION**

- A. Furnish and install a valve access box for each electric valve, quick coupling valve, isolation valve and wire splice.
- B. All valve access boxes shall be installed on a minimum 4-inch crushed stone base. Finish elevation of all boxes shall be at grade. Supply all crushed stone and install before valve box. Crushed stone shall not be poured into previously installed valve boxes.

### **3.07 24 VOLT CONTROL VALVE INSTALLATION**

- A. Control valves shall be installed on a level crushed stone base. Grade of bases shall be consistent throughout the project so that finish grades fall within the limits of work. Valves shall be set plumb with adjusting handle and all bolts, screws and wiring accessible through the valve box opening. Valves shall be set in a plumb position with 24-inch minimum maintenance clearance from other equipment.
- B. Install at sufficient depth to provide more than 6-inch, nor less than 4-inch cover from top of valve to finish grade.
- C. Adjust zone valve operation after installation using flow control device on valve.

### **3.08 WIRING INSTALLATION**

- A. Wiring shall be installed along with the main line. Multiple wire bundles shall be cinched together at maximum 12-foot centers using plastic cable cinches and shall be laid beside, and at the same invert as, the irrigation lines. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide and install an additional 8 inches to 12 inches slack at all changes of direction. Wiring in valve boxes shall be a sufficient length to allow the valve solenoid splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box. Each valve shall have a separate wire back to the controller.
- B. All wire shall be laid in trenches and shall be carefully back-filled to avoid any damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 2 inches layer of sand or stone dust on the bottom before the wires are laid into the trench and back-filled. The wires shall have a minimum of 22 inches of cover (See Detail). Wire not to be installed that day shall not be laid out.
- C. An expansion curl shall be provided and installed within 6 inches of each wire connection to a solenoid. Expansion curls can be formed by wrapping five (5) turns of wire around a 1-inch diameter or larger pipe and then withdrawing the pipe.



- D. Provide and install a common ground wire of white color. No white color shall be used for power wire. Control wire shall be red and spare wiring shall be blue in color.
- E. Service wiring in connection with drawings and local codes for low voltage service. All in-ground wire connections shall be waterproofed with 3M DBR/Y-6 splice kits. All splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box-valve box shall be used). Splice locations shall be shown on the record drawings.
- F. Provide a complete wiring diagram showing wire routing for the connections between the controller and valves. See section one for the inclusion of wiring diagram in operation and maintenance manuals.

### **3.09 CONTROLLER INSTALLATION**

- A. Install controller on interior wall in existing utility building, per detail. Wire valves and rain sensor into controller and set proper program.
- B. Wire controller to electrical supply furnished and installed to the controller location.
- C. Keys shall be turned over to Owner's Representative.

### **3.10 GROUNDING INSTALLATION**

- A. The grounding rod shall be driven into the ground its full length 12-feet from the controller and connected via a Cadweld or approved equal connection to #6 solid, bare copper wire. The copper wire is to be installed in as straight a line as possible, and if it is necessary to make a turn or bend, it shall be done in a sweeping curve with a minimum radius of 8 inches and a minimum included angle of 90 degrees. There shall be no splices in the bare copper wire. The top of the ground rod shall be driven below the ground surface. A 4-inch grated cover as specified, set a minimum of 1-inch below grade, shall be placed over the ground rod and Cadweld or approved equal connection for periodic maintenance. Cover shall be installed on a minimum of 6 inches of 4-inch ADS corrugated polyethylene, perforated drainage pipe. Plate shall be installed 36 inches below grade with 50 lbs of Power Set or approved equal ground enhancement material spread evenly below the plate and 50 lbs of Power Set or approved equal ground enhancement material spread evenly above the plate in accordance with the manufacturer's requirements. Plates shall also be covered with a 4 inch grated cover as specified, set a minimum of 1-inch below grade, to facilitate drainage onto the plate. Cover shall be installed on a minimum of 36 inches of 4-inch ADS or approved equal corrugated polyethylene, perforated drainage pipe.
- B. When tested, grounding grid shall have an earth resistance no greater than 10 ohms. If earth resistance is greater than 10 ohms, additional grounding rods and/or plates and



enhancement material shall be added to system until desired test results have been met. The minimum requirements of the NEC shall be met, which are:

1. a resistance reading of no more than 25 ohms or
2. a two electrode ground grid.

### **3.11 RAIN SENSOR INSTALLATION**

- A. Install rain sensor on exterior building wall, generally where indicated on the drawings. Coordinate final location of rain sensor with Owner's Representative. Rain sensor shall be in direct contact with the weather.
- B. Install rain sensor wiring within 1/2-inch conduit where exposed. All above ground wires shall be installed in conduits.

### **3.12 SPRINKLER INSTALLATION**

- A. Medium rotary sprinklers shall be installed flush to grade on 3/4-inch prefabricated PVC unitized swing joint assemblies with integral o-rings, minimum length 12 inches.
- B. Large rotary sprinklers shall be installed flush to grade on 1-inch prefabricated PVC unitized swing joint assemblies with integral o-rings, minimum length 12 inches.
- C. Sprinklers shall not exceed maximum spacing indicated
- D. Adjust sprinkler zone after installation using flow control device on valve.

### **3.13 QUICK COUPLING VALVE INSTALLATION**

- A. Provide and install quick coupling valves where indicated on the drawings.
- B. Quick coupling valves to be mounted on 1-inch prefabricated PVC unitized swing joint assemblies with integral o-rings, minimum length 12 inches with brass insert and stabilizer as per details.

### **3.14 BACKFLOW PREVENTION INSTALLATION**

- A. Install 1-1/2-inch reduced pressure back flow prevention assembly in existing utility building as specified. Back flow installation shall be in accordance with Worcester, MA, Cross Connection Department.
- B. Install drain piping to suitable floor drain within water service room within utility building.



### **3.15 CHECK/TEST/START-UP/ADJUST**

**A. Flushing:**

1. After all piping, valves, sprinkler bodies, pipe lines and risers are in place and connected, but prior to installation of sprinkler internals, open the control valves and flush out the system under a full head of water.
2. Sprinkler internals and riser nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
3. Flush the entire system after installation is complete and service any clogged nozzles for thirty (30) days after substantial completion of this portion of the landscape irrigation system.

**B. Testing:**

1. Leakage test: test all lines for leaks under operating pressure. Repair all leaks and re-test.
2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Owner's Representative at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate. Readjust sprinklers and/or sprinkler locations as necessary or directed to achieve proper coverage.
3. All testing shall be at the expense of the Company performing the work under contract.

### **3.16 CLEANING AND ADJUSTING**

- A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.
- B. Adjust sprinklers, valve boxes, and quick coupling valves to grade as required, so that they will not be damaged by mowing operations.
- C. Continue sprinkler coverage adjustment as required by settlement, etc., throughout the guarantee period.
- D. Each control zone shall be operated for a minimum of 5 minutes and all sprinklers checked for consistency of delivering water. Adjustments shall be made to sprinklers that are not consistent to the point that they match the manufacturer's standards. All sprinklers, valves, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.



### **3.17 ACCEPTANCE AND OPERATION BY OWNER**

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

### **3.18 CLEAN UP**

- A. Upon completion of all installation work remove all leftover materials and equipment from the site in a safe and legal manner.
- B. Remove all debris resulting from work of this section.
- C. Regrade, lightly compact, and replant around sprinklers where necessary to maintain proper vertical positioning in relation to established grade.
- D. Fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with drawings requirements.

**END OF SECTION**



**SECTION 32 91 13  
LOAM**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Loam for general turf and planting areas
  - 2. Root zone mix (sandy loam) for athletic fields

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 31 23 10 – Earthwork
- B. Section 32 92 19 – Seeding
- C. Section 32 93 00 – Planting

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. AOAC: Association of Official Agricultural Chemists
  - 2. ASTM: American Society for Testing and Materials
  - 3. USDA: United States Department of Agriculture

**1.04 SUBMITTALS AND QUALIFICATIONS**

- A. The Contractor shall provide soil test analyses of finished soil for installation in athletic field turf root zone, and loam for general turf and planting areas, to the Owner's Representative. Test analyses shall include both physical and chemical properties of each type of soil. Chemical analyses shall be performed in accordance with the current "Standards of the Association of Official Agricultural Chemists". The contractor shall pay for testing.
  - 1. Physical and chemical analyses shall be performed by a public extension service agency or a certified private testing laboratory in accordance with the current "Standards of the Association of Official Agriculture Chemists", and acceptable to the Owner's representative.
  - 2. Soil test report shall include a mechanical sieve analysis with soil classification. Organic content shall be reported. Chemical analysis shall include pH (1:1 soil-water



ratio), buffer pH, soluble salts (1:2 soil-water ratio), nitrate nitrogen, ammonium nitrogen, phosphorus, potassium, calcium, aluminum, magnesium, manganese, ferric iron and sulfate.

3. Chemical test report shall clearly recommend appropriate limestone and fertilizer requirements.
  4. Two tests shall be performed to determine organic material content: One prior to incorporation of organic matter additive, and another following incorporation.
- B. Test Reports on Root Zone Mix (soil mix for athletic field turf areas): The root zone mix shall be evaluated by using the ASTM test methods for High Predominance Sand-based Root Zones for Sports Fields, ASTM F 2396. A sand sample and compost sample shall be submitted to testing agent for adherence to specifications.
- C. The location and source of loam and root zone mix shall be submitted to the Owner's Representative.
- D. The Contractor or sub-contractor for this work shall have a minimum of five (5) years of experience installing root zone mix based athletic fields.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. The Contractor shall deliver all items to the site in their original containers with all labels intact and legible at time of Owner's inspection.
- B. The Contractor shall immediately remove from the site all materials which do not comply with the provisions of this Section of these Specifications.
- C. Packaged Materials: The Contractor shall deliver packaged materials in containers showing weight, analysis, and name of manufacturer/source. He/she shall protect materials from deterioration during delivery, and while stored at site.

#### **1.06 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

### **PART 2 - PRODUCTS**

#### **2.01 SCREENED LOAM**

- A. Screened Loam shall be "Loam or Sandy Loam," determined by mechanical analysis (ASTM D-422) and based on the USDA Classification System.
- B. Screened Loam shall be a natural product consisting primarily of natural topsoil, free from subsoil, and obtained from an area which has never been stripped, as noted above. The location of the source of the Loam shall be submitted to the Owner's representative.



Screened Loam for general turf and planting areas shall not contain less than 5 percent nor more than 10 percent organic matter as determined by the loss on ignition of oven-dried samples, at 100°C ± 5°C. To adjust organic matter content, the soil may be amended, prior to site delivery, by the addition of composted leaf mold or peat moss. Use of organic amendments is accepted only if random soil sampling indicates a thorough incorporation of these materials.

- C. Screened Loam shall consist of fertile, friable, natural loam capable of sustaining vigorous plant growth. Loam shall be without admixture of subsoil and refuse, resulting in a homogeneous material free of stones greater than ½” in the longest dimension; free of lumps, plants, glass, roots, sticks, excessive stone content, debris, and extraneous matter as determined by the Owner’s representative. Screened Loam shall fall within the pH range of 6.0 to 6.5 except as where noted on plans and details. It shall be uncontaminated by salt water, foreign matter, and substances harmful to plant growth. The maximum soluble salt index shall be 100. Screened Loam shall not have levels of aluminum greater than 200 parts per million.
- D. The Owner will reject any material delivered to the site that, after post-delivery testing, does not meet these specifications. If the delivered screened loam does not meet the specifications stated in this document, it shall be removed by the Contractor at the Contractor’s expense and at the time of rejection.
- E. The Contractor shall take representative samples of topsoil from the site and from loam to be imported, and shall submit samples to a Soil Testing Laboratory for chemical and physical analysis. The Contractor shall indicate to the testing agencies that turf is to be planted and who the Owner is. The Contractor shall forward to the Owner two copies of analysis and recommendations of the testing agencies.
- F. Topsoil, which has been stockpiled on the site, may be used provided that it can be made to comply with these Specifications for screened loam.
- G. All loam provided from off-site sources shall meet specification requirements when brought to the site, in terms of physical properties and organic content. No mixing or amending of organic material in Loam will be permitted on site. No loam shall be spread prior to screening. The loam shall not be handled or moved when in a wet or frozen condition.
- H. To assure imported loam and stockpiled topsoil fulfills specified requirements regarding textural analysis, organic matter content, and pH, soil testing results shall be obtained by the Contractor and submitted to the Owner’s Representative for approval at least one (1) month before any soil is delivered to the site.

**2.02 ROOT ZONE MIX (SANDY LOAM) FOR ATHLETIC FIELDS**

- A. Sandy Loam for athletic field turf establishment shall be “coarse sandy loam” determined by mechanical analysis (ASTM D-422) and based on the USDA Classification System. It shall have the following mechanical analysis:

| Textural Class | Percentage of Total Weight | Average Percentage |
|----------------|----------------------------|--------------------|
|----------------|----------------------------|--------------------|



|                                       |         |    |
|---------------------------------------|---------|----|
| Sand (0.05 – 2.0 mm. dia. range)      | 60 – 75 | 70 |
| Silt (0.002 – 0.05 mm. dia. range)    | 15 – 35 | 20 |
| Clay (less than 0.002 mm. dia. range) | 5 – 20  | 10 |

- B. Coarse sandy loam shall have less than 30% fine/very fine sand, and 50% or more medium/coarse/very coarse sand.
- C. Coarse sandy loam shall have an organic content between 6-8% by weight.
- D. Coarse sandy loam shall meet all other applicable criteria specified for screened loam.
- E. Coarse sandy loam shall be amended as directed by the Owner’s representative and re-tested at the Contractor’s expense to meet compliance with these specifications.

**2.03 SOIL AMENDMENTS**

- A. Commercial fertilizer, peat, humus, or other additives shall be used by the Contractor to counteract soil deficiencies as recommended by the soil analysis and as directed by the Owner’s Representative.
- B. If stored at the site, the Contractor shall protect fertilizer from the weather elements at all times.
- C. Fertilizer shall be commercial fertilizer containing at least sixty percent (60%) organic material.
  - 1. Percentages of nitrogen, phosphorous and potash shall be based on laboratory test recommendations as approved by the Owner’s representative. For purpose of bidding, the Contractor shall assume ten percent (10%) nitrogen, twenty percent (20%) phosphorus and six percent (6%) potash by weight. At least fifty percent (50%) of the total nitrogen shall contain no less than three percent (3%) water-insoluble nitrogen.
  - 2. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Owner’s Representative. The Contractor shall store fertilizer in a weatherproof place and in such a manner that it will be kept dry and its effectiveness will not be impaired.
- D. Humus shall be natural humus. It shall be free from excessive amounts of zinc, low in wood content, free from hard lumps, and in a shredded or granular form. According to the methods of testing of the AOAC, the acidity range shall be approximately 5.5 pH to 7.5 pH and the organic matter shall be not less than 85% as determined by loss on ignition. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.
- E. Manure shall be well-rotted, unbleached, stable manure not less than eight months and not



more than two years old. It shall be free from sawdust, shavings, or refuse of any kind and shall not contain over twenty-five (25) percent straw. The Contractor shall furnish information as to the kind of disinfectant or chemicals, if any, that may have been used in storage of the manure.

- F. Lime: Natural dolomitic limestone shall contain not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates, and shall be ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.
- G. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.
- H. Aluminum Sulfate: Commercial grade.
- I. Bonemeal: Commercial, raw, finely ground; 4 percent nitrogen and 20 percent phosphoric acid.

### **PART 3 - EXECUTION**

#### **3.01 FINE GRADING AND LOAMING**

- A. After the areas to be loamed have been brought to rough grade, and immediately prior to spreading the loam borrow or topsoil, the subgrade shall be loosened by disking or rototilling to a depth of at least three inches to permit bonding of the loam to the subsoil. The Contractor shall remove all stones greater than one (1) inch in diameter and all debris or rubbish. Such material shall be removed from the site, at no additional cost to the Owner.
- B. The Contractor shall provide a minimum depth of six (6) inches of planting soil (loam) in all areas indicated for seeding and planting, and all areas disturbed by excavation and construction operations.
- C. Screened loam borrow or topsoil shall be placed and spread by the Contractor over approved areas to a depth sufficiently greater than six inches so that after natural settlement and light rolling, the completed work will conform to the lines, grades, and elevations indicated. The Contractor shall supply additional loam, after testing and approval as may be needed, to achieve the specified depths and finished grades under the Contract without additional cost to the Owner.
- D. Disturbed areas outside the limit of seeding shall be spread with six (6) inches of screened loam or screened topsoil to the finished grade as specified herein above.
- E. No subsoil or loam shall be handled in any way if it is in a wet or frozen condition.
- F. Sufficient grade stakes shall be set by the Contractor for checking the finished grades. Stakes shall, at minimum, be set in the bottoms of swales and at tops of slopes. Grades shall be established which are accurate to one tenth of a foot either way. The Contractor shall connect contours and spot elevations with an even slope.



- G. After loam has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. All large stiff clods, lumps, brush, glass, roots, stumps, litter and other foreign matter, and stones over one inch in diameter shall be removed from the loam. Loam shall also be free of smaller stones in excessive quantities as determined by the Owner's Representative.
- H. The whole surface shall then be rolled with a hand roller weighing not more than 100 pounds per foot of width. During the rolling, all depressions caused by settlements or rolling shall be filled with additional loam and the surface shall be re-graded and rolled until it presents a smooth and even finish to the required grade.
- I. The Contractor shall obtain the Owner's Representative's written approval of fine grading and bed preparation before doing any seeding.

**3.02 PLACEMENT OF ROOT ZONE MIX (SANDY LOAM) ON ATHLETIC FIELDS**

- A. The Contractor shall furnish and spread material to the depths shown on the Drawings, which shall be the minimum required depth after settlement. No compaction shall be required beyond that extent necessary to place sod or for the establishment of seed.
- B. Sandy Loam shall be spread in such a manner as to establish a loose, friable seedbed.
- C. Finish grades shall be verified by the Contractor using laser operation survey instruments with a tolerance of +/- ¼ inch.

**3.03 INCORPORATION OF SOIL AMENDMENTS**

- A. Loam (including root zone mix) shall not be placed until the Owner's Representative's has approved the prepared subgrade.
- B. For areas to receive sod, see Section 32 92 23 – Sod, Part 3, for incorporation of lime and fertilizer.
- C. The Contractor shall incorporate humus in the soil as required by soil analysis, prior to delivery to site. The Contractor shall have loam re-tested with organic matter incorporated and shall obtain approval prior to bringing any loam to the site.
- D. Soil amendments (not including humus) shall be spread and thoroughly incorporated into the layer of loam by harrowing or other methods approved by the Owner's Representative. The following soil amendments shall be incorporated in all areas to be seeded with turfgrass (not in plant beds).
  - 1. The Contractor shall spread and incorporate ground limestone into the loam as required by soil analysis to achieve a pH of 6.0 to 6.5, but no more than 200 pounds of limestone per 1,000 square feet of loam.
  - 2. The Contractor shall spread fertilizer at the rate of forty (40) pounds per one thousand (1,000) square feet, or more as required by soil analysis.



3. The Contractor shall spread Superphosphate at the rate of twenty (20) pounds per one thousand (1,000) square feet.

**END OF SECTION**



**SECTION 32 92 19  
SEEDING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Seeding
  - 2. Maintenance of seeded areas during the construction period

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Related Sections: The following Sections contain requirements that relate to this Section.
  - 1. Section 32 91 13 – Loam
  - 2. Section 32 84 00 – Irrigation System
  - 3. Section 31 25 00 – Erosion and Sedimentation Controls (for blankets in swales outside of athletic fields)

**1.03 QUALITY ASSURANCE**

- A. The contractor performing this work shall be a member in good standing of the Associated Landscape Contractors of America.
- B. The contractor performing this work shall show previous evidence of having successfully installed and maintained landscape projects of similar scope to the subject project with regard to quantities of seeding involved, complexity, and a minimum of five (5) years of experience on projects similar to this one. The Owner's Representative shall have the right to review the qualifications and references of the Contractor for approval to work on this project.
- C. Source Quality Control:
  - 1. Analysis and standards: For materials other than those with manufacturer's certified analysis, the Contractor shall provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.
- D. Within 30 days after award of Contract and before any seeding materials are delivered to the job site, the Contractor shall submit to the Owner's Representative a complete list of all seed and other items proposed to be installed. At least 10 days prior to shipment and



delivery of materials, the Contractor shall submit to the Owner's Representative a one (1) cubic foot representative sample, certifications, and certified test results for materials as specified below. No material shall be ordered or delivered until the required submittals have been submitted and approved by the Owner's Representative. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner reserves the right to reject, on or after delivery, any material that does not meet these specifications.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. The Contractor shall deliver all items to the site in their original containers with all labels intact and legible at time of Owner's inspection.
- B. The Contractor shall immediately remove from the site all seeding materials which are not true to name, and all materials which do not comply with the provisions of this Section of these Specifications.
- C. The Contractor shall use all means necessary to protect seeding materials before, during, and after installation and to protect the installed work and materials of all other trades.
- D. Packaged Materials: The Contractor shall deliver packaged materials in containers showing weight, analysis, and name of manufacturer/source. He/she shall protect materials from deterioration during delivery, and while stored at site.

**1.05 PROJECT CONDITIONS**

- A. All areas to be seeded shall be inspected by the Contractor before starting work, and any defects, such as incorrect grading, etc., shall be reported to the Owner's Representative prior to beginning this work. The commencement of work by the Contractor shall indicate his/her acceptance of the areas to be seeded, and he/she shall assume full responsibility for the work of this Section.

**1.06 REFERENCE STANDARDS**

- A. The work shall conform to the codes and standards of the following agencies and publications as further cited herein:
  - 1. USDA: United States Department of Agriculture

**1.07 QUALITY CONTROL / QUALIFICATIONS**

- A. The Contractor shall provide affidavits from manufacturers' major suppliers where required by these Specifications.

**1.08 REQUIRED SUBMITTALS**

- A. The Contractor is required to submit the following items to the Owner's Representative prior to usage on this Project:



1. Seed - statement of composition percentages of purity and germination of each seed mix.

## 1.09 COORDINATION

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

## PART 2 - PRODUCTS

### 2.01 SOIL AMENDMENTS

- A. See Section 31 91 13 (Loam) for soil amendment requirements.

### 2.02 SEED

- A. Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall weed seed content exceed 1% by weight. The seed shall be furnished and delivered in the proportions specified below in new, clean, sealed, and properly-labeled containers. All seed shall comply with State and Federal seed laws. The Contractor shall submit manufacturer's Certificate of Compliance. Seed that has become wet, moldy, or otherwise damaged shall not be acceptable.

- B. Athletic field seed shall be composed of the following varieties, which shall be mixed in the proportions indicated and shall test to minimum percentages, purity, and germination specified.

70 – 80 % Kentucky Bluegrass  
20 – 30 % Perennial Ryegrass

- C. Seed for general turf areas shall be composed of the following varieties, which shall be mixed in the proportions indicated and shall test to minimum percentages, purity, and germination specified.

35 % Fine Fescue  
33% Kentucky Bluegrass  
33 % Perennial Ryegrass

- D. All turfgrass seed shall have a minimum purity of 98 percent and a germination rate of 85 percent.
- E. All turfgrass seed shall be labeled to show that it is within the requirements of the USDA as to purity, germination and presence of restricted or prohibited weeds.
- F. Any proposed product substitutions shall be presented to the Owner's Representative for approval prior to seeding.



**2.03 MULCH**

- A. Mulch for non-hydroseeded turf areas shall be straw or salt marsh hay.

**2.04 HYDRO MULCH AND SOIL STABILIZER**

A. Wood Cellulose Fiber Mulch

1. Mulch to cover hydroseeded areas shall be fiber-processed from whole wood chips manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard.
2. Moisture content shall not exceed 10 percent, plus or minus 3 percent, as defined by the pulp and paper industry standards. Fiber shall have a water-holding capacity of not less than 900 grams of water per 100 grams fiber.
3. The mulch shall disperse into a uniform slurry when mixed with water. It shall be nontoxic to plant life or animal life.
4. The mulch shall contain a non-petroleum based tackifier and a green dye for visual monitoring during application, both non-injurious to plant growth.

- B. Hydromulch mixture shall be Conwed Fibers (a division of Profile Products), 750 Lake Cook Rd, Suite 440 Buffalo Grove, IL 60089 Phone: 1-800-366-1180; or approved equivalent.

**PART 3 - EXECUTION**

**3.01 PREPARATION OF SOIL**

- A. See Section 31 91 13 (Loam) for soil preparation and incorporation of soil amendments.

**3.02 SEEDING**

- A. Seeding shall not take place until the Owner's Representative has approved loam and root zone mix placement. (See Section 31 91 13 – Loam.)
- B. Immediately before seeding, the ground shall be restored, as necessary, to a loose friable condition by disking or other approved method to a depth of not less than 2". The surface shall be cleared of all debris and of all stones 1" or more in diameter.
- C. Seeding shall be done only during the period from April 1 to May 30 or August 15 to October 15. The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. At his option, and on his responsibility, the Contractor may plant seed under unseasonable conditions at no increased cost to the Owner.



- D. Seeding of lawns shall be done only by experienced workers under the supervision of a qualified foreman.
- E. The Contractor shall seed only when the bed is in a friable condition, not muddy or hard.
- F. The Contractor shall seed all areas indicated on the Drawings to be seeded with specified grass seed, sowing evenly with an approved mechanical seeder at the rate of 5 pounds per 1,000 square feet. He/she shall spread seed when soil is moist. A Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seedbed in one operation. In areas inaccessible by a Cultipacker, the seeded ground shall be lightly raked and rolled in two directions with a water ballast roller. Extreme care shall be taken during seeding and raking to insure that no change occurs in the finished grades and that the seed is not raked from one spot to another. Hydroseeding is an acceptable manner of seeding, providing the Contractor certifies in writing that the hydroseed mix is as herein specified, and applied at the equivalent rate of 5 pounds of seed per 1,000 square feet.
- G. If covering and rolling is not properly accomplished by the seeding machine, the seed shall be lightly raked into the ground, after which the ground shall be rolled with a five hundred pound roller and thoroughly and evenly watered with a fine spray to penetrate the soil to a depth of at least two (2) inches.
- H. Promptly after seeding, the Contractor shall wet the seedbed thoroughly, keeping all areas moist throughout the germination period.
- I. Mulch shall be placed by the Contractor immediately after seeding. Straw or salt marsh hay that has been thoroughly fluffed shall be spread evenly and uniformly at the rate of two to three tons per acre. Lumps and thick mulch materials shall be thinned. All mulch anchor stakes, strings, and matting shall be removed before final acceptance of lawns. In addition, following mulching, Straw/net blanket shall be installed in swales outside of athletic fields in accordance with Section 31 25 00 – Erosion and Sedimentation Controls.
- J. Hydroseed mix: All work shall be installed using an approved spraying machine specifically used for this purpose. Amounts of fertilizer used shall be as the testing agency recommendations prescribe and as directed by the Owner's Representative. The Contractor shall submit to the Owner's Representative for approval prior to the start of any seeding work, a certified statement with the number of pounds and types of fertilizer, amounts and types of grass seed, and processed fiber per one hundred (100) gallons of water.
  - 1. The Contractor shall add hydromulch to the hydroseed tank at the rate of sixty (60) pounds per acre.
- K. Over-seeding: Existing turf areas within the construction limits that are not being graded and/or receiving topsoil shall be seeded as specified in this Section, except that the soil in these areas shall be aerated prior to seeding instead of being scarified, and shall not be rolled.

### **3.03 MAINTENANCE OF SEEDED AREAS**

- A. Maintenance shall begin immediately after any area is seeded and shall continue until final



acceptance.

1. Maintenance may continue until the next growing season if in the opinion of the Owner's Representative the season enters a winter dormancy and no maintenance should continue.
- B. General acceptance by the Owner's Representative will be granted for seeded lawn areas and athletic fields when all areas have a close stand of grass which has received a minimum of three mowings, has no bare spots greater than two inches in diameter, and at least 90% of the grass established is permanent grass species. The Contractor shall maintain all seeded areas until final acceptance.
- B. Maintenance shall include reseeding, mowing, watering, weeding, and fertilizing. If irrigation system for athletic fields is included with this Work, the Contractor shall use this system to water the athletic field turf areas. If the Owner's water supply is not available or not functioning, the Contractor will be held responsible to furnish water.
- C. Watering of Seeded Areas:
1. First Week: The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of an adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least two inches.
  2. Second and Subsequent Weeks: The Contractor shall water the lawn as required to maintain adequate moisture, in the upper two inches of soil, necessary for the promotion of deep root growth.
  3. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities of water over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in an eight (8) hour period.
- D. Protection:
1. Seeded areas shall be protected by stakes and caution tape or snow fence as directed by the Owner's Representative. Wire shall not be used.
  2. Barriers shall be placed immediately after seeding and shall be maintained until acceptance.
- E. Reseeding: After the grass in seeded areas has appeared, all areas and parts of areas which, in the opinion of the Owner's Representative, fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the expense of the Contractor.



F. Mowing:

1. At the time of the first cutting, there shall be a uniform stand between 3 and 3-1/2" high, and mower blades shall be set between 2-1/2" and 3" high.
2. Mowing shall include removal of clippings.

G. Fertilizing: A second application of fertilizer, as specified herein, shall be applied after one (1) season of growth of a minimum of two (2) months duration, but only during the months of April, May, August, or September. Fertilizer shall be applied at the rate of three (3) pounds per one thousand (1,000) square feet.

H. Liming: If more than one initial application of limestone is required by the soils analysis to bring the pH of the stockpiled loam borrow & topsoil to a specified range, the Contractor shall be responsible for all additional required lime applications.

**3.04 CLEANUP AND PROTECTION**

- A. During seeding work, the Contractor shall keep pavements clean and work area in an orderly condition.
- B. The Contractor shall protect seeding work and materials from damage due to landscape operations, operations by other contractors or trades, and trespassers.
  1. The Contractor shall maintain protection during installation and maintenance periods. He/she shall treat, repair, or replace damaged landscape work as directed by the Owner's Representative.

**3.05 ACCEPTANCE**

- A. The Owner's Representative shall inspect all work for Acceptance upon written request by the Contractor. The request shall be received by the Owner at least 10 calendar days before the anticipated date of inspection. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Owner's Representative, he/she shall certify in writing to the Contractor as to the Acceptance of the work.

**3.06 ACCEPTANCE IN PART**

- A. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so and when approval is given to the Contractor in writing to complete the work in parts. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

**3.07 CLEANUP**

- A. When any of this work is done while buildings are occupied, pavements shall be kept clear at all times, broom cleaned to prevent tracking dirt into buildings.
- B. After completion of all planting operations, the Contractor shall dispose of all debris and



excess material to the satisfaction of the Owner. All pavements shall be swept and hosed clean.

**3.08 FINAL INSPECTION AND ACCEPTANCE**

- A. At the end of the guarantee period, the Owner’s Representative shall inspect all guaranteed work for the Final Acceptance upon written request of the Contractor. The request shall be received at least 10 calendar days before the anticipated date for final inspection.
- B. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Owner at that time, he/she shall certify in writing to the Contractor as to the Final Acceptance of the project.

**END OF SECTION**



**SECTION 32 92 23  
SODDING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Sod (perennial turf grass)
  - 2. Maintenance of sodded areas during the construction period

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 32 91 13 – Loam
- B. Section 32 92 19 – Seeding
- C. Section 32 18 23 – Athletic Surfacing
- D. Section 32 84 00 – Irrigation System

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.
  - 1. Turfgrass Producers International
    - a. TPI GSS – Guideline specifications for turfgrass sodding.

**1.04 REQUIRED SUBMITTALS**

- A. The Contractor is required to submit the following items to the Owner’s Representative prior to usage on this Project:
  - 1. Sod - statement of composition percentages of turfgrass from sod supplier

**1.05 QUALITY ASSURANCE**

- A. The Contractor shall use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.



## **1.06 DELIVERY, STORAGE, AND HANDLING**

### **A. Sod**

1. The Contractor shall protect sod from drying out and from contamination during delivery, on-site storage, and handling.
2. The Contractor shall lightly sprinkle with water, cover with moist burlap, straw, or other approved covering; and protect from exposure to wind and direct sunlight until planted. He/she shall provide covering that will allow air to circulate so that internal heat will not develop. Sod shall not be stored directly on concrete or bituminous surfaces.

### **B. Inspection**

1. Sod and fertilizer shall be inspected by Owner's Representative upon arrival at the Project Site for conformity to species, composition, and quality. Other materials shall be inspected for compliance with specified requirements. Unacceptable materials shall be removed from the job site.

### **C. Handling and Storage**

1. Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.
2. The Contractor shall protect materials from deterioration during delivery and while stored at site.
3. Materials shall be stored in designated areas. Sod and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials.

### **D. Time Limitation**

1. The Contractor shall place sod a maximum of 36 hours after initial harvesting, in accordance with TPI GSS.

## **1.07 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

## **PART 2 – PRODUCTS**

### **2.01 SOD**

- A. Sod shall be nursery-grown and certified as classified in the TPI GSS. Sod shall also be machine-cut sod at a uniform thickness of  $\frac{3}{4}$  inches with tolerance of  $\frac{1}{4}$  inch, excluding top growth and thatch. Each individual sod piece shall be strong enough to support its



own weight when lifted by the ends. Broken pads, irregularly shaped pieces, and torn or uneven ends, will be rejected.

B. Sod species shall be genetically pure, and free from weeds, pests, and disease.

C. Athletic field sod shall be composed of the following turfgrass types:

70 – 80 % Kentucky Bluegrass

20 – 30 % Perennial Ryegrass

## **2.02 LOAM**

A. See Section 32 91 13 – Loam.

## **2.03 SOIL AMENDMENTS**

B. See Section 32 91 13 – Loam.

## **PART 3 – EXECUTION**

### **3.01 GENERAL**

A. Construction methods shall be those established as agronomically acceptable and feasible and which are approved by the Owner’s Representative.

B. Sodding operations shall be conducted at the conclusion of construction activities and shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the sodding operations, proposed alternate times shall be submitted for approval.

### **3.02 SOIL PREPARATION**

A. Loam for soil bed shall be made friable and receptive for sodding by disking or by other approved methods to the satisfaction of the Owner’s Representative. In all cases, the final prepared soil surface shall meet the lines and grades for such surface as shown in the plans, or as directed by the Owner’s representative. In no event will sodding be permitted on hard or crusted soil surfaces.

B. All areas to be covered with sod shall be free from all weeds and stones. Removal of unacceptable weed growth shall be by approved methods, including non-selective herbicide, which does not rut or scar the surface, or cause excessive disruption of the slope line or grade.

C. Sodding Season: The calendar dates for sodding shall be:

Spring – March 15 to June 15



Fall – August 15 to October 15

- D. If sodding is placed during periods outside of the date ranges listed above, the Contractor shall be responsible for re-sodding with sod of the same grass seed mixture specified in Part 2 until the turf stand conforms to the requirements herein.

### **3.03 INCORPORATION OF SOIL AMENDMENTS**

A. Lime:

1. Lime shall be applied at the rate determined by the results of laboratory tests conducted at a certified testing laboratory at the Contractor's expense.
2. Lime shall be mechanically spread at the rate determined by testing on all areas which are to be sodded up to a slope gradient of twenty-five percent (25%).
3. The lime shall be distributed uniformly and worked into the top four (4) inches minimum of the topsoil areas designated for sodding by disking or rototilling and shall be uniformly blended into the topsoil.

B. Fertilizer:

1. Fertilizer shall be applied in two (2) applications. The first application shall be within one (1) week before the sodding at the rate of thirty-five (35) pounds per thousand (1,000) square feet harrowed into the top two (2) inches of sod bed. The second application shall be done as a maintenance application per paragraph 3.09.
2. After the liming and tilling has been approved by the Owner's Representative, the Contractor shall apply fertilizer to all areas to be sodded. All fertilizer shall be uniformly spread by a mechanical spreader at the rate recommended by the testing laboratory. Fertilizer shall not be applied during the months of June, July or August.
3. After the areas to be sodded have been properly fertilized, the Contractor shall hand rake the fertilizer into the topsoil to a minimum depth of one (1) inch so that the material is uniformly blended by means of garden rakes. During this raking process, the areas to be sodded shall be cleared of all stones over one (1) inch in size and all other unsuitable material. All such undesirable material shall be removed from the site. These areas shall be fine graded to achieve sod sub-grade after compaction which shall be obtained by rolling, dragging or by an approved method which obtains an equivalent compaction to that produced by a hand roller weighing from 75 to 100 pounds per foot of width. All depressions caused by settlement or rolling shall be filled with additional loam and re-graded and prepared as specified above until it presents a reasonable smooth and even finish at the required sod sub-grade.
4. At least four (4) days shall elapse after the application of lime and fertilizer before sodding shall begin.

### **3.04 SOD PLACEMENT**



- A. The Contractor shall place sod a maximum of 36 hours after initial harvesting, in accordance with TPI GSS.

**3.05 SODDING SLOPES AND SWALES**

- A. For slopes 2:1 and greater, sod shall be laid with long edge perpendicular to the contour.
- B. For V-shaped swales and flat-bottomed swales, sod shall be laid with long edge perpendicular to flow of water.
- C. Each piece of sod shall be anchored with wood pegs or wire staples maximum 2 feet on center.
- D. On slope areas, placement of sod shall start at bottom of slope.

**3.06 FINISHING**

- A. After completing sodding, the Contractor shall blend edges of sodded areas smoothly into surrounding areas. Air pockets shall be eliminated and a true even surface shall be provided. Frayed edges shall be trimmed and holes and missing corners shall be patched with sod.
- B. Rolling: Immediately after sodding, the Contractor shall firm entire area except for slopes in excess of 3:1 with roller not to exceed 50 pounds for each foot of roller.

**3.07 RESTORATION AND CLEAN UP**

- A. Clean-up shall include, but not be limited to, the removal of all debris from the turf establishment operations on the shoulders, pavement and/or elsewhere on adjacent properties publicly and privately owned. Excess and waste material shall be removed from the sodded areas and shall be disposed off-site.
- B. Existing turf areas and facilities that have been damaged from the sodding operations shall be restored to original condition at Contractor's expense.

**3.08 PROTECTION OF INSTALLED AREAS**

- A. Immediately upon completion of the sodding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed by Owner's representative.

**3.09 MAINTENANCE**

- A. Maintenance shall begin immediately after an area is sodded and shall continue until final acceptance.
- B. Maintenance shall include mowing, watering, weeding, and fertilizing. Sod on athletic fields shall be watered with the new irrigation system, if system is part of this Work. If



the Owner's water supply is not available or not functioning, the Contractor will be held responsible to furnish water.

C. Watering of Sodded Areas:

1. First Week: The Contractor shall provide all labor and arrange for all watering necessary for rooting of sod. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantity to maintain moist soil to a depth of at least four inches (4"). Watering shall not be done during the heat of the day to help prevent wilting.
2. Second and Subsequent Weeks: The Contractor shall water the sod as required to maintain adequate moisture, until final acceptance, in the upper four inches (4") of soil.
3. If a new irrigation system is not part of this work, watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent the damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one (1) complete coverage to the sodded areas in an eight (8) hour period.

D. Mowing: The first mowing of sodded areas shall not be attempted until the sod is firmly rooted and secure in place. Not more than 40% of the grass leaf shall be removed by the initial or subsequent mowings. Grass height shall be maintained between two inches (2") and two and one half inches (2.5") unless otherwise specified. Thereafter grass shall be maintained at two inches (2") until acceptance.

E. Fertilizing: A second application of fertilizer, as specified herein, shall be applied approximately 6 weeks after the sod has been installed, as directed by the Owner's representative. Fertilizer shall be applied at the rate of ten (10) lbs per 1,000 square feet.

**3.10 WARRANTY AND REPLACEMENT**

- A. If a satisfactory stand of maintained turfgrass has been produced at the time of final inspection, it shall be guaranteed through one complete growing season. If re-sodding is required at the end of the warranty period, this work shall be done in conformance with the requirements of this Section.
- B. If a satisfactory stand of maintained turfgrass has not been produced at the time of final inspection, necessary repairs shall be performed in conformance with the requirements of this Section. Upon completion of these repairs, the turfgrass shall be guaranteed as in paragraph A above.

**END OF SECTION**



**SECTION 32 93 00  
PLANTING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Furnishing and installing trees
  - 2. Maintenance of trees during the construction period
- C. The locations of all trees shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 32 91 13 – Loam
- B. Section 32 92 19 – Seeding

**1.03 QUALITY ASSURANCES**

- A. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the plantings.

**1.04 SUBMITTALS**

- A. If plant substitutions are proposed due to lack of availability of certain specified plants at nurseries in the region during the planting season, a list of proposed substituted plant species and/or varieties shall be submitted to the Owner's Representative for approval. Substitutions shall meet the requirements in Part 2 of this Section.

**1.05 COORDINATION**

- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 PLANT LIST**

- A. A schedule of required plants is included on the Drawings.



**2.02 NOMENCLATURE**

- A. The names of plants required under this contract conform to those given in the Standardized Plant Names, 1942 Edition, prepared by the American Joint Committee on Horticultural Nomenclature. Names of species and varieties not included therein conform generally with names accepted in the nursery trade.

**2.03 QUANTITIES**

- A. Quantities necessary to complete the plantings as specified on the Drawings shall be furnished.

**2.04 SIZES**

- A. Plants shall have a habit of growth that is normal for the species and shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plants shall equal or exceed the measurements specified in the Plant Schedule, which are minimum acceptable sizes. They shall be measured before any pruning is done at time of planting. Requirements for the measurements, branching, grading, quality, balling and burlapping of plants in the Plant Schedule shall follow the code of standards currently recommended by the American Associations of Nurserymen, Inc., in the American Standard for Nursery Stock.

**2.05 SUBSTITUTIONS**

- A. Substitutions will be permitted only upon submission of proof that any plant as specified is not obtainable during the scheduled planting season. Written authorization by the Owner's Representative will be required for any substitution. The nearest equivalent obtainable size or variety of plant having the same essential characteristics shall be used.

**2.06 BALLED AND BURLAPPED MATERIALS**

- A. Plants designated "B&B" in the Plant Schedule shall be balled and burlapped. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Material shall be in a condition where the natural root collar of the plant is exposed at the top of the root ball. Balls shall be firmly wrapped with burlap or similar material and bound with twine, cord, or wire mesh. Where necessary to prevent breaking or cracking of the ball during the process of planting, the ball may be secured to a platform. Balls shall be kept moist and shaded until they are planted.

**2.07 CONTAINER-GROWN MATERIALS**

- A. Plants designated "cont.", "gal.", or "pot" in the Plant Schedule are container-grown plants. Any container plants available as balled and burlapped may be substituted at the Contractor's option. If stored on the site, they shall be watered thoroughly at least once every 48 hours. Root systems of container grown plants shall be well developed but not in "pot bound" condition of dense encircling roots.



**2.08 SOIL MIX FOR FILL AROUND ROOT BALLS**

- A. Shrubs: The soil removed for placement of shrubs shall be mixed with 20 percent composted ground pine bark.
- B. Trees: The soil excavated for tree installation shall be un-amended.

**2.09 MULCH**

- A. Double-shredded hardwood mulch shall be used as the mulch for all plant beds indicated on the Drawings, including areas within plant saucers.

**PART 3 - EXECUTION**

**3.01 PLANTING SEASON**

- B. The normal planting season is April 1 through October 15. After notification to proceed, planting operations shall be conducted under favorable weather conditions during the normal planting season. At the option of and on the full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

**3.02 WEATHER CONDITIONS AND PLANT PROTECTION**

- A. Planting shall not take place when soils on site are frozen or wet and in poor tilth.
- B. The root zone of all plants not yet installed shall be protected from freezing, drying, and direct sunlight.

**3.03 PLANTING OF BALLED AND BURLAPPED MATERIALS**

- A. Circular pits shall be excavated for all trees. The diameter of pits for trees shall be at least two (2) times the diameter of the ball. The depth of pits for trees shall be enough to accommodate the ball of roots when the plant is set such that the root collar is a minimum of 3 inches or a maximum of 4 inches above finished grade. Root balls of shrubs shall be set with root collars 2 to 3 inches above finished grade. Burlap shall be removed from at least the top half of the root ball, after the plant is set in place.
- B. The Contractor shall contact the Owner's Representative to inspect the root balls of balled and burlapped plants after they have been set in place (with top half of burlap removed), but before soil has been filled around them.

**3.04 PLANTING OF CONTAINER-GROWN MATERIALS**

- A. Circular holes shall be excavated for all plants. The diameter of the planting holes shall be at least twice the diameter of the root ball. The depth of the planting hole shall accommodate the root ball so that the root collar is 3 to 6 inches above finished grade for trees, and 2 to 3 inches for shrubs. The root ball of the plant shall be loosened to alleviate



encircling roots and to provide an increased root interface with fill soil.

### **3.05 LAYOUT**

- A. New plantings shall be located according to the Drawings. The Contractor shall mark the plant locations, and shall then contact the Owner's Representative for approval. In the event that subsurface rock is encountered, planting in that area shall be immediately halted and the Owner's Representative notified so that the extent of the problem can be determined and, if necessary, alternative solutions formulated.

### **3.06 SETTING PLANTS**

- A. All plants shall be planted in prepared soil beds, and set on firm soil to such depth as indicated elsewhere in these specifications. Trees and shrubs shall be set so that the plant's natural root collar is above finished grade in accordance with paragraphs 3.03 and 3.04 above. No burlap shall be pulled from under the balls. Roots on bare-root plants shall be spread in their normal position. All broken or frayed roots shall be cut off cleanly. Topsoil or prepared soil shall be placed and compacted carefully to avoid injury to roots, to fill all voids and to minimize rocking of root ball. Add water and tamp the backfill until the backfill is completely saturated, then allow it to soak away. Fill the hole to finished grade, and form a shallow saucer around each plant by placing a ridge of topsoil around the edge of each pit. After the ground settles, additional soil shall be filled in to the level of the finished grade.

### **3.07 MULCHING**

- A. Plant beds, plant saucers, and other areas indicated on the Drawings shall be mulched with three (3) inches of double-shredded hardwood mulch. Leave area adjacent to newly planted trees and shrubs un-mulched to six (6) inches from truck.

### **3.08 STAKING AND GUYING TREES**

- A. The Contractor shall not stake or guy trees unless trees are planted on steep slopes, in which case the Contractor shall contact the Owner's Representative for permission to stake those particular trees.

### **3.09 MAINTENANCE**

- A. General: Maintain work of this section from time of installation until the final inspection immediately prior to commencement of the guarantee period. Maintenance shall include watering and protection of plantings and other necessary operations.
- B. Preparation for Inspection: When the plantings are ready for final inspection, all mulched areas shall be free from weeds and mulched to the extent indicated in these specifications. Plant tags shall be removed by the Contractor prior to the inspection for acceptance. At the time of acceptance following final inspection, the Contractor is relieved of routine maintenance responsibilities for the plantings under this contract.

### **3.10 FINAL INSPECTION, CLEAN-UP, AND COMPLETION**



- A. General: Final inspection shall be for the completed landscape and shall be made at the conclusion of the landscape work upon written notice requesting such inspection submitted by the Contractor to the Owner's Representative at least 10 days prior to the anticipated date.
- B. Acceptance after Inspection: The Contractor will be notified in writing of acceptance of all work of this section, exclusive of the possible replacement of plants subject to guaranty, or if there are any deficiencies in the requirements of completion of the work. Maintenance or other remaining work to be done shall be subject to re-inspection before acceptance.
- C. Clean-up and Completion: Upon completion of work, remove from the site all equipment and other articles used. All excess soil, stones, and debris shall be removed and legally disposed of. All work areas shall be left in a clean and neat condition.

### **3.11 GUARANTY AND REPLACEMENT**

- A. Guaranty: After acceptance at the time of final inspection, all plants shall be guaranteed for one (1) year. Plantings shall be alive and in satisfactory vigor at the end of the guaranty period.
- B. Replacement: At the end of the guarantee period, inspection will be made by the Owner's Representative upon written notice requesting such inspection submitted by the Contractor at least ten days before the anticipated date. Any plant required under this contract that is dead or in poor vigor as determined by the Owner's Representative shall be removed from the site; these and any plants missing, due to the Contractor's negligence, shall be replaced as soon as conditions permit, but during the normal planting season.
- C. Materials and Operations: All replacements shall be plants of the same kind as originally planted and shall be of size equal to that attained by adjacent plants of the same kind at the time replacement is made. They shall be furnished and planted as specified in this Section, and the cost shall be borne by the Contractor. Only one replacement in conformance with the provision of this Section will be required for each plant declared dead, in an unhealthy or badly impaired condition, or missing at the time of final inspection.

**END OF SECTION**



**SECTION 33 41 00  
SUBDRAINAGE FOR ATHLETIC FIELDS**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Subdrainage system for athletic fields, including strip drains and collector drains
- C. The layout of all strip and collector drain lines shall be marked in the field for review and approval by the Owner's Representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 31 23 10 – Earthwork
- B. Section 32 91 13 – Loam
- C. Section 33 42 00 – Stormwater Conveyance

**1.03 REFERENCE STANDARDS AND SPECIFICATIONS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. ASTM: American Society for Testing and Materials, latest edition

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. The strip drain material shall remain wrapped or protected from exposure to ultraviolet light and from contamination until it is installed. Each roll, or shipping unit, of drain shall be marked with a tag, or other identification label showing the product type and number and the date of manufacture.

**1.05 QUALITY ASSURANCE**

- A. The Contractor shall contact the Owner's Representative to inspect all drains (strip and collector) after they are installed in the trenches, but before the trenches are backfilled.

**1.06 COORDINATION**



- A. The work specified in this Section shall be coordinated with all work shown/described on the Drawings and in other Sections of the Specifications.

**PART 2 - PRODUCTS**

**2.01 STRIP DRAIN SYSTEM**

- A. Strip drains shall be Hydraway 2000 geocomposite drain and outlet pipes, or approved equal. Strip drains shall be of the type, size and dimensions shown on the Drawings. The drains shall consist of a geotextile filter fabric which is heat fusion bonded to an internal high density polyethylene (HDPE) core. The drain shall be lightweight, flexible, and sufficiently durable to withstand automated and/or manual installation procedures. The system shall include couplers, ends, outlets, and adapters where required. Hydraway 2000 is manufactured by: Intech Anchoring Systems, Caseyville, IL 62232; Telephone: 800-223-7015, www.hydraway.net; Email: info@hydraway.net
- B. The strip drain core shall meet the following requirements:

| <b>Product Test</b>                               | <b>Average Test Value</b> | <b>ASTM Test Method</b> |
|---------------------------------------------------|---------------------------|-------------------------|
| Compressive strength at maximum deflection of 20% | 11,400 lbs./sq. ft.       | D1621                   |
| Flow rate at 10 psi and gradient of 0.1           | 21 gpm/ft. width          | D4716                   |
| Peel strength (fabric to core)                    | 50 lbs./ft. width         | D1876                   |

- C. The strip drain geotextile fabric shall meet the following requirements:

| <b>Product Test</b>   | <b>Average Test Value</b> | <b>ASTM Test Method</b> |
|-----------------------|---------------------------|-------------------------|
| Elongation            | 50%                       | D4632                   |
| Grab tensile          | 120 lbs.                  | D4632                   |
| Permeability          | 135 gal./min./sq. ft.     | D4491                   |
| Apparent Opening Size | 70 U.S. std. sieve        | D4751                   |

**2.02 COLLECTOR DRAINS**

- A. Collector drain pipes shall be perforated dual-wall high density polyethylene (HDPE) drain pipe with smooth interior & corrugated exterior.

**2.03 GEOTEXTILE FABRIC FOR COLLECTOR DRAIN TRENCHES**

- A. Fabric for collector drain trenches shall be a non-woven polyester or polypropylene geotextile fabric with a weight of 4 to 6 ounces per square yard.

**2.04 DRAINAGE STONE**

- A. Drainage stone for collector pipe trenches shall be ASTM #57 washed stone.

**2.05 SAND**



- A. Sand for strip drain trenches shall be coarse sand, as defined by ASTM D2487.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION EQUIPMENT**

- A. All equipment necessary and required for the proper construction of the drain system shall be in working condition and approved by the Owner's Representative. The Contractor shall also provide equipment to obtain proper compaction at the bottom of the trenches.

#### **3.02 INSTALLATION AND BACKFILL**

##### **A. Strip Drains:**

1. Trenching: Trenches shall be excavated at the required depth to permit installation of the strip drains along the lines and grades shown on the Drawings. Trench dimensions shall be in accordance with the Drawings. No trenches shall be left open at the end of the work day.
2. Until the backfill is placed on the drain, all wheeled traffic shall be kept off the drain lines. After a minimum of 4 inches of cover is placed, then tracked equipment can drive over the strip drain lines. After a total of at least 6 inches of cover is placed, wheeled equipment can be driven over the drain locations.
3. Strip drains shall be placed at bottom of trench, centered within trench, and in a vertical position, as shown on the Drawing detail. Drains shall be laid at a constant depth below finished grade, as noted on the Drawings. All fittings shall be installed in accordance with the manufacturer's recommendations.
4. All necessary splices shall be made with connections furnished by the manufacturer or approved by the Owner's Representative in accordance with the project specifications. The strip drains and connectors shall be inspected prior to backfill being placed. If the drain is found to be out of alignment or damaged, it shall be removed and replaced as directed by the Owner's Representative.
5. Fabric end caps, supplied by the strip drain manufacturer, shall be installed on lower ends of strip drains where they connect with collector drain trenches, and upper ends of strip drains, in accordance with the Drawing details and manufacturer's instructions.
6. Trenches shall be backfilled with coarse, clean sand, to the level shown on the Drawing detail. Loam shall then be spread over tops of trenches, to finished grade.

##### **B. Collector Drains:**

1. Trenching: Trenches shall be excavated at the required depth to permit installation of



the drain pipe along the lines and grades shown on the Drawings. Trench dimensions shall be in accordance with the Drawings. No trenches shall be left open at the end of the work day.

2. Wrapping with Fabric: Bottom, ends, and sides of collector drain trenches shall be tightly lined with filter fabric, prior to placement of piping and stone. After piping and stone are placed, fabric ends shall be placed over the top of the trench with a minimum of nine (9) inches of overlap. During fine grading and loaming operations, care shall be taken to avoid disturbance of the fabric. Damaged or dislodged fabric shall be promptly repositioned, repaired, or replaced, as necessary.
3. Piping: Pipes shall be placed at bottom of trench; and laid at a constant slope, as noted on the Drawings, between ends and intersections. Uppermost ends of pipes shall be plugged with solid caps. Pipes shall be free from obstructions. Pipe joints and caps shall be installed in accordance with the manufacturer's recommendations.
4. Collector pipes shall connect to drain basins in accordance with Section 33 42 00 – Stormwater Conveyance, and the civil details on the Drawings.
5. Backfilling: The Contractor shall backfill trenches with washed stone as shown on the Drawings. Fabric shall then be wrapped over top of trench backfill in accordance with paragraph 2 above, and loam shall then be spread over top of wrapped trench.

**END OF SECTION**



**SECTION 33 42 00  
STORMWATER CONVEYANCE**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions, and applicable parts of the Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Contractor shall provide all labor, equipment, and materials; and perform all operations necessary to complete the work of this section as indicated on the Drawings and specified herein which shall include but is not limited to the following:
  - 1. Installation of storm drainage piping & structures
  - 2. Installation of underground detention systems
  - 3. Installation of other drainage appurtenances
- C. All work described above shall be marked out in the field for review and approval by the Owner's representative prior to installation.

**1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Worcester Special Conditions and Specifications – CAST IN PLACE CEMENT CONCRETE
- B. Worcester Special Conditions and Specifications – GRAVEL BORROW
- C. 33 41 00 – Sub-drainage for Athletic Fields

**1.03 GENERAL PROVISIONS**

- A. This specification applies to work depicted on the Civil Drawings prepared by Quinn Engineering, Inc., herein referred to as the "Drawings" and specifically consisting of:
  - 1. Sheets C-1 through C-4.
- B. Attention is directed to PROJECT SPECIAL CONDITIONS which are hereby made a part of this Section of the Specifications.
- C. All work conducted in association with this section shall conform to the applicable requirements of the Occupational Safety and Health Administration (OSHA).
- D. In accordance with MA General Law Chapter 82 Section 40A and prior to construction, the Contractor shall contact DIGSAFE and other utility providers in order to determine the location of existing utilities within the project area. The Contractor is responsible for coordinating the work with the existing utilities so that disruption to the existing utilities is minimized.



- E. Prior to construction, the Contractor shall notify and coordinate any planned disruptions to existing utilities that are required to perform the work with the appropriate utility provider and with the Owner’s representative. Disruptions to existing utilities shall be planned so that the time of disruption is minimized.

#### **1.04 INDUSTRY STANDARDS**

- A. Except as modified by governing codes and by the Contract Documents, the Contractor shall comply with applicable provisions and recommendations of the following:
  - 1. Commonwealth of Massachusetts, Department of Public Works, Standard specifications for Highways and Bridges, Supplemental Specifications, latest edition.
  - 2. AASHTO: American Association of State Highway and Transportation Officials
  - 3. ASTM: American Society for Testing and Materials
  - 4. Mass DOT: Massachusetts Department of Transportation, Highway Division
  - 5. MSSHB: Massachusetts Standard Specifications for Highways and Bridges

#### **1.05 PERMITS**

- A. The Contractor shall secure all necessary permits from the City of Worcester of Department of Public Works and Parks and City of Worcester Water Operations prior to construction. Securing permits shall be conducted in accordance with project specifications.
- B. The Contractor shall apply for and obtain all permits necessary for the work depicted on the Drawings and specified in this section.
- C. Permits shall be secured and paid for in accordance with these specifications.

#### **1.06 QUALITY ASSURANCE**

- A. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.
- B. Contractor is responsible for compatibility between pipe materials, fittings and appurtenances.
- C. All materials for each product shall be produced and obtained from a single manufacturer.
- D. Installation shall be performed by qualified personnel.
- E. Coordinate the work shown on the Drawings and specified herein with all other trades in order to provide a complete installation.
- F. The Contractor shall provide all necessary miscellaneous items and appurtenances not identified on the Drawings or specified herein to provide a complete installation.

#### **1.07 SUBMITTALS**

- A. Submit for approval prior to ordering and shipment technical information regarding
  - 1. Drain manholes, drain basins



2. Piping, manifolds,
3. Covers, grates, frames
4. Stone, aggregate, soil, gravel, filter fabric, etc.
5. Any other items used as part of the stormwater conveyance system

#### **1.08 SITE CONDITIONS**

- A. The Contractor is responsible for verifying the layout of all materials prior to installation in relation to the locations specified on the Drawings and in relation to the existing conditions.
- B. The Contractor shall provide barricades or barriers to protect the public from construction activities.
- C. The work specified herein shall take place under weather conditions so as not to cause erosion or negatively impact any portion of the site.

#### **1.09 WARRANTY**

- A. The Contractor shall warrant all materials and workmanship specified herein for a period of one year from the time of acceptance by the Owner.

#### **1.10 DELIVERY, STORAGE AND HANDLING**

- A. All items shall be packaged and stored on site in such a manner so that the items are in new and excellent condition immediately prior to installation.
- B. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures and out of the sunlight or delivered to the site so that no pipe is exposed to sunlight for more than 60 days. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup or direct or indirect sunlight will not be permitted.
- C. If any defective item is discovered after it has been installed, it shall be removed and replaced with an exact replacement item in a satisfactory manner by the Contractor, at the Contractor's own expense. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until testing.
- D. In handling the items, use special devices and methods as required to achieve the results specified herein.

#### **1.11 CONFORMANCE WITH THE AMERICANS WITH DISABILITIES ACT AND THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD**

- A. Materials and work identified on the Drawings and specified herein shall conform to the Americans with Disabilities Act Standards for Accessible Design (28 FCR Part 36) and the Massachusetts Architectural Access Board (521 CMR).
- B. The Contractor shall notify the Owner's representative of any discrepancies between the Drawings and work specified herein and the above referenced standards prior to installation.

#### **1.12 COORDINATION**



- A. The work specified in this section shall be coordinated with all work shown/described on the Drawings and in the specifications with other portions of the work for the entire project.
- B. The Contractor shall give the Engineer at least 48 hour notice when requesting inspections on site.

### **1.13 EXISTING UTILITIES**

- A. Existing utility information depicted on the Drawing has been provided to Quinn Engineering, Inc. unless otherwise noted. The Contractor is responsible for coordinating the locations of all existing utilities with the utility provider and “DIGSAFE”. Quinn Engineering, Inc. does not warrant that all existing utilities have been depicted on the Drawings.
- B. The Contractor shall take every precaution to limit disruption to existing utilities. Any existing utilities disrupted or affected by the Contractor as a result of his/her work shall be repaired at least to the condition that existed prior to construction. The Contractor shall coordinate repair of any utilities with the utility providers and any costs associated with the repair shall be borne by the Contractor.

### **1.14 DRAWINGS**

- A. The Contractor is responsible for reviewing the Drawings and existing site conditions with respect to this section.
- B. The information depicted on the Drawings is believed to reflect the current site conditions unless otherwise noted on the Drawings. The Contractor is responsible for reviewing the existing site conditions in the areas of the proposed work and notify the Owner’s representative as soon as possible if any discrepancies exist between the two.
- C. The existing conditions depicted on the Drawings have been provided to Quinn Engineering, Inc. Quinn Engineering, Inc. does not warrant that all existing conditions, structures, utilities, etc. have been depicted.

## **PART 2 - PRODUCTS**

### **2.01 REINFORCED CONCRETE DRAIN MANHOLES**

- A. Reinforced concrete drain manholes shall conform to the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) available from the City of Worcester Department of Public Works & Parks or online at <http://www.worcesterma.gov/uploads/71/11/71117081c8b68ca78d082bce4ef5a81a/standard-specs.pdf>

### **2.02 FRAMES AND COVERS**

- A. Frames and covers shall conform to the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) available from the City of Worcester Department of Public Works & Parks or online at <http://www.worcesterma.gov/uploads/71/11/71117081c8b68ca78d082bce4ef5a81a/standard-specs.pdf>

### **2.03 MISC. CAST IN PLACE CEMENT CONCRETE & REINFORCEMENT**



- A. See Worcester Special Conditions and Specifications – CAST IN PLACE CEMENT CONCRETE

#### **2.04 REINFORCED CONCRETE PIPE**

- A. Reinforced concrete pipe (RCP) shall conform to the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) available from the City of Worcester Department of Public Works & Parks or online at <http://www.worcesterma.gov/uploads/71/11/71117081c8b68ca78d082bce4ef5a81a/standard-specs.pdf>

#### **2.05 AWWA C900 DRAIN PIPE (DR18)**

- A. AWWA C900 drain pipe (DR 18) shall conform to the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) available from the City of Worcester Department of Public Works & Parks or online at <http://www.worcesterma.gov/uploads/71/11/71117081c8b68ca78d082bce4ef5a81a/standard-specs.pdf>

#### **2.06 BRICK, MORTAR AND RELATED MATERIALS**

- A. Brick, mortar and related materials used in drain system construction shall conform to the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) available from the City of Worcester Department of Public Works & Parks or online at <http://www.worcesterma.gov/uploads/71/11/71117081c8b68ca78d082bce4ef5a81a/standard-specs.pdf>

#### **2.07 NYLOPLAST IN-LINE DRAIN**

- A. PVC surface drainage inlets shall be of the inline drain type as indicated on the contract drawing and referenced within the contract specifications.
- B. The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer.
- C. The surface drainage inlets shall be as manufactured by Nyloplast a division of Advanced Drainage Systems, Inc., or prior approved equal.
- D. The inline drain required for this contract shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the furnished configuration.
- E. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the inline drain body by use of a swage mechanical joint. The raw material used to manufacture the pipe stock that is used to manufacture the inline drain body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.



- F. The grates furnished for all surface drainage inlets shall be ductile iron grates for sizes 8", 10", 12", 15", 18", 24" and 30" shall be made specifically for each fitting so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for inline drains shall be capable of supporting H-20 wheel loading for traffic areas or H-10 loading for pedestrian areas. 12" and 15" square grates will be hinged to the frame using pins. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron. Grates shall be provided painted black.

**2.08 SCHEDULE 40 PIPE USED FOR SUBDRAIN PURPOSES IN THE UNDERGROUND DETENTION AREA & RETAINING WALL AREA**

- A. All Schedule 40 PVC pipe and fittings shall conform to ASTM D178M, D3915, ASTM D1785, ASTM D3915, and ASTM D4396.
- B. Pipe shall be provided with perforations and wrapped in filter fabric or stone/fabric as called for on the Drawings.
- C. Pipe shall be perforated as called for on the Drawings. Perforations shall be set in order to maximize flow of water into the pipe from the bottom.

**2.09 ADS N-12 ST IB GRAVITY DRAIN PIPE & CAP**

- A. ADS N -12 ST IB pipe and caps used in gravity drain applications shall be manufactured by Advanced Drainage Systems, Inc. and shall conform to the manufacturer's specifications.
- B. Pipe and pipe caps shall be soil tight (ST) unless otherwise noted on the Drawings.
- C. Pipe size and caps shall be as specified on the Drawings.
- D. Pipe shall be provided with perforations as called for on the Drawings.

**2.10 GRAVEL BORROW**

- A. See Worcester Special Conditions and Specifications.

**2.11 ORDINARY BORROW**

- A. See 31 23 10 – Section 2.01

**2.12 CRUSHED STONE**

- A. Crushed Stone shall conform to MA DOT Specification *M2.01.0* through *M2.01.6* for the applicable size of stone

**2.13 SAND BORROW**

- A. Sand Borrow (used in areas outside of irrigation trenches) shall consist of clean inert, hard, durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials. The allowable amount of material passing a No. 200 sieve as determined by AASHTO-T11 shall not exceed 10% by weight.
- B. The maximum particle size for Sand Borrow shall be as follows:  
  
M 1.04.0 Type a                      1/4 in.
- C. The use of processed glass aggregate shall not be allowed.



## 2.14 SUITABLE FILL

- A. Suitable fill shall consist of material soil free from organic materials, loam, and any deleterious materials. Suitable fill shall not contain stones larger than 10” in any dimension and shall have less than 75% passing the No.4 sieve and a maximum of 20% passing the No. 200 sieve. Suitable fill shall not contain any building rubble, granite or concrete block, roofing materials, or other construction refuse. At the time of placement, suitable fill shall not contain frost, snow, ice, and shall not contain water greater than the optimal moisture content.

## 2.15 RIP RAP

- A. Stone used for rip rap shall be hard, durable, angular in shape, resistant to weathering. Stones shall be free from overburden, spoil, shale and organic materials.
- B. Stones shall have a minimum dimension identified on the Drawings.
- C. Neither the breadth nor the thickness of a single stone shall be less than 1/3 its length.
- D. Rounded stones or boulders shall not be accepted.

## 2.16 FILTER FABRIC

- A. Filter fabric used in the following locations shall be Mirafi 140NL manufactured by Mirafi/Tencate 365 South Holland Drive Pendergrass, GA 30567 Tel: (800) 685-9990 Tel: (706) 693-2226 Fax: (706) 693-4400 [www.mirafi.com](http://www.mirafi.com)
1. Below rip rap/stone at discharge ends of pipes
  2. Below stone check dams
  3. Wrapping sub-drains in the detention area and at the outlet control structure
  4. Associated with drains behind the retaining wall
  5. Around the detention area stone
  6. Separating existing materials from imported materials at the detention area
  7. Any other location specified on the C Sheets.

## 2.17 PRESSURE TREATED WOOD MARKERS

- A. Pressure treated wood used to mark stub locations shall be southern yellow pine and shall have nominal dimensions of 2 inches by 4 inches.
- B. Wooden stubs shall be of sufficient length to be set vertically with one end 6 inches below the stub invert and the other end set 6 inches below finish grade.

## 2.18 GRANITE CURB

- A. Granite curb used to replace the existing concrete curb shall be Type VA4 and shall conform with MA DOT Specification *M9.04.1 Granite Curb*.

## PART 3 - EXECUTION



### **3.01 DRAIN STRUCTURE LAYOUT**

- A. The Contractor shall furnish the services of a Professional Land Surveyor registered in the Commonwealth of Massachusetts to provide construction layout of the new (and any future) drain structures.
- B. The survey layout shall be used to establish accurate locations and to ensure drain structures are installed in the locations depicted on the drawings and shall provide reference points for stub installations.

### **3.02 INSTALLATION OF DRAIN MANHOLES**

- A. Unless otherwise specified in the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) installation of drain manholes shall conform to the following:
- B. Excavations for reinforced concrete manholes shall be sufficient enough to accommodate base courses and fill around the structures as indicated on the Drawings.
- C. Gravel bases and backfill shall be placed and compacted to 95% MMD so that the structures do not settle and no settling occurs immediately around the structures.
- D. Manhole shall be set level so that the walls are plumb and can accommodate the inverts specified on the Drawings.
- E. Construct inverts within drain manholes with the inverts and elevations shown on the Drawings.
- F. Slabs, cones, brick leveling course, hood and rims/grates shall be constructed as shown on the Drawings.

### **3.03 BRICK WORK:**

- A. Unless otherwise specified in the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) brick work shall conform to the following:
- B. Bricks shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
- C. Each brick shall be laid as a header in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded.
- D. Brick inverts (where applicable) shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipe.

### **3.04 INSTALLATION OF GRAVITY DRAIN PIPE (NOT USED FOR UNDERGROUND DETENTION)**

- A. Unless otherwise specified in the City of Worcester Department of Public Works & Parks Standard Specifications & Details dated March 20, 2019 (or subsequent revision) installation of gravity drain pipe shall conform to the following:



- B. No pipe shall be laid unless it is straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-in per foot of length. Sections of pipe that fail to meet this criterion shall be rejected. If a section of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site.
- C. Pipes shall be laid in accordance with any applicable manufacture's specifications.
- D. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when laid.
- E. The trench for the pipe shall be excavated to the required line and grade and of sufficient width to permit thorough tamping of the fill material under the haunches and around the pipe.
- F. Soft or unsuitable material encountered below the normal bedding line of the pipe shall be removed as directed, replaced with crushed stone and thoroughly compacted.
- G. If any cross pipes, conduits, drains, or other unforeseen obstacles are encountered in the excavation, the grade of the bottom of the trench may be raised or lowered during the excavation operation as directed by the Engineer. Use concrete or other approved support under existing pipes passing through the excavation where said pipe would normally be supported by backfilled earth.
- H. All pipes shall be laid true to the specified lines and grades. For all pipe, the bell end shall be toward rising grade and each section of pipe shall have a firm bearing throughout its length. Material placed around and under the pipe shall be free of stones larger than 3 inches in diameter.
- I. Pipe bedding and blanket material shall be as shown on the Drawings as specified herein.
- J. Where rock in either ledge or boulder formation is encountered, it shall be removed to a line 12 inches below the bottom of the outside of the pipe barrel. No part of any rock remaining in the trench shall come within 12 inches of any portion of the pipe.
- K. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end.

**3.05 INSTALLATION OF ADS N-12 DRAIN PIPE (USED FOR UNDERGROUND DETENTION)**

- A. See Drawings for excavation and backfill requirements below the underground detention area.
- B. See 31 23 10 for Proof Compaction requirements.
- C. Installation of ADS N-12 gravity drain pipe, manifolds, connections, backfill, and all other appurtenances used for underground detention shall be in accordance with the specifications provided by the manufacturer Advanced Drainage Systems, Inc.

**3.06 NYLOPLAST IN-LINE DRAIN INSTALLATION**

- A. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures.
- B. The backfill material shall be crushed stone or other granular material meeting the requirements of Class 1, Class 2, or Class 3 materials as defined in ASTM D2321.



- C. Bedding and backfill for surface drainage inlets shall be well placed and compacted uniformly in accordance with ASTM D2321.
- D. The drain basin body will be cut at the time of the final grade.
- E. No brick, stone or concrete block will be required to set the grate to the final grade height. For H-20 load rated installations, a concrete ring will be poured under and around the grate and frame. The concrete slab must be designed taking into consideration local soil conditions, traffic loading, and other applicable design factors.
- F. For other installation considerations such as migration of fines, ground water, and soft foundations refer to ASTM D2321 guidelines

**3.07 GRANITE CURB**

- A. Granite curb shall be installed in accordance with MA DOT Specification *Section 501 Curb, Curb Inlets, Curb Corners and Edging*.
- B. Joints mortared in accordance with MA DOT *Section 501.67 Pointing*.
- C. Curb shall be installed to provide the reveal indicated on the Drawings.

**3.08 CLEANING OF NEW PIPING AND STRUCTURES**

- A. At the conclusion of the work, thoroughly clean all new drain basins, manholes, and pipelines by flushing with water or other means. All dirt, stones, wood, or other deleterious material found in the pipes shall be removed and disposed of accordingly. In no case shall debris within the pipe be allowed to flow to the downstream drain system.

**3.09 CLEANUP**

- A. The Contractor shall remove all debris, excess materials, equipment related to the storm drain installation from the site.

**END OF SECTION**