HAZELWOOD PARK LAWN BOWLING PROJECT
NEW BEDFORD, MASSACHUSETTS

GARDNER+GERRISH, LLC
LANDSCAPE ARCHITECTS
PROVIDENCE, RHODE ISLAND

ADDENDUM #1
5 AUGUST 2019

The following represents Addendum #2 for the Hazelwood Park lawn Bowling Project. All materials are “or equal”. To review the changes and additions:

ITEM NO. 1 MAINTENANCE PLAN

Please see attached REVISED Appendix A Maintenance Plan.

ITEM NO. 2 IRRIGATION PLAN I-2

Base bid water fountain supply line is 1” copper SIZED polyethylene pipe. Pipe is only copper after gate valve and in cabinet.

ITEM NO. 3 GRADING SHEET

a. Replace 6” HDPE drain line with 8” HDPE.

CLARIFICATIONS:

1. A Project Construction Sign is required for this project. See Specifications page
2. Add Alternate #3: Under Section 2.13 of 38400, all valves shall open RIGHT. Make sure the inside of the valve is chlorinated with 5.26% chlorine solution before being installed (for the fountain).
3. Add Alternate #3 additional specifications:

CHLORINATION OF PIPELINES

1. Before being placed in service, all new potable water pipelines (including plant water) shall be chlorinated using the continuous feed methods in AWWA C651. The procedure shall be approved by the Landscape Architect in advance.
2. The location of the chlorination and sampling points will be determined by the Landscape Architect in the field. Taps for chlorination and sampling shall be installed. Uncover and backfill taps as required.
3. The general procedure for chlorination shall be first to flush all dirty
discolored water from the lines and then introduce chlorine in approved
dosages through a tap at one end, while water is being withdrawn at the other
end. The chlorine solution shall remain in the pipeline for 24 hours.
4. Following the chlorination period, all treated water shall be flushed from the
lines at their extremities and replaced with potable water. All treated water
flushed from the lines shall be disposed of by discharging to the nearest
sanitary sewer or by other approved means. No discharge to any storm drain
or natural course will be allowed. Bacteriological sampling and analysis of
the replacement water may then be made by the Landscape Architect in full
accordance with AWWA C651. Rechlorinate, if necessary and the line shall
not be placed in service until the requirements of the State Public Health
Department are met.
5. Special disinfecting procedures shall be used in connection to existing
pipelines and where the method outlined above is not practicable.
6. All adjoining potable water pipelines (at ends) shall be kept clean and shall
be swabbed with a 5.26 percent chlorine solution just prior to installing the
pipes, valves, components, fittings and appurtenances. Contractor shall
provide necessary labor and equipment for disinfection.

4. Irrigation cabinet will be located within the fence boundary. Additional 2”
copper piping might be necessary to connect.
5. All plinth and bank hardware are Type 316 stainless steel.
6. Base bid electrical conduit is Schedule 40, size per drawing.
7. Base and Add Alternate #4 hand holds are: locking, Carlson hand hold E989N or
approved equal.
## Technical Specifications

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>01100</td>
<td>General Requirements</td>
<td>01100-1 to 01100-14</td>
</tr>
<tr>
<td>02001</td>
<td>Mobilization/Demobilization</td>
<td>02001-1 to 02001-3</td>
</tr>
<tr>
<td>02100</td>
<td>Site Preparation and Demolition</td>
<td>02100-1 to 02100-6</td>
</tr>
<tr>
<td>02200</td>
<td>Earthwork</td>
<td>02200-1 to 02200-14</td>
</tr>
<tr>
<td>02301</td>
<td>Lawn Bowling</td>
<td>02301-1 to 02301-5</td>
</tr>
<tr>
<td>02400</td>
<td>Storm Drainage System</td>
<td>02400-1 to 02400-5</td>
</tr>
<tr>
<td>02510</td>
<td>Bituminous Concrete Paving</td>
<td>02510-1 to 02510-4</td>
</tr>
<tr>
<td>02800</td>
<td>Site Furnishings</td>
<td>02800-1 to 02800-7</td>
</tr>
<tr>
<td>02821</td>
<td>Wood Fence and Gate</td>
<td>02821-1 to 02821-3</td>
</tr>
<tr>
<td>02920</td>
<td>Turf</td>
<td>02920-1 to 02920-8</td>
</tr>
<tr>
<td>02930</td>
<td>Plants</td>
<td>02930-1 to 02930-9</td>
</tr>
<tr>
<td>03100</td>
<td>Concrete Formwork</td>
<td>03100-1 to 03100-3</td>
</tr>
<tr>
<td>03200</td>
<td>Concrete Reinforcement</td>
<td>03200-1 to 03200-2</td>
</tr>
<tr>
<td>03225</td>
<td>Concrete Accessories</td>
<td>03225-1 to 03225-1</td>
</tr>
<tr>
<td>03300</td>
<td>Site Cast-in-Place Concrete</td>
<td>03300-1 to 03300-8</td>
</tr>
<tr>
<td>03345</td>
<td>Site Cast-in-Place Concrete Finishes</td>
<td>03345-1 to 03345-3</td>
</tr>
<tr>
<td>06100</td>
<td>Rough Carpentry</td>
<td>06100-1 to 06100-9</td>
</tr>
<tr>
<td>06110</td>
<td>Wood Structure</td>
<td>06110-1 to 06110-3</td>
</tr>
<tr>
<td>16050</td>
<td>Basic Electrical Materials and Methods</td>
<td>16050-1 to 16050-1</td>
</tr>
<tr>
<td>32840</td>
<td>Irrigation System</td>
<td>32840-1 to 32840-26</td>
</tr>
</tbody>
</table>

Appendix A  Maintenance Plan
Appendix B  Test Pit Data
SECTİON 01100
GENERAL REQUIREMENTS

All work done under this Contract shall be in conformance with the latest version of Massachusetts Department of Transportation (MADOT) Standard Specifications for Highways and Bridge dated 1988, as amended, the Supplemental Specifications dated July 1, 2015, the Massachusetts Standard Details 2017 Edition, the MADOT Traffic Management Plans and Details Drawings, the latest Manual on Uniform Traffic Control Devices, and the latest edition of the American Standards for Nursery Stock, the Drawings and these Supplemental Technical Specifications. Where these standards conflict with the Supplemental Technical Specifications or Drawings, the more stringent shall apply.

SCOPE OF WORK

The general summary of work to be done under this contract (Base Bid and Bid Alternates 1 through 7) consists of furnishing and installing, but shall not be limited, to the following as shown in the Contract Documents:

- Mobilization and provide controls as necessary to ensure public safety and facilitate construction;
- Maintenance and further installation of erosion and sediment control devices;
- Removal and proper disposal of existing unclassified material including saw cutting, pavement;
- Earthwork and site preparation including rough grading of stormwater management facilities;
- Installation of Directional, Regulatory, Warning and Guide signage;
- Installation of temporary fencing for site control;
- Installation of electrical connections including but not limited to all conduits, ducts, wiring, and connections;
- Connection to existing water service;
- Lawn bowling greens
- Subsurface drainage;
- Irrigation system and controller;
- Wood fence and gates;
- Installation of benches;
- Drain pipe connections to existing stormwater system;
- Bituminous concrete pavement cut and repair;
- Pavement patching and replacement;
- Loam installation for disturbed areas within the site;
- Test pits;
- Materials testing and acceptance;
- Surveying;
- Coordination with public and private utilities;
- Installation of plantings and hydroseeding; and
- Demobilize and final cleanup of the site including removal of remaining erosion and sediment control devices and any remaining sediment, pavement sweeping

**METHOD OF AWARD**

The Contract will be awarded to the lowest responsible and eligible bidder (Successful Bidder) based on the Total Bid Price for the Base Bid. The Owner may elect to increase the scope of work by adding Bid Alternate No. 1 or Bid Alternate No. 1 plus Bid Alternate No. 2 or Bid Alternate No. 1 plus Bid Alternate No. 2 plus Bid Alternate No. 3, or Bid Alternate No. 2 or Bid Alternate No. 1 plus Bid Alternate No. 2 plus Bid Alternate No. 3 plus Bid Alternate No. 4, or Bid Alternate No. 2 or Bid Alternate No. 1 plus Bid Alternate No. 2 plus Bid Alternate No. 3 plus Bid Alternate No. 4 plus Bid Alternate No. 5, or plus Bid Alternate No. 4 plus Bid Alternate No. 5 plus Bid Alternate No. 6 plus Bid Alternate No. 7 to the Contract should sufficient funds be available. Such Bidder shall possess the skill, ability and integrity necessary for the faithful performance of the work. The term “lowest responsible and eligible Bidder” as used herein shall mean the Bidder whose Bid is the lowest of those Bidders possessing the skill, ability and integrity necessary to faithful performance of the Work.

**SPECIAL PROVISIONS**

The City of New Bedford Water Department shall operate all valves. The Owner will within 72-hours of notice from the Contractor, operate all valves for isolating watermains, and for draining or admitting water to various sections of the main, and at the request of the Contractor, dewater such sections of the main to the extent possible by gravity, but the Contractor shall be responsible for removing the remainder of the water. No damage shall be claimed by the Contractor for delays in isolating pipelines, dewatering pipelines whether or not such dewatering is done by him/her or the Owner nor shall any damage be claimed because of water leakage through closed valves after dewatering is complete. The Owner will be responsible for shutting down the necessary lines to allow the Contractor to install and restrain new valves as shown on the Drawings.

Under no circumstances will the Contractor be allowed to use the senior center parking lot for storage of material or parking of vehicles. In addition, the newly paved parking lot to the west of the site shall also not be used for parking.

Contractor should be advised that additional work within the Park may be occurring simultaneously. This includes work by Eversource Electric, the City of New Bedford and P.A. Landers.

The reconstruction profiles and final grading contours shown on the Drawings are for quantity estimate purposes only. Prior to final grading, the Contractor will be required to coordinate with the Landscape Architect to establish survey control, stake elevations for the purposes of grading the site and make all adjustments to final line and grade as required by the Landscape Architect. The Landscape Architect reserves the right to make such modifications in locations as may be found desirable to achieve proper slope or for other reasons at no additional cost to the Contract or change in contract duration.

Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights or other means to prevent accidents to persons and damage to property. As mandated by Chapter 82A of the Massachusetts General Law, trench safety regulations require that all Contractors,
whether public or private, take specific precautions to protect the general public and prevent unauthorized access to unattended trenches.

Excavate test pits, at the direction of the Landscape Architect, to locate underground pipelines or structures in advance of the construction. Backfill test pits immediately after their purpose has been satisfied and restore and maintain the surface in a manner satisfactory to the Landscape Architect. Test pit excavation, backfilling and restoration shall be considered incidental to the cost of the project.

Reimburse the Owner for the actual cost of services of Public Infrastructure and/or Water Department Personnel required during other than regular working hours. The emergency contact number for the Water Department during non-business hours is 508-979-1550.

The Contractor shall be responsible for making any and all additional field investigations (at his/her own cost) prior to finalizing his/her bid. The Contractor shall also satisfy him/herself as to the conditions existing within the project area, the type of equipment required to perform the work, the character, quality and quantity of the subsurface materials to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Drawings and related Sections. Any failure of the Contractor to acquaint him/herself with the available information will not relieve him/her from the responsibility for estimating properly the difficulty or cost of successfully completing the work. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the Owner.

Unless otherwise directed by the Owner, the Owner will refill the mainline and sideline connections to various sections of the work after pipe has been sterilized by the Contractor. All air must be purged from the mains before they can be re-pressurized, and the Contractor shall have no claim for delay while the Owner accomplishes this. The Owner may require the Contractor to make the required tap for this purpose.

Obtain all necessary permits required for proper execution of the project. Fill out forms and furnish all drawings required to obtain the permits. A copy of each permit shall be submitted to the Landscape Architect. All fees associated with these permits shall be paid by the Contractor as part of the work. Work shall not commence on any phase of the work requiring a permit until the permit is obtained.

Obtain required street opening permits for excavation within street or sidewalk areas.

Obtain required demolition permit and building permits.

Contractor shall strictly follow the requirements of Chapter 22, Article II Section 28-29 of the New Bedford City Code (latest version) which includes the requirements that all applications for permits to disturb City street surfaces for any reason including the installation or repair of sewer and drainage pipes must be accompanied by a certified check in the amount to be determined by the Commissioner of the New Bedford Department of Public Infrastructure (DPI). Contractor is responsible for all fees required by the City of New Bedford in obtaining these permits with the DPI. Contractor shall determine the current permitting fees prior to submitting the Bid for this project and the Contractor shall be solely responsible for paying all permitting fees.
1. This check is to be held by the DPI as surety that the disturbed street surface will be properly and permanently repaired by the applicant and will be refunded to the applicant upon certification by a City Inspector that the repair is satisfactory. Any minor expenses incurred by the City arising from the pavement disturbance will be deducted from the surety check before refunding same. Major expenses will continue to be handled through the applicant’s bonding company as in the past.

2. Any complaints required deductions from the surety deposit will be noted in the applicant’s performance record in the DPI Engineering Office, and can be considered cause for refusal of future permits.

3. The same Ordinance amendment also makes positive the three (3) year period following the completion of a street pavement repair during which the applicant is held responsible for the condition of the repair.

Make all arrangements with the proper utility companies for bracing and protection of utility poles that may be damaged or endangered by the operations. Work under this includes the related removal and reinstallation of guy wires, or support poles whether shown on the Drawings or not.

The Contractor is required to maintain survey control throughout the duration of the project, and to protect and reset existing monumentation and bench marks. This work shall include, but is not limited to, maintenance and protection of existing control and offset and reset of existing monuments and bench marks by a Registered Professional Land Surveyor in the Commonwealth of Massachusetts. Control may include but is not limited to: iron pipes, stone or concrete bounds, survey/property disks, drill holes in walls, sidewalks and solid surfaces. Drill holes shall not be set in bituminous concrete.

In the event of inclement weather, the Contractor and subcontractors shall protect the Work and materials from damage or injury from the weather. If in the opinion of the Landscape Architect, any portions of the work or materials has been damaged by reason of failure on the part of the Contractor or subcontractors to so protect the Work, such Work and materials shall be removed and replaced with new materials to the satisfaction of the Landscape Architect at no additional cost or time extension.

All equipment to be furnished under this Contract, unless specified otherwise in the technical specifications, shall be designed to ensure that the sound pressure levels does not exceed 85 decibels over a frequency range of 37.8 to 9600 cycles per second at a distance of 3-ft from any portion of the equipment, under any load condition, when tested using standard equipment and methods. Noise levels shall include the noise from the monitor. Mufflers or external baffles shall not be acceptable for the purpose of reducing noise. Data on noise levels shall be included with the shop drawing submittal.

**WORKING HOURS**

Regular working hours are defined as 8 hours per day, Monday through Friday, excluding holidays between the hours of 7:00 am and 5:00 pm. Request to work other than regular working hours shall be submitted to the Landscape Architect not less than 72 hours prior to any proposed weekend work or scheduled extended work weeks. Occasional unscheduled overtime on weekdays may be permitted provided two hours notice is given to the Landscape Architect.
1. Contractor may be required to work during non-regular working hours (5:00 pm to 7:00 am). Contractor shall be required to notify the Landscape Architect in writing 72 hours in advance. Contractor should be advised that there is no guarantee from the Owner or Landscape Architect that the request will be granted. The Contractor shall have no claim for delay or request for additional cost or time extension as a result of the denial to work extended hours. If the Contractor wishes to work extra hours and the request is granted, Contractor will only be allowed to work 8 hours during that time frame, or proportion his/her time during regular work hours such that the total time worked on a work day does not exceed 8 hours. Should the Contractor exceed 8 hours per day, Contractor will be required to reimburse the Owner for additional Architectural Services as specified below.

2. Contractor shall reimburse Owner for additional Engineering or Architectural Services costs incurred as a result of overtime work in excess of the regular working hours stipulated above. At Owner’s option, overtime cost may either be deducted from the Contractor’s monthly payment requests or deducted from the Contractor’s retainer prior to release of final payment. Overtime costs for the Owner’s personnel shall be based on the individual’s current overtime wage rate. Overtime costs for personnel employed by the Architect or Owner’s independent testing laboratory shall be calculated in accordance with the terms and conditions of their respective contract with the Owner. Overtime costs for personnel employed by the Architect shall be $125.00 per hour per site worked by the Contractor.

CHANGE ORDER PROCEDURE

DESCRIPTION

The Contractor shall comply with this procedure in the process of giving notification of change and preparing and submitting a proposal for adjustment due to a desired, perceived, or actual change in the work. Changes in the work, or period of performance of the work, may be directed in writing by the Owner or Landscape Architect or may be requested by the Contractor. In either case, payment for work accomplished under a modification may not be made until a formal contract modification, incorporating the change into the contract, has been issued and executed. Therefore, it is incumbent upon the Contractor to comply fully with this procedure and to expedite the resolution of changes.

CHANGE SUBMITTALS

When requested, the Contractor shall submit the following within 10 days after the start of the event that gave rise to the request for a claim, to the Owner or Landscape Architect in accordance with the Submittals procedures described in these specifications:

1. Proposal cover letter on Contractor's letterhead;
2. Detailed price proposal;
3. Drawings or other explanatory data; and
4. Time extension statement with justification if any time extension is requested.
COMPLIANCE

The Contractor shall take such measures as needed to assure familiarity and compliance by its staff with these procedures. If change proposals are incomplete, unclear, or ambiguous or are not supported by adequate documentation, the data will be returned and the Contractor shall resubmit or supplement the proposal as requested by the Owner or Landscape Architect. Delay resulting from the Contractor's noncompliance with this procedure shall not in itself constitute the basis for an extension in the time of performance under the contract.

PROCESSING CHANGES INITIATED BY THE LANDSCAPE ARCHITECT

The Landscape Architect will initiate changes only in writing. The Owner will sign any Request for Proposal (RFP). This will establish a Proposed Change (PC) number, by which the change will be identified until such time as it may be incorporated into the contract by formal modification.

The Contractor may or may not be authorized to proceed with the changed work pending resolution of changes in the contract price or time of performance. If the work described in the RFP becomes critical to the timely performance of the Contractor's work, a written request for a Notice to Proceed must be forwarded to the Owner immediately. The Owner will issue any Notice to Proceed. This unilateral modification to the contract may be subject to further negotiation regarding price and time for completion.

Payment for changed work, covered by a unilateral modification, will not be made until a bilateral modification covering the changed work has been executed.

The Contractor shall prepare and submit its proposal for change to include at a minimum:

1. A cover letter referencing the PC number and citing the attachments, if any, which constitute the Contractor's total proposal.
2. A detailed price proposal showing labor, construction equipment, and material quantities and prices at the lowest practical level of each element of the work.
3. Any drawings, sketches, catalog cuts, samples, certifications, or other data required to be submitted by the Owner or Landscape Architect or that is required to fully document Contractor's work under the proposed change.
4. A statement of the proposed change in the time of completion of the contract, together with all required justification for such a change.
5. A statement to the effect that there is "no change in price and/or time of completion of the work under this contract as a result of this proposed change", if that is the case.

The Owner may accept the Contractor's proposal without negotiation. Alternatively, upon receipt of a proposal which is satisfactory in form, the Owner or Landscape Architect may require negotiation with the Contractor to arrive at a fair and equitable change in the contract price and time of completion. Upon agreement, a contract modification will be issued by the Owner for Contractor's execution.

PROCESSING CHANGES INITIATED BY THE CONTRACTOR

Should the Contractor feel that a change to the work under the contract, or to the contract itself, is necessary or desirable, it shall propose such a change to the Owner or Landscape Architect. This
The City of New Bedford
Hazelwood Park Lawn Bowling

proposed change shall include a clear and concise description of the proposed change, along with that information cited in above.

Within a reasonable time, the Owner or Landscape Architect will review the Contractor's proposal and determine if the proposed change is in the Owner's best interest. If so, Contractor will be advised of this and a PC number will be assigned to Contractor's proposal.

**EXECUTING CHANGED WORK**

The Contractor is cautioned not to proceed with the work described in a proposed change until it is authorized to do so in writing by the Owner or Landscape Architect.

Any claim not responded to within 30 days shall be deemed denied by the Landscape Architect and/or Owner.

**INSPECTION OF WORK**

**DESCRIPTION**

Work included in this Section consists of periodic observation of construction of the project. The Contractor's work shall be monitored periodically by the Owner or Landscape Architect.

The Owner or Landscape Architect does not anticipate that a full-time construction observation will be assigned to this work. The Owner or Landscape Architect will provide periodic field visits as identified in the Drawings.

The Owner or Landscape Architect’s construction observation work is inspectional in nature and will not include supervision or direction of the actual work of the contractor.

In no event will the Owner or Landscape Architect be responsible or liable for the Contractor’s use or administration of personnel, machinery, staging, or other temporary or precautionary construction, safety precautions or procedures, or for compliance by the contractor with the provisions, terms, or specifications of the contract. Observation services provided by the Owner or Landscape Architect are solely for the benefit of the Owner.

The Contractor shall keep the Owner or Landscape Architect informed concerning the work status and projected work schedule through regular communications.

The Contractor shall not cover any work related to the required field visits until one of the following occurs:

1. The Contractor is authorized by the Owner or Landscape Architect to proceed after the field visit.
2. The field visit is rescheduled by the Owner or Landscape Architect to a later construction event
3. The field visit is waived in writing by the Owner or Landscape Architect.
The Contractor shall submit a written request for a Final Inspection seven calendar days in advance of the planned completion date. After review of the Notice of Completion, the Owner or Landscape Architect may reject the Notice for cause or schedule the Final Inspection. The Owner or Landscape Architect will perform its Final Inspection on all phases of the work and develop a comprehensive punch list, which will be provided to the Contractor.

The Completion Verification Inspection will be scheduled when the punch list items discovered during the Final Inspection have been corrected. The Owner or Landscape Architect may add new items to the punch list at this inspection.

The Contractor is advised that the Owner or Landscape Architect will not accept the work until the Owner or Landscape Architect determines substantial completion has been achieved. Therefore, to minimize its risk, the Contractor should schedule its work to be substantially complete in time to allow the Final Inspection, punch list work, and Completion Verification Inspection to occur in advance of the Contract Completion Date. Due to the construction time period and the anticipated weather conditions, substantially complete will be defined as the completion of construction for all item and the temporary stabilization of all disturbed areas, excluding planting and final seeding. Planting and final seeding is to occur during the time periods specified in the Drawings.

Nothing in this Section shall be construed to limit the Owner’s or Landscape Architect’s or right to inspect the work at any time.

CONSTRUCTION SCHEDULES AND SCHEDULE OF VALUES

DESCRIPTION

Work included in this Section consists of preparation, submittal, and updating of the project.

CONSTRUCTION SCHEDULE

Submit the following to the Owner or Landscape Architect in accordance with the Submittals Section. Submittals are for the record or approval as indicated.

1. The proposed construction schedule shall be submitted for approval within five (5) calendar days after receipt of Notice to Proceed.
2. Submit contract Weekly Summary Reports to the Owner or Landscape Architect for the record on a weekly basis.
3. Submit construction progress schedule as backup to progress invoices.

The construction schedule shall show all work activities for completion of the work to be performed under this contract and will reflect Contractor's general sequential approach to the work. The construction schedule will be in an arrow diagram, precedence diagram, or bar chart format. The minimum level of detail (number of activities) shall include the activities described in the Schedule of Values and the Scope of the Work. The construction schedule shall demonstrate completion of all work within the period of performance of the contract in a reasonable and achievable manner.
PERIODIC SCHEDULE UPDATES

The Contractor shall support periodic payment requests with an approved construction schedule marked to indicate progress. Submit updated schedule as necessary.

When in the opinion of the Owner or Landscape Architect, changes in the work occur that significantly affect the schedule, the Contractor shall submit a revised construction schedule for approval. The revised construction schedule shall be submitted within 10 calendar days after it is requested by the Owner or Landscape Architect. The current approved construction schedule shall be used as a baseline for progress reporting.

CONTRACT WEEKLY SUMMARY REPORT

The Contractor shall maintain a weekly record of actions, events and manpower utilized. This report shall be completed and submitted to the Owner or Landscape Architect at the end of each week. Reports are to be complete and accurately describe actions and events.

SCHEDULE OF VALUES

Submit a schedule of values allocated to the various portions of the work, in accordance with the General Conditions of the Contract.

Upon request of the Architect, support the values with data which will substantiate their correctness.

The acceptance of Schedule of Values shall be used only as the basis for the Contractor’s Applications for Payment.

SUBMITTAL PROCEDURES

DESCRIPTION

This Specification Section covers the preparation and submission of all work plans, drawings, samples, manufacturer's literature and brochures, installation instructions, and operation and maintenance manuals as specified herein and in the various sections of these Specifications.

A Submittal Schedule shall be submitted for approval within five (5) calendar days after receipt of Notice to Proceed.

DRAWINGS

The term "drawings" as used herein includes fabrication, erection and installation, layout, and setting drawings; lists or schedules of materials and catalogues and brochures; performance and test data; and all other drawings and descriptive data pertaining to materials and methods of construction as may be required to show that the materials, equipment, or systems and the positions thereof conform to the requirements of the Contract Documents.

When requested by the Owner or Landscape Architect, drawings shall be accompanied by design
computations.

Sheet sizes of drawings shall not exceed 24 in. by 36 in. The title block on all drawings shall bear the name of the Owner and the name of the project and shall include a space for the Owner's index number.

The Contractor's drawings shall be submitted electronically in PDF format to the Owner or Landscape Architect for review and approval.

The Contractor shall maintain a complete set of construction drawings at the jobsite, clearly marked to reflect as-built conditions. Upon completion of the work, the Contractor shall submit these Record Drawings to the Owner or Landscape Architect.

The Owner or Landscape Architect will review drawings and schedules only for conformance with the design of the Project and for compliance with the Contract Documents and Contract Drawings. The Contractor shall make any and all corrections required by the Owner or Landscape Architect.

Drawings shall be reviewed and returned within ten (10) working days of receipt of drawings at jobsite. Drawings and all supporting data, catalogs, or similar information shall be prepared by the Contractor or his suppliers and subcontractors but shall be submitted as instruments of the Contractor.

The Owner or Landscape Architect’s review of drawings will be of a general nature and shall not relieve the Contractor from responsibility for errors and omissions of any sort, for deviations from Drawings or Specifications, or for conflict with the work of others that may result from such deviations. The Owner or Landscape Architect’s review of drawings will not relieve the Contractor of responsibility to complete the work in accordance with the requirements of the Contract Documents.

After Notice of Award, the Contractor shall submit a Drawing Submittal Schedule to the Owner or Landscape Architect. The Contractor's drawing schedule shall be brought up to date from time to time to show the latest changes, omissions, and additions. The Schedule will be based on the Contractor's Construction Schedule and will show when the Contractor will submit the drawings and when he/she expects them to be returned so that construction activities shown on the Construction Schedule are not interrupted. There will be a minimum of three weeks between these two activities. Specific methods and routines for handling drawing reviews shall be established in advance within the general framework of the Contract Documents.

Work for which the Contractor's submittals are required shall not be started until the submittals have been reviewed and accepted in writing by the Owner or Landscape Architect. Any revision by the Contractor of a previously accepted submittal must be accepted in writing by the Owner or Landscape Architect before implementation.

**SAMPLES**

The Contractor shall, at his expense, furnish the Owner or Landscape Architect with samples of the various materials thereon specified in the Specification and Drawings. Samples shall be sent to the office of the Owner or Landscape Architect at the Contractor’s expense.
PRODUCT DATA

The Contractor shall submit to the Owner or Landscape Architect product data for all items required by the Specification and Drawings to be furnished by the Contractor in accordance with the approved schedule.

SUBMITTAL SUMMARY TABLE

<table>
<thead>
<tr>
<th>Submittal Name</th>
<th>Required For</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measurement and Payment</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Schedule of Prices</td>
<td>A</td>
</tr>
<tr>
<td>▪ Project Invoices</td>
<td>A</td>
</tr>
<tr>
<td><strong>Change Procedure</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Change Requests</td>
<td>A</td>
</tr>
<tr>
<td><strong>Schedule of Work</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Construction Schedule</td>
<td>A</td>
</tr>
<tr>
<td>▪ Week Summary Reports</td>
<td>R</td>
</tr>
<tr>
<td>▪ Invoice Backup Information</td>
<td>R</td>
</tr>
<tr>
<td><strong>Submittals and Substitutions</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Submittal Schedule</td>
<td>A</td>
</tr>
<tr>
<td><strong>Quality Control</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Subcontractor Qualifications</td>
<td>A</td>
</tr>
<tr>
<td><strong>Material and Equipment</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Product Substitution Request (if applicable)</td>
<td>A</td>
</tr>
<tr>
<td><strong>Closeout Procedures</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Record Drawings</td>
<td>R</td>
</tr>
<tr>
<td>▪ Record Specifications</td>
<td>R</td>
</tr>
<tr>
<td><strong>Warranties</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Standard Warranties</td>
<td>R</td>
</tr>
<tr>
<td>▪ Special Warranties</td>
<td>R</td>
</tr>
</tbody>
</table>

NOTES
1. This table is intended to summarize all submittals required by the Contract. Where a submittal is called for in the Specification or Contract but is not itemized herein, the number of copies and distribution will be same as similar documents listed unless directed otherwise by the Landscape Architect.
2. Legend A – Approval Required R – Project Record
3. The number and type of documents submitted for all submittals that include drawings will be as specified in the Submittals and Substitutions section or related sections.

All submittals will be reviewed no more than twice at the Owner’s expense. All subsequent submittal reviews will be performed at the Contractor’s expense. Reimburse the Owner for all costs invoiced by the Architect for the third and subsequent reviews. The Architect’s standard rate is $150 per hour.
PROJECT SIGN

1. Provide a project sign. Location to be determined by the Landscape Architect. Sign shall have, at a minimum, the following information on it:
   a. Title of project
   b. Name of Owner
   c. Name and title of authorities
   d. Name and title of Landscape Architect
   e. Prime Contractor
   f. Statement on any special funding sources
2. Sign shall be plywood construction.
3. Final sign including dimensions shall be approved by the Landscape Architect.

QUALITY CONTROL

DESCRIPTION

This Section provides the requirements for Contract quality control (QC) pertaining to the Work, including:

1. QC of products and workmanship;
2. Manufacturer's instructions; and
3. Manufacturer's certificates and field services.

WORKMANSHIP

The Contractor shall comply with industry standards of the region, except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

The Contractor shall provide suitably-qualified personnel to produce work of specified quality.

The Contractor shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

The Contractor shall provide materials to match approved samples.

MANUFACTURER'S INSTRUCTIONS

The Contractor shall require compliance with instructions in full detail, including each step in sequence. Should instructions conflict with the Contract Documents, the Contractor shall request clarification from the Landscape Architect before proceeding.

MANUFACTURER'S CERTIFICATES

When required in individual Specifications sections, the Contractor shall submit manufacturer's certificates, in duplicate, certifying that products meet or exceed specified requirements.
The City of New Bedford
Hazelwood Park Lawn Bowling

TESTING LABORATORY SERVICES (NIC)

The Contractor shall employ and pay for services of an independent testing laboratory to perform the material tests and other services required by the Specification and Drawings.

The services will be performed in accordance with the requirements of governing authorities and with specified standards.

The reports will be submitted to the Landscape Architect in duplicate giving observations and results of the tests, indicating the compliance or non-compliance with specified standards and with the Contract Documents.

The Contractor shall cooperate with testing laboratory personnel and furnish tools, samples of materials, design mix, equipment, storage, and assistance as requested.

The Contractor shall notify the Landscape Architect and the testing laboratory 24 hours prior to expected time for operations requiring testing services.

The Contractor shall make arrangements with the testing laboratory and pay for additional samples and tests for the Contractor's convenience.

MANUFACTURER'S FIELD SERVICES

When required by the manufacturer or Landscape Architect, the Contractor shall have the manufacturer provide a qualified representative to observe field conditions, conditions of surfaces and installation, and quality of workmanship as applicable and to make written report of observations and recommendations to the Owner or Landscape Architect.

AUTHORITY OF LANDSCAPE ARCHITECT

The Landscape Architect or Owner will decide all questions that may arise as to the quality and acceptability of materials furnished. All questions that may arise as to the interpretation of the Contract Drawing and Specifications shall be determined by the Landscape Architect.

The Landscape Architect will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions and programs incident thereto, and the Landscape Architect will not be responsible for the Contractor's failure to perform the work in accordance with the Contract Documents.

The Landscape Architect will not be responsible for the acts or omissions of the Contractor or any subcontractors, of the agents or employees of any Contractor or subcontractor, or of any other persons at the site or otherwise performing any of the work.

COORDINATION OF DRAWINGS AND SPECIFICATIONS

The Contractor shall take no advantage of any apparent error or omission in the Contract Drawings or Specifications. In the event the Contractor discovers such an error or omission, he/she shall immediately notify the Landscape Architect. After consultation with the Landscape Architect, the Landscape Architect will make such corrections and interpretations as may be
deemed necessary for fulfilling the intent of the Contract Drawings and Specifications.

When general reference is made on the Contract Drawings or within the Specifications to any cited Standard Specifications, it shall refer to the current edition of such Specifications or the latest revision thereof or interim Specifications adopted and in effect on the date of Effective Date of Agreement. In the event of a conflict between the Contract Drawings and the specifications, the Landscape Architect shall be notified to provide a clarification to the Contractor. If none is given, the more stringent shall apply.

COOPERATION WITH UTILITIES

The Contractor will notify all utility companies, all pipeline owners, or other parties affected and endeavor to have all necessary adjustments of the public or private utility fixtures, pipelines, and other appurtenances within or adjacent to the limits of construction made as soon as practical.

Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be crossed, relocated or adjusted are to be moved by the Contractor or its designated agents, except as otherwise noted on the Contract Drawings. In the case of utility lines, the Contractor shall coordinate with the respective utilities for their removal and relocation.

Attention is directed to the possible existence of underground facilities not known to the Owner or Landscape Architect or in a location different from that which is shown on the Contract Drawings. The Contractor shall take steps to ascertain the exact location of all underground facilities prior to doing work that may damage such facilities or interfere with their service.

Payment for coordination with the utility company shall be included in the appropriate item in the Bid Form.

INDEPENDENT TESTING AND INSPECTION (NIC)

The testing and/or inspection firm shall meet requirements specified herein.

1. Independent testing and inspection, when required by the contract, will be performed by an independent testing and/or inspection firm, hereinafter called "the firm", under the authority of a professional Landscape Architect, licensed by the state in which the project is located and within the discipline for which the test and/or inspection is being made. The firm shall be the Contractor's subcontractor. Unless otherwise specified herein, tests shall be performed in accordance with industry standards.

2. When material is proposed for use which is specified to be either certified or tested but cannot be identified with specific certification or test reports, the Landscape Architect may, at its discretion, select random samples from the lot for testing.

These samples shall be prepared in accordance with the referenced test specification and furnished by the Contractor to the firm at the Contractor's expense. The number of samples and tests will be as specified. The cost of testing the samples shall be solely the responsibility of the Contractor.
REQUIREMENTS

The requirements for sampling and testing or inspection are specified in the Specifications and Drawings. The Contractor shall maintain a complete and up-to-date file of all quality control documentation at the jobsite.

DUST CONTROL

Perform dust control operations, in an approved manner, whenever necessary or when directed by the Engineer even though other work on the project may be suspended.

Several materials may be used for dust control, including temporary much, spray on adhesives such as latex emulsions or resin in water sprayed onto mineral soils, sprinkling water, crushed stone or wind barrier in the form of sediment fence or snow fence. Do not use Calcium Chloride or spray on asphalt emulsions on the site as it will hinder and/or prevent the growth of grass/vegetation.

Method of controlling dust shall meet all air pollution standards as set forth by Federal and State regulatory agencies.

Maintain all excavations, embankments, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

Control dust associated with the traffic generated by the work performed under this Contract. The following describes the minimum required by the Contractor in this regard. Assure that all work areas and all roads used are kept free from debris and that dust is adequately controlled. Weather permitting, arrange for street sweeping of the construction traffic route as necessary, or as directed by the Architect and Owner. Owner may request additional street sweeping in the project area and along haul rotes which shall be completed at no additional cost to the Owner. Weather permitting, within one week of discovery or notice from the Owner through the Architect, repair roadways which are damaged as a result of construction related traffic to City streets and as specified in Division 2. Assure that any open truck transporting materials with the potential to generate spillage or dust shall have its bed securely covered by a canvas or plastic tarp to ensure that its load is contained to minimize spillage or dust. Also, assure that all construction related vehicles will be washed as necessary, weather permitting, or otherwise cleaned prior to leaving the site or returning to the City, to remove significant dirt and dust which may be emitted from them during transit. In the event that these minimum measures prove inadequate, the Owner receives verifiable and reasonable complaints covering dust generated by construction or related traffic, furnish such additional dust control measures as may be required to control the dust so generated.

Trucks hauling fill materials from or to the site shall be covered with a tarpaulin and equipped with refuse gates which prevent materials from dropping while the vehicle is moving.

MATERIAL AND EQUIPMENT

DESCRIPTION

This Specification Section includes the requirements for the transportation, handling, storage, and
protection of materials and equipment as specified herein and in the various Sections of these Specifications. This Section also addresses the procedure for Contractor-proposed product substitutions.

MANUFACTURER REQUIREMENTS

In general, the Contractor shall receive, handle, and store materials and equipment in accordance with manufacturer's recommendations and in a manner which will protect such items from damage or deterioration.

GENERAL

Products include the material, equipment, and systems used on this Project. Comply with the Specifications, Drawings and referenced standards as minimum requirements.

TRANSPORTATION AND HANDLING

The Contractor shall receive, handle, and store materials and equipment supplied by him/her in a manner that will protect such items from damage or deterioration in accordance with procedures provided by manufacturers and the Owner.

Promptly inspect the shipments to assure that the products comply with requirements, the quantities are correct, and the products are undamaged.

STORAGE AND PROTECTION

Materials and equipment shall be stored off the ground on blocking or pallets and shall be covered for protection from vandalism and weather damage.

Materials and equipment shall be stored, tested, and cleaned prior to use, in accordance with the Specification and all specific manufacturers’ requirements. Damaged or nonconforming items shall be removed immediately to a separated storage area for expeditious removal from site.

The Contractor shall provide a secure outside storage area in the vicinity of the site at his/her expense. Any damage to materials stored is the responsibility of the Contractor and shall be replaced at no cost to the Owner.

SUBSTITUTIONS

Substitutions will be considered only when a product becomes unavailable due to no fault of the Contractor or when deemed appropriate by the Owner or Landscape Architect.

Document each request with complete data substantiating the compliance of the proposed substitution with the Contract Documents.

The request constitutes a representation that the Contractor:

1. Has investigated the proposed product and determined that it meets or exceeds, in all
respects, the specified product.
2. Will provide the same warranty for substitution as for the specified product.
3. Will coordinate installation and make other changes which may be required for the Work to be complete in all respects.
4. Waives claims for additional costs which may subsequently become apparent.

Substitutions will be considered when they are indicated or implied on shop drawings or product data submittals without separate written request, or when acceptance will require substantial revision of the Contract Documents.

The Landscape Architect will determine acceptability of the proposed substitution, and will notify the Contractor of acceptance or rejection in writing within a reasonable time.

Only one request for the substitution will be considered for each product. When substitution is not accepted, the Contractor shall provide the specified product.

REJECTED MATERIALS AND DEFECTIVE WORK

Materials furnished by the Contractor and condemned by the Landscape Architect as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor immediately, and shall not be made use of elsewhere in the work.

Any errors, defects, or omissions in the execution of work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Owner or Landscape Architect.

The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect error, omission or act of the Contractor or his employees, as determined by the Landscape Architect, occurring previous to the final payment.

PROJECT CLOSEOUT

DESCRIPTION

This Section specifies administrative and procedural requirements for the project closeout including, but not limited to:

1. Project record document (as-built drawings) submittal.

Record Drawings (As-Built)

Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Upon completion of work, submit record drawings to the Landscape Architect.

**Record Specifications**

Maintain one complete copy of the Project Manual, including addenda. Mark these documents to show substantial variations in actual Work performed in comparison with the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data. Upon completion of the Work, submit record Specifications to the Landscape Architect.

**Test Results**

A copy of all test reports signed by authorized official of testing laboratory that a material, product, or system identical to the material, product, or system to be provided has been tested in accord with specified requirements.

**REMOVAL OF PROTECTION**

Remove temporary protection and facilities installed for protection of the Work during construction. Erosion and sediment control measures and best management practices can be removed after permanent measures have been established.

**WARRANTIES**

**DESCRIPTION**

This Section specifies general administration and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers’ standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor’s special warranty of workmanship and materials;
2. General closeout requirements are included in Section “Project Closeout”; and
3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the specifications and Drawings.

**Disclaimers and Limitations**

Manufacturer’s disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
DEFINITIONS

Standard Warranties

Standard product warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Landscape Architect.

Special Warranties

Special warranties are written required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Landscape Architect.

WARRANTY REQUIREMENTS

Related Damages and Losses

When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for corrections of warranted Work.

Reinstatement of Warranty

When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

Replacement Cost

Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Landscape Architect has benefited from use of the Work through a portion of its anticipated useful service life.

Owner’s Recourse

Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights and remedies.

Rejection of Warranties

The Landscape Architect reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents. The Landscape Architect reserves the right to refuse to accept Work for the Project where a
special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to counter sign such commitments are willing to do so.

All warranties shall be submitted to the Owner in accordance with conditions of the Contract and the Submittals.

**WARRANTY PERIOD**

All warranties required by the Contract documents shall commence on the date of Final Acceptance. If no warranty is specified, the minimum period shall be one year as defined in the General Conditions of the Contract.

If at any time during the said guarantee period, any part of the work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within seven (7) days from receipt of such notice, or having commenced fails to prosecute such work with diligence, the Owner may employ other persons to make said repairs, corrections or replacements and charge the costs, including compensation for additional professional services to the Contractor.

The Contractor’s guarantee under this clause noted in the paragraphs above, is in addition to the Contractor’s express or implied warranties under this Agreement and State Law and in no way diminish any other rights that the Owner may have against the Contractor.

**END OF SECTION**
SECTION 02001
MOBILIZATION/DEMOBILIZATION

PART 1 - GENERAL

1.01 Work Included

A. Provide all facilities, labor, materials, tools, equipment, appliances, transportation, supervision, and supplies necessary to complete the Work under this project. The Work includes, but is not necessarily limited to:

1. Protection of adjacent properties in the vicinity of all work areas, as directed by Landscape Architect.

2. All required bonds and insurance.

3. Site cleanup and restoration.

4. All notifications required by law and/or regulations.

5. All required submittals.

1.02 Related Work Specified Elsewhere

A. Site Preparation and Demolition- Section 02100

1.03 Applicable Laws and Regulations

A. The Contractor shall comply with all applicable rules and regulations relative to Work on this project promulgated by the Owner and enforced by its departments, including but not limited to the Building Department and Board of Health.

B. The Contractor shall obtain required permits and make all required notifications, including payment of any associated fees.

C. The Contractor shall notify affected utility companies, including Dig Safe, before starting work and comply with their requirements.

1.04 Project Site Conditions

A. Site conditions existing at time of the Pre-Construction conference shall be maintained insofar as practical.

B. Variations of conditions or discrepancies in actual conditions as they apply to site operations shall be brought to the attention of the Landscape Architect prior to the commencement of any site work.
C. The use of explosives shall not be permitted.

1.05 Submittals

A. The Contractor shall submit to the Landscape Architect all required permits, and all other information related to the Work to be performed under this project in accordance with the General Conditions.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 Protection

A. The Contractor shall protect existing trees, monuments, existing improvements, adjacent property, and facilities from damage.

B. The Contractor shall conduct operations with a minimum of interference to public or private accesses and facilities. Maintain site access and egress at all times and clean and keep clear all roadways daily, or as required by the governing authority. At such times deemed necessary by the Landscape Architect, dust control shall be provided by the Contractor.

C. The Contractor shall protect benchmarks, property corners, groundwater monitoring wells, and all other survey monuments from damage or displacement. If a marker needs to be removed, it shall be referenced by a licensed land surveyor in the Commonwealth of Massachusetts and replaced, as necessary, by the same at no additional cost to the Owner.

3.02 Site Maintenance & Cleanup

A. The project site shall be maintained in a neat and orderly fashion throughout the duration of the project. All wastes generated during construction activities shall be containerized.

B. Upon completion of work, the Contractor shall remove all equipment, supplies, excess and waste materials, etc., and restore the Site to its pre-construction condition, to the satisfaction of the Landscape Architect.

C. Refer to Section 01100 for sweeping requirements and dust control.
3.03 Site Security

A. Contractor shall be responsible for maintaining the security of the Site to protect his own equipment, supplies and all work areas which may pose a health or safety risk to the Public.

END OF SECTION
SECTION 02100
SITE PREPARATION AND DEMOLITION

PART 1—GENERAL

1.01 Description

A. The Contractor shall provide all facilities, labor, materials, tools, equipment, appliances, transportation, supervision, and related work necessary to complete the Work specified in this section, and as shown on the Drawings.

B. The Contractor shall perform all work under this section of the specifications subject to the General Conditions and Supplementary Conditions of the Contract.

C. The Work of this section includes, but is not necessarily limited to:

1. Protection of existing vegetation, trees and stumps indicated on the Drawings.

2. Removal and disposal of concrete walks.

3. Removal and disposal of bituminous concrete.

4. Saw cut concrete and/or bituminous concrete.

5. Removal and disposal on utility pole bases

6. Removal and disposal of buried water line, electric lines, and underdrains.

7. Removal and disposal of below ground foundations that impede improvements.

8. Removal and disposal of benches and footings

9. Disconnecting, capping or sealing, and abandoning site utilities in place.

10. Disconnecting, capping or sealing, and removing site utilities.

11. Removal of abandoned piping, wire fencing, and fence posts and any other debris not previously disposed of.

1.02 Related Sections

A. The Contractor shall carefully examine all of the Contract Documents for requirements which affect the work in this section. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
1. Earthwork – See Section 02200

2. Bituminous Concrete Paving – See Section 02510

3. Cast in Place Concrete – See Section 03300

1.03 Materials Ownership

A. Except for materials indicated to be stockpiled or to remain Owner’s property, cleared materials shall become Contractor’s property and shall be removed from the site and disposed of in accordance with all local, state and federal requirements.

1.04 Submittals

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing. Refer to Section 01100 for additional requirements.

B. Record drawings according to Section 01100 "Contract Closeout." Identify and accurately locate existing utilities to remain and capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.05 Laws and Regulations

A. The Contractor shall conform to applicable codes for dust and runoff control.

B. The Contractor shall obtain required permits and licenses from authorities. Pay associated fees including disposal charges, if applicable.

C. The Contractor shall notify affected utility companies before starting work and comply with their requirements.

D. The Contractor shall not close or obstruct roadways, sidewalks or hydrants without permits.

E. The Contractor shall conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

F. The Contractor shall conform to the Commonwealth of Massachusetts Department of Transportation, Highway Division, Standard Specifications for Highways and Bridge Construction, and current Addenda.
1.06 Environmental Requirements

The Contractor shall construct temporary erosion control systems as shown on the plans or as directed by the Landscape Architect to protect adjacent properties and water resources from erosion and sedimentation.

1.07 Project Conditions

A. Conditions existing at time of inspection for bidding purposes shall be maintained by Owner in so far as practical.

B. Variations to conditions or discrepancies in actual conditions as they apply to site preparation operations shall be brought to the attention of the Owner prior to the commencement of any site work.

C. The Contractor shall be responsible for all cutting and patching required by the Work. All surfaces and finishes shall be restored using materials and methods necessary to equal original conditions.

D. The use of explosives shall not be permitted without the Owner’s written permission.

E. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

F. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated. Materials not specifically identified for salvage shall become the property of the contractor and shall be legally disposed of off-site.

G. Notify utility locator service for area where Project is located before site demolition.

H. Comply with all regulations including "Dig Safe" requirements.

PART 2—PRODUCTS

2.01 Soil Materials
A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

2.02 Concrete Materials

A. Requirements for portland cement concrete materials are specified in Section "Cast in Place Concrete."

2.03 Barrier Devices

A. Install barriers and security devices, including temporary fence, as needed for protection and control of vehicular and pedestrian traffic.

1. Temporary site security fence: Fabric shall be No. 9 gauge galvanized wire woven in 2-inch diamond mesh with top and bottom twisted selvage. Intermediate and terminal posts shall be galvanized steel H or pipe, minimum 2-3/8-in OD line posts, 2-7/8-in OD corner posts and pull posts, and 1-5/8-in OD top rails.

2. Privacy screen for temporary security fence shall be Enviroscreen 95% opacity, as manufactured by Enviroscreen, Inc. 195 S. Westmonte Drive, Suite K, Altamonte Springs FL 32714 or approved equal.

3. Perform daily inspections of fence, gates, screen and immediately repair or replace damaged or compromised sections as directed by the Landscape Architect.

4. Temporary safety fence shall be bright orange, four feet high, flexible plastic lightweight safety fence to identify work area.

5. Temporary safety fence shall be Carsonite Flexible Fencing, flexible safety fencing CFF-AP, orange, 48-in high with fence post ties and poly rope or cable through the top fence line or approved equal.

PART 3—EXECUTION

3.01 Protection

A. Before demolition begins, the Contractor shall protect indicated trees and areas to remain as shown on the Demolition Plans. Tree protection will consist of orange construction fence. The location of tree protection is determined from the diameter of the tree in inches converted to a radius in feet unless noted differently on the plans. This method shall prevent damage to the trunk, foliage and root system by construction equipment and procedures. Fencing shall be maintained by the Contractor.
The City of New Bedford
Hazelwood Park Lawn Bowling

SITE PREPARATION AND DEMOLITION
02100-5

B. The Contractor shall protect other plants, monuments, existing improvements, adjacent property, and facilities from damage.

C. The Contractor shall be responsible, at his/her cost, to repair or replace immediately any damage to existing trees or root systems that are to remain. The Contractor shall hire a licensed arborist to determine the repair and replacement needs and methods.

D. The Contractor shall replace damaged trees and shrubs designated to remain with the same size and species.

E. The Contractor shall conduct operations with a minimum of interference to public or private accesses and facilities. Maintain access and egress at all times and clean or sweep any roadways daily or as required by the governing authority. At such times as deemed necessary by the Owner, dust control shall be provided with equipment provided by the Contractor.

F. The Contractor shall protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed, it shall be referenced by a licensed land surveyor registered in the Commonwealth of Massachusetts and replaced, as necessary, by the same.

G. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

H. Provide dust control as specified.

3.02 Utilities

A. The Contractor shall locate and identify existing utilities that are to remain and protect them from damage.

B. The Contractor shall notify all corporations, companies, individuals or local authorities owning, or having jurisdiction over, utilities running to, through or across areas disturbed by demolition operations.

C. The Contractor shall have all utility services disconnected at service mains in accordance with requirements governing the utility involved.

D. The Contractor shall locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

E. Remove all abandoned utilities from beneath buildings, structures, slabs, footings and utilities. Refill excavations with compacted granular fill. Abandoned utilities outside of the Work areas may be left in place. Abandoned utilities shall be plugged at the limit of excavation with cast-in-place concrete that completely fills the pipe or conduit for a distance of two pipe diameters or more.
F. Abandoned catch basins, manholes, vaults or similar below grade structures shall be removed in their entirety and the resulting depressions refilled with compacted granular fill.

3.03 **Grubbing (Not In Contract)**

A. The Contractor shall completely grub the area within the clearing limits to completely remove stumps and root systems to a depth of 18” below exposed subgrade.

B. Depressions from the removal of stumps or roots shall be filled and compacted with approved on site material.

   1. Place fill material in horizontal layers not exceeding eight inch loose depth, and compact each layer to a density equal to adjacent original ground.

3.04 **Topsoil Stripping (NIC)**

A. Strip topsoil in its entirety in a manner to prevent intermingling with underlying subsoil or other waste materials. Stockpile off site for re-use.

   1. Strip surface soil of unsuitable topsoil, including trash, pavement, debris, building materials, weeds, roots, and other waste materials. Dispose of off-site.

B. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

   1. Stockpile topsoil for re-spreading on-site. There is no excess topsoil on site. **Additional offsite topsoil will be necessary.**

3.05 **Site Improvements**

A. Remove existing above and below grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, and aggregate base as indicated.

   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement at nearest control or construction joint to remain before removing existing pavement. Saw-cut faces vertically.

C. Except where fence posts are installed in wall or curb, remove posts completely, including the entire footings. Backfill systematically, as early as possible, to
allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces. Where posts are installed in curb or wall, cut posts ½” below adjoining concrete surface.

3.06 Pavement Removal

A. Remove and legally dispose of existing pavements as indicated on the Drawings and as directed by the Owner and/or Landscape Architect. Saw cut pavement when existing pavement to be removed is adjacent to pavement to remain and when existing pavement to be retained is adjacent to new pavement to be installed.

3.07 Disposal

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, pavement, slabs on grade, building materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

B. Burning of any cleared or grubbed material or other fires for any reason will not be allowed.

3.07 Potential Contamination—Soils

A. The Contractor’s attention is directed to his obligations related to potentially contaminated soils. There is no known contaminated soil.

END OF SECTION
SECTION 02200
EARTHWORK

PART 1—GENERAL

1.01  Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Referenced ASTM requirements.

C. The MassDOT Highway Division, Standard Specifications for Highway and Bridges, and current Addenda.


1.02  Summary

A. This Section includes the following:
1. Excavation, fill, grading and preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches within building lines.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
10. All excavation is "unclassified." Separate or additional payment will not be made for the excavation, removal and replacement with granular fill of bedrock or boulders if encountered.

B. Related Sections include the following:
1. Section "General Conditions."
2. Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
3. Section 'Dewatering" for lowering and disposing of ground water during construction.
4. Section "Excavation Support and Protection."
5. Section "Lanscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.
6. Section "Cast-in-Place Concrete" for granular course over vapor retarder.

1.03 Rock Removal Limits

A. Rock Removal: Minimum rock removal limits are as specified below:
   1. 24 inches outside of concrete forms other than at footings.
   2. 12 inches outside of concrete forms at footings.
   3. 6 inches outside of minimum required dimensions of concrete cast against grade.
   4. 6 inches beneath bottom of concrete slabs on grade.
   5. 6 inches beneath pipe in trenches for pipes 18 inches nominal diameter and 12 inches beneath pipes in trenches for pipes greater than 18 inches in nominal diameter.
   6. The greater of 24 inches wider than pipe or 42 inches wide.

B. Rock excavation and removal includes replacement with granular fill.

C. All excavation is "unclassified." Separate or additional payment will not be made for the excavation of bedrock or boulders if encountered. Unused Rock and Boulders shall become property of the Contractor and removed and disposed of off-site unless otherwise indicated on the Drawings (e.g., boulders adjacent to the Hazlewood Park Access Roadway).

1.04 Definitions

A. Backfill: Soil materials used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.
   1. Additional Excavation: Excavation below subgrade elevations as directed by Landscape Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Landscape Architect. Unauthorized excavation, as well as remedial work directed by Landscape Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering or ripping.

I. Peat: Any soil classified as Pt or OH by the Unified Soil Classification System or any other soft or compressible soil or soil with more than 5% organic (by weight) content.

J. Unsuitable Materials: Unsatisfactory soils - any soil too soft, too wet or too compressible to support the various building, utility or site loads which will likely be applied; or any fill material containing refuse, debris, ashes, cinders, building rubble, construction materials, wood, trash, organic material or other material in sufficient quantities which, in the opinion of the Landscape Architect, would render the soil unacceptable to support the various building utility or site loads which are likely to be applied.

K. Granular Fill: Borrow or on-site material conforming to the specified gradation requirements for use as fill to bring the site to subgrade or for refill of excavations made to remove peat or other unsuitable materials.

L. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

M. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

N. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

0. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.05 Submittals

A. Product Data: For the following:
   1. Plastic warning tape.

B. Samples: For the following:
1. 10-lb samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources, delivered to testing agency.
2. 12-by-12-inch sample of drainage fabric.
3. 12-by-12-inch sample of separation fabric.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

D. Submit, within 10 days after the award of Contract, one copy of an approved Stormwater Pollution Prevention Plan (SWPPP) complete with technical product literature for all commercial products to be used for erosion and sedimentation control, including straw mulch tackifier to the Owner and Landscape Architect for informational purposes only.

E. At a minimum, the SWPPP shall include the following:
1. Project and site description with site map.
2. Schedule of construction milestones including anticipated start and end dates.
3. Sequence of construction activities.
4. Description of potential pollution sources.
5. Description of site planning.
7. Erosion and sedimentation control and water quality control measures.
8. Best management practices to be used on-site to reduce pollution potential.
9. Description of equipment, procedures.
10. Schedule for street sweeping.
11. Copies of monitoring records and logs.
12. Location of proposed stormwater control measures including, but not limited to sedimentation fence, haybales, construction entrance and staging area and inlet protection.
13. Technical product literature for all commercial products to be used.

F. The Contractor’s erosion and sediment control plan which shall include drawings produced by the Contractor illustrative of the overall intent to minimize or prevent erosion, control sediment movement, and stabilize exposed soils during construction. At his/her option, the Contractor may submit alternative materials and installation methods to the Engineer for review and approval.
1. Performance requirements shall include performing periodic monitoring of the SWPPP to ensure work is in conformance with the following:
   a. Provide on-site treatment as necessary to prevent the discharge of contaminated water into existing surface water areas caused by Contractor’s operations or contaminated water that passes through an erosion and sediment control system installed by the Contractor such that treatment systems are designed to remove particles 40 microns and larger with discharge not to exceed 15 NTU or 25 ppm TS.
   b. Delineation and brief description of the measures undertaken to retain sediment on the site, including, but not limited to designs and specifications for sediment detention basins and traps, and a schedule for their maintenance and upkeep.
   c. Delineation and brief description of the surface runoff and erosion control measures to be implemented, including but not limited to, materials and installation methods of applying mulches, and designs and specifications for diversions and drains and a schedule for their maintenance and upkeep.

2. The Contractor may propose the use of an erosion and sediment control technique in the SWPPP provides such materials and installation techniques are proven to be as or more effective than the equivalent practices contained herein.

G. Prior to the start of construction, Contractor shall prepare and submit the EPA NPDES Notice of Intent to discharge to the applicable EPA Office in accordance with EPA regulations. Submit one copy of the approved permit to the Owner and Landscape Architect for informational purposes only.

1.06 Quality Assurance

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to AS1'M D 3740 and ASTM E 548.

B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division I Section "Project Meetings."

1.07 Project Conditions

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Landscape Architect and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Landscape Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Landscape Architect's written permission.

EARTHWORK
02200-5
3. Contact utility-locator service for area where Project is located before excavating.
4. Comply with all regulations including "Dig Safe" requirements.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

C. All excavations are "unclassified."

D. Blasting is not permitted.

E. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
   1. Grab Tensile Strength: 200 lbf; ASTM D 4632.
   2. Tear Strength: 75 lbf ASTM D 4533.
   5. Apparent Opening Size: No. 30; ASTM D 4751.

F. The Contractor is responsible to field verify and become familiar with all field conditions which may affect the performance of the specified work.

G. The Contractor is responsible to document existing trees and site improvements adjacent to and in the construction area to establish pre-construction conditions which might be misconstrued as damaged during subsequent construction activities.
   1. Documentation shall be sufficiently detailed photographs or videotapes provided to the owner prior to starting construction activities.

H. Work includes all excavation necessary to provide a fully complete and functional facility in accordance with the plans and specifications

I. It is the Contractor’s responsibility to contact DIG SAFE

J. Contractor shall not start construction activities until temporary erosion and sedimentation control and tree protection measures are in place.

1.08 Protection

A. Provide temporary barricades and other forms of protection as specified to provide free and safe passage of owner’s personnel and visitors to and from the site.

B. Remove protection upon completion of required work.
C. No utility trench shall be left open overnight. Conform to proper trench law requirements.

D. Any damage to existing utilities, drainage components or other site improvements caused by neglect or carelessness on the part of the Contractor, is to be repaired immediately in a manner satisfactorily to the Owner and at no additional cost to the Owner.

1.09 Material Ownership

A. Materials indicated to be stockpiled to remain the Owner’s property and will be moved and stored at a location as directed by the Owner.

B. All material which is not the Owner’s and is not required for the completion of the project, will be removed from the site and properly disposed of.

PART 2- PRODUCTS

2.01 Soil Materials

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW and SP, or a combination of these group symbols; free of rock or gravel larger than three inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SM, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols. Unsatisfactory soils also include satisfactory soils not maintained within two percent of optimum moisture content at time of compaction.

D. Backfill Outside of Structure Limits: Satisfactory soil materials conforming to the State Standards for "Common Borrow."

E. Subbase: Naturally or artificially graded mixture of natural or processed and washed crushed gravel, crushed stone, and natural or crushed sand; conforming to the State Standards for "gravel borrow."

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; conforming to the State Standards for "Crushed Stone" or "Crushed Gravel," M.0 1.09. Gradation II.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed and washed gravel, crushed stone, and natural or crushed sand; conforming to the State Standards for "Gravel Borrow."
H. Bedding: Artificially graded mixture of crushed and washed gravel, crushed and washed stone, conforming to the State Standards for "Bedding Material," M.0 1.04.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.

J. Filter Material: Processed and washed, narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Impervious Fill: Bentonite and sand mixture consisting of 5% processed commercial bentonite and 95% sand capable of compacting to a dense state.

L. Granular Fill: Granular fill placed beneath structures and footings, within the foundation zone as shown on the drawings; within the top 48 inches below utilities, and slabs on grade; and within the top 24 inches beneath walks and pavement shall be considered "Engineered Fill" and shall conform to the State Standards for "Gravel Borrow." Granular fill placed outside of the above specified limits shall conform to the State Standards for "Common Borrow." Granular fill may be suitable material from on-site excavations specifically approved by the Landscape Architect for re-use and such additional quantities from off-site sources as required to complete the fill placement to subgrade or the indicated site grades, whichever is higher in elevation.

M. Sand: Natural or processed material conforming to the requirements of ASTM C-33 fine aggregate.

N. Controlled Low Strength Material or Flowable Fill shall be Type 2E. No fly ash.

O. Materials used for backfilling of irrigation system piping and the copper piping for the water fountain shall be as specified in Section 328400.

2.02 Accessories

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum six inches wide and four mils thick, continuously inscribed With a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems and storm drains.

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf; ASTM D 4632.
2. Tear Strength: 40 lbf; ASTM D 4533.
5. Apparent Opening Size: No. 50; ASTM D 4751.

PART 3- EXECUTION

3.01 Preparation

A. 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. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Construct and maintain erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. Refer to Section "Erosion Control" for detailed specifications and requirements.

D. Construct and maintain stormwater control measures.

3.02 Dewatering

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
C. Design, furnish, install, operation, monitor, maintain, and remove a temporary dewatering system as required to lower and control groundwater levels to at least 2-ft below subgrades of excavations and to permit construction to proceed in the dry. System shall be designed by a registered professional engineering in the Commonwealth of Massachusetts. Comply and pay for any and all necessary permits. Do not discharge to a sanitary sewer. If discharging to a storm drain, comply with all appropriate permits.

3.03 Explosives

A. Explosives: Do not use explosives.

3.04 Excavation, General

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Segregate and stockpile separately satisfactory materials for re-use.

3.05 Excavation for Removal of Peat and Unsuitable Materials

A. Peat and unsuitable materials shall be removed completely from beneath structures and utilities and within the park.

B. The Contractor shall perform such excavations as necessary to completely remove the peat and all other unsuitable material to such limits as directed by the Landscape Architect. The Contractor shall provide all sheeting, shoring and excavation support; perform all dewatering and control and diversion of water; provide all shoring and support necessary to protect roads, walks, public and private property, utilities and any structures and facilities to remain; dispose of all peat and unsuitable material off-site; refill excavations with compacted granular fill; and provide sufficient quantities of common borrow and gravel borrow as necessary to bring the site to subgrade or the indicated site grade, whichever is higher in elevation.

3.06 Excavation for Structures

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus one inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus one inch. Do not disturb bottom of excavations intended for bearing surface. In areas of fill or refill, the site shall be brought to a minimum of 24 inches above the required bottom of footing, then excavations made to the required depths.

3.07 Excavation for Walks and Pavements

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.08 Excavation for Utility Trenches

A. In areas of fill or refill, the site shall be brought to a minimum of 24 inches above invert, and then excavations made to the required depths.

B. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

C. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
   1. Clearance: 12 inches on each side of pipe or conduit or such additional width to install sheeting, shoring or trench boxes.

D. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
   1. For pipes and conduit less than six inches in nominal diameter and flat-bottomed, multipleduct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   2. For pipes and conduit six inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
   3. Excavate trenches six inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trench Bottoms: Excavate trenches 12 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate bedding for bell of pipe.
   1. Excavate trenches 12 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.09 Excavation in City Right of Way
A. Any excavation in the City Right of Way shall be backfilled with CLSM/Flowable fill.

3.10 Approval of Subgrade

A. Notify Landscape Architect when excavations have reached required subgrade.

B. If Landscape Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted granular fill material as directed.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Landscape Architect.

3.11 Unauthorized Excavations

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill shall be used when directed by Landscape Architect.

1. Fill unauthorized excavations under other construction or utility pipe with compacted gravel or as otherwise directed by Landscape Architect.

3.12 Storage of Soil Materials

A. Stockpile borrow materials and satisfactory excavated soil materials on site for re-use. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

2. Unsuitable materials shall not be stockpiled on-site. Remove unsuitable materials within 72 hours of excavation.

3.13 Backfill

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for record documents.

3. Inspecting and testing underground utilities.

4. Removing concrete formwork.

5. Removing trash and debris.

6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.14 Utility Trench Backfill

A. Place and compact bedding course on trench bottoms and around the lower half of pipe (or lower quadrant of pipe for pipes 36 inches or greater in diameter) as indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Provide four inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of four inches of concrete before backfilling or placing roadway subbase.

C. Place and compact initial backfill of subbase material, free of particles larger than one inch, to a height of twelve inches over the utility pipe or conduit.
   1. Place and compact material carefully under pipe haunches in 6-inch lifts 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.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, thirty inches below finished grade, except six inches below subgrade under pavements and slabs.

3.15 Fill

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Scarify, bench, or break up sloped surfaces steeper than one vertical to four horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use satisfactory soil material.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.

3.16 Moisture Control
A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within two percent of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by two percent and is too wet to compact to specified dry unit weight.

3.17 Compaction of Backfills and Fills

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

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTMD 1557:
   1. Under structures, building slabs, steps, and pavements, scarify and re-compact top twelve inches of existing subgrade and each layer of backfill or fill material at 95 percent.
   2. Under walkways, scarify and re-compact top six inches below subgrade and compact each layer of backfill or fill material at 92 percent.
   3. Under lawn or unpaved areas, scarify and re-compact top six inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.18 Grading

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus one inch with a tolerance of ½ inch when tested with a ten foot straightedge.
   2. Walks: Plus or minus one inch.
   3. Pavements: Plus or minus ½ inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of ½ inch when tested with a ten foot straightedge.
3.19 **Subsurface Drainage**

A. **Drainage Piping:** Drainage pipe is specified in Section "Storm Water Drainage Systems."

B. **Subsurface Drain:** Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a six inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe (top, bottom and sides) in a minimum of six inches of filter material and wrap in drainage fabric, overlapping sides and ends at least six inches.
   1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.

C. **Drainage Backfill:** Place and compact filter material over subsurface drain, to limits indicated, to within twelve inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least six inches.
   1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.

3.20 **Subbase and Base Courses**

A. **Under pavements and walks,** place subbase course on prepared subgrade and as follows:
   1. Place base course material over subbase.
   2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
   3. Shape subbase and base to required crown elevations and cross-slope grades.
   4. When thickness of compacted subbase or base course is eight inches or less, place materials in a single layer.
   5. When thickness of compacted subbase or base course exceeds eight inches, place materials in equal layers, with no layer more than eight inches thick or less than four inches thick when compacted.

B. **Pavement Shoulders:** Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least twelve inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.21 **Drainage Course**

A. **Under slabs-on-grade,** place drainage course on prepared subgrade and as follows:
1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

2. When compacted thickness of drainage course is six inches or less, place materials in a single layer.

3. When compacted thickness of drainage course exceeds six inches, place materials in equal layers, with no layer more than six inches thick or less than three inches thick when compacted.

3.22 Protection

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

END OF SECTION
PART 1 - GENERAL

1.1 Scope
A. This Section applies to the furnishing of all supplies, material, equipment and labor necessary to complete the bowling green fill materials and grading work, including but not limited to:

1. Grading and compaction of the existing sub-base; (Not In Contract)
2. Supply, installation, compaction and levelling of the gravel sub-base material; (NIC)
3. Installation, compaction and levelling of the root zone fill material;
4. Supply installation of plynth, backboard, and ditch material;
5. Irrigation system shall be fully operational prior to placing any of the sub-base or root zone fill in greens. Irrigation system to be used to help with consolidation of the sub-base and root zone layers.

1.2 Testing
A. All root zone fill and gravel sub-base material supplied by Contractor shall be tested by an approved soil testing laboratory at the Contractor’s expense.

B. All material must meet the products as specified herein and soil reports indicating compliance must be submitted to the Consultant prior to installation.

C. Soil density after compaction on the root zone fill should be between 92 and 94 LB per SF.

PART 2 - PRODUCTS

2.1 Green Fill Materials
A. Low-calcareous sub-angular sand mix for the lawn bowling green root zone mix; containing 0.9% to 1.2% organic content by weight percent through loss on ignition and include a germinating fertilizer mix. (NIC)

B. The organic amendment (peat) shall be mixed at the required percent with the root zone material. The mixture shall be thoroughly mixed so that the fibers are mixed and not balls of lumps of organic matter. Any stock piled material contaminated by other sands or soil to be discarded. (NIC)

C. Root zone fill to have a minimum depth of at a minimum fifteen inches (15.0”) as shown in contract drawings.
2.2 Properties of Root Zone Fill

Table #1

<table>
<thead>
<tr>
<th>SOIL CLASSIFICATION</th>
<th>PARTICLE SIZE</th>
<th>PERCENTAGE RETAINED ON SIEVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel</td>
<td>&gt;2.0mm</td>
<td>0%</td>
</tr>
<tr>
<td>Very Coarse Sand</td>
<td>1.0–2.0mm</td>
<td>7-12%</td>
</tr>
<tr>
<td>Coarse Sand</td>
<td>0.5–1.0mm</td>
<td>&gt;25%</td>
</tr>
<tr>
<td>Medium Sand</td>
<td>0.25–0.5mm</td>
<td>&gt;30%</td>
</tr>
<tr>
<td>Fine Sand</td>
<td>0.1–0.25mm</td>
<td>&gt;10% - &lt;20%</td>
</tr>
<tr>
<td>Very Fine Sand</td>
<td>0.05–1mm</td>
<td>&lt;6%</td>
</tr>
<tr>
<td>Silt</td>
<td>&lt;0.05mm</td>
<td>&lt;2%</td>
</tr>
</tbody>
</table>

Uniformity Coefficient must be between 2.25 to 3.0 (D60/D10)

Bulk Density: <1.65 grams per cubic

Porosity Values: cm
  Total – 35 - 55%
  Capillary 18 - 25%
  Air 18 - 30%

Infiltration Rate: > 250 mm/hr.

Minimum C.E.C.: 5 meq/100 grams Under Compaction

2.3 Gravel Sub-Base Material

A. ¼”-3/8” clean, washed, angular, crushed natural stone, free from shale, clay, roots and vegetative material.

B. Minimum four inch (4”) depth of gravel sub-base material at center of greens.

C. Properties of gravel sub-base material shall be as shown in Table 2.

Table #2

<table>
<thead>
<tr>
<th>PARTICLE SIZE</th>
<th>SIEVE SIZE</th>
<th>PERCENTAGE PASSING BY WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 - 5.0mm</td>
<td>No. 4</td>
<td>98%</td>
</tr>
<tr>
<td>2.36mm</td>
<td>No. 10</td>
<td>2%</td>
</tr>
</tbody>
</table>
D. All ditches shall confirm to current World Bowls Board dimensions.

**2.4 Bowling Green Plynth Trough Board**

A. Plynth boards and posts to be installed as shown on contract drawings and details using materials as detailed on sheets L-2, L-3, L-4 and details on L-6.

B. Plynth board elevation to be consistent at +/- 1/16” throughout the green.

C. The top of the plynth to be nine inches (9 inches) from the inside top of the backboard elevation.

D. Taper inward slope of plynth board toward the green (45% as shown in contract drawings).

(NIC)

**2.5 Bowling Green Backboard**

A. Backboards shall confirm to current World Bowls Board Dimensions.

B. Backboard installation to be undertaken as shown on contract drawings and details using materials as detailed on sheets L-2, L-3, L-4 and details on L-6.

C. 7 - 10 degree inside angle of backboards toward green.

D. Maintain approximately eight inches (8 inches) from inside edge of plynth to backboards.

E. Two ply natural insertion rubber, 6.0mm in thickness or equivalent fitted to backboard (green color).

**2.6 Hardware**

A. All hardware shall be Type 316 stainless steel unless otherwise noted.

**PART 3 - EXECUTION**

**3.1 Existing Sub-Base Compaction (Not In Contract)**

A. Grade existing sub-base with 1% (1:100) fall from center of greens to lateral drainage pipes as per drawings.

B. Compact existing sub-base to 100% corrected maximum dry density.

C. Fine grade to ensure uniform drainage. Care needs to be taken that slopes from center of greens to drains are smooth and to line and level, without pockets of sub-grade depressions.

D. Top of grade at center of greens to be a minimum of 4” below finished surface of gravel sub-base surface.
3.2 Gravel Sub-Base Material

A. Install gravel sub-base material at 4.0”. Ensure that trucks to do not disturb the compacted sub-base and drainage system. (NIC)

B. All the equipment spreading the gravel shall be track equipment. Sharp turning that displaces the gravel shall be avoided. All vehicles shall only work off a gravel raft rather than off the sub-base.

C. Consolidate or compact to 95% corrected dry density with a small track excavator or roller. To ensure no contamination of the site, all equipment must be completely cleaned of soils, sands, and gravels before entering any of the green sites.

D. When gravel material has been roughly levelled, pneumatic vibrate and use a small tractor/bobcat with low pressure turf tires to achieve a level firm gravel surface. Laser level gravel sub-base material to +/- 1/4”.

3.3 Root Zone Fill Material

A. Install root zone fill material in four inch (4”) lifts. The gravel sub-base drainage layer shall be watered prior to laying the root zone fill material. The root zone material shall be moist at the time of installation and not be placed on the gravel sub-base in a total dry state.

B. A distinct interface between the gravel sub-base drainage layer material and the root zone material shall be maintained at all times with no mixing of materials permitted.

C. Water continuously during installation of root zone fill to ensure proper compaction and removal of trapped air.

D. Compact each lift to maximum dry density by utilizing vibrator/hand tampers or a small roller. Ensure that equipment does not disturb the compacted sub-base material while placing or compacting root zone material. Care must be taken not to disturb plynth boards during installation of root zone fill.

E. When all rootzone mix is in, heavily water mix and allow 24 hours prior to final laser levelling. Further consolidation can be achieved with a tracked vehicle. No wheel equipment shall be permitted to work on the root zone fill layer, only track equipment.

F. Check plynth board levels with laser level to ensure accuracy to +/- 1/16”. Adequate moisture shall be maintained at all times to assist with consolidation so that the root zone material is not displaced by wind.

G. Using laser level, screed green to ensure very hard uniform green to +/- 1/16” accuracy. Water continuously during screeding process to ensure firmness. Final levels need to match plynth levels and within the required tolerances.

H. Contamination from surrounding soils must be avoided at all times. Any root zone fill material contaminated by spills or leaking such fuels from equipment shall be removed and discarded.
3.5 Bowling Green Plynth Board

A. Install plynth boards and 4” x 4” posts on all four (4) sides of greens as shown in details.

B. Plynth boards to be laser levelled to within +/- 1/16” green on all four (4) sides of greens.

C. Composite wood posts to be located 3.0’ o.c.

D. Composition plynth board to be cut as shown on details to 2” x 12”, attach to posts with two galvanized or SS carriage bolts, washers and nuts, slot 1.0” horizontal for movement.

3.6 Bowling Green Backboard Installation

A. Construct footing and backboard wall with materials as per contract drawings and details.

B. Angle backboard 7-10 degrees toward green (all four sides of green).

C. Install carriage bolts and washers (prior painted) as shown in details.

D. Hardware used must be stainless steel.

E. Backboards to be laser levelled to within +/- 1/16” green on all four (4) sides of greens.

F. Rubber to be adhered to backboard by adhesive or equivalent so not to damage bowls.

END OF SECTION
SECTION 02400
STORM DRAINAGE SYSTEM

PART 1—GENERAL

1.01 Description

A. Provide all facilities, labor, materials, tools, equipment, appliances, transportation, supervision, and related work necessary to complete the Work specified in this section, and as shown on the Drawings.

B. All work performed under this section of the specifications shall be subject to the General Conditions and Supplementary Conditions of the Contract.

C. The Work of this section shall include, but is not necessarily limited to the construction of a site storm drainage system, trench crossings, “rip rap” outlet sections, inlet and outlet structures, all as shown on the Drawings, as directed by the Landscape Architect and as specified herein.

1.02 Related Sections

A. Carefully examine all of the Contract Documents for requirements which affect the work in this section. Other specification sections which directly relate to the Work of this section include, but are not limited to, the following:

1. Dewatering and Drainage Control - See section 02200 Earthwork

2. Riprap—See Section 02420 (NIC)

1.03 Reference Standards

A. References herein to any technical society, organization, group or body 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:

AASHTO M252: Specification for Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter
AASHTO M294: Specification for Corrugated Polyethylene Pipe, 12 to 36 Inch Diameter
ASTM D1056: Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM D2321: Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
PART 2—PRODUCTS

2.01 General

A. All materials for storm drainage system shall be new and unused.

2.02 Corrugated High Density Poly Ethylene Pipe (HDPE)

A. Acceptable Manufacturers:

The storm drainage pipe shall be Nyloplast pipe as manufactured by Advanced Drainage Systems, Inc. or Landscape Architect approved equivalent.

B. Materials:

1. HDPE pipe shall be N-12 black, corrugated on the exterior with smooth walled interior. Pipe diameters and lengths shall be as specified on the Construction Drawings.

2. Corrugated Polyethylene Pipe, The product supplied under this specification shall be high density polyethylene corrugated exterior /smooth interior pipe. Twelve-to-36-inch diameters shall conform to AASHTO M294 Type S; 8-and 10-inch diameters shall meet the strength requirements of AASHTO M252 with the addition that the pipe have a smooth interior liner. Material shall conform to ASTM D3350. Minimum conveyance factors shall be as shown in Table 1.

Table 1
Conveyance Factors

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter (in.)</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>24</th>
<th>30</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15.7</td>
<td>28.5</td>
<td>46.3</td>
<td>83.9</td>
<td>136.4</td>
<td>293.9</td>
<td>532.9</td>
<td>866.6</td>
</tr>
</tbody>
</table>

3. Joints and Fittings

a. Pipe joints and fitting shall conform to AASHTO M252 or AASHTO M294, or be approved by the Landscape Architect. Coupling bands should cover at least one full corrugation on each section of pipe. When gasketed coupling bands are required, the gasket shall be made of closed-cell synthetic expanded rubber meeting the requirements of ASTM D1056, Grade RE42. All gaskets shall be installed on the coupler by the pipe manufacturer prior to delivery to the Project site. All coupling bands shall meet or exceed the soil-tightness requirements of the AASHTO Standard Specifications for Highway Bridges, Section 23, paragraph 23.3.1.5.4(e).

b. Fitting shall conform to the requirements of AASHTO M294.
2.03 Drain Basins

A. Precast inline drains shall be Nyloplast as manufactured by Advanced Drainage Systems, Inc. or Landscape Architect approved equivalent, the diameter and depth as detailed on the Drawings and shall conform to ASTM A48, latest issue. See Drainage Details on Sheet L7 and L8.

2.04 Backfill and Bedding

A. Backfill material shall be CA-6, grade 8 or 9, in conformance with M.A.D.O.T. Standard Details and the Massachusetts Standard Specification for Road and Bridge Construction, current and addenda.

B. The source of the material shall be approved by the Landscape Architect prior to delivery. Samples of the proposed material shall be submitted to the Landscape Architect for approval prior to delivery and installation.

PART 3—EXECUTION

3.01 General

A. Contractor shall install and maintain erosion control measures as necessary.

3.02 Subgrade Preparation

A. Existing topsoil shall be striped and stockpiled, subgrade shall be excavated to the required lines and grades as shown on the Construction Drawings and to match the existing ditch bottom slope. The subgrade shall be compacted to a minimum of 95% density based on a Standard Proctor (ASTM D-698). If the required compaction density cannot be achieved due to the presence of unsuitable material, the material shall be excavated and replaced as directed by the Landscape Architect. Topsoil shall be re-spread to a minimum depth of four inches over entire disturbed area.

3.03 Pipe Installation

A. All delivered pipe shall be inspected. Damaged pipes may not be accepted. Pipe shall be delivered to the Project site and handled by means that provide adequate support to the pipe and do not subject it to undue stresses or damage. When handling the placing corrugated polyethylene pipe care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal edges or rocks). The manufacturer’s special handling requirements shall be strictly observed. Pipe shall be stored on a relatively flat surface so the full length of the pipe is evenly supported. Unless the pipe is specifically manufactured to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for 15 days or longer.
B. As soon as the excavation is completed to the normal grade of the bottom of the trench, the Contractor shall immediately place the bedding material in the trench. Then the pipe shall be firmly bedded in the compacted bedding material to conform accurately to the lines and grades indicated on the Drawings.

C. Install pipe, fittings, and accessories in accordance with manufacturer's instructions.

D. Notch under pipe bells and joints, where applicable to provide for uniform bearing under entire length of pipe.

E. Excavation, backfilling and compaction shall be a specified in Section 02200 of the “Earthwork” Specifications.

F. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 Backfill

A. Backfill material shall be CA-6, grade 8 or 9, in conformance with MASSDOT Standard Details and the Massachusetts Standard Specification for Highway and Bridge Construction, current and addenda. Backfill material shall be placed and compacted in uniform lifts of a maximum loose thickness of six inches. The source of the material shall be approved by the Landscape Architect prior to delivery. Samples of the proposed material shall be submitted to the Landscape Architect for approval prior to delivery and installation.

3.05 Drain Basin

A. Drain Basins and Inline Drains shall be constructed at the location and to the lines, grades, dimensions and design noted on Drawings.

B. Invert shall conform accurately to the size of the adjoining pipes.

1. Smooth plastic pipe, the dimension of the outlet pipe, shall be used to form the invert.

2. Side inverts and main inverts where the direction changes, shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerline of adjoining pipelines.

3. Invert shelves shall be graded to provide a one inch per one foot wash from the manhole walls.

C. Openings which are cut in the risers in the field shall be carefully made so as not to damage the riser. Damaged risers will be rejected and shall be replaced at no additional expense to the Owner.
3.06 Cleaning and Inspection

A. At the completion of the Work, clean all piping, structures, as well as open drainage courses through and to which water from this construction is directed to the satisfaction of the Landscape Architect.

B. All gravity pipelines shall be tested for leakage by an infiltration or exfiltration test. In addition, all pipelines shall be internally inspected by closed circuit television equipment. Buried piping shall be tested by an infiltration test if the groundwater is more than 2-ft above the crown of the pipe or the full length of the section to be tested. Air testing may be used in lieu of exfiltration test subject to the approval of the Landscape Architect.

C. Submit a pipeline testing plan 10 days following the written notice to proceed

END OF SECTION
SECTION 02510
BITUMINOUS CONCRETE PAVEMENT

PART 1 GENERAL

1.01 Related Documents

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.


1.02 Description of Work

A. Work consists of a processed aggregate base, bituminous concrete surface course, conforming to the lines, grade, compacted thickness and typical cross section as shown on the plans and details.

1.03 Related Work

A. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:

1. Section 02200 - Earthwork.

1.04 Submittals

A. The Contractor shall submit the following samples, certifications or test results prior to use on the project.

1. Sieve analysis and product certification for processed aggregate.

2. Sieve analysis for bank-run gravel.

3. Product certification for bituminous concrete surface course.

PART 2 PRODUCTS

2.01 Materials

A. Processed aggregate for processed base course shall conform to Article M.05.01 of the MADOT State Standard Specifications in all applicable respects, including reclaimed aggregate is an acceptable material for this item. Gravel shall conform to the following gradation requirements:
B. The material for the bituminous concrete mixture shall be Type I-1 and shall conform to the requirements of Part 400 of the MADOT State Standard Specifications.

C. Pavement markings shall be thermoplastic in conformance with M7.01 of the referenced specification. Color to be determined by Landscape Architect.

PART 3 EXECUTION

3.01 Subgrade

A. Prepare the subgrade for pavement, as detailed on the plans, below and parallel to the finished grade after compaction.

3.02 Construction

A. The methods employed in performing the work and all equipment, tools, machinery and other plant used in handling materials and executing any part of the work shall conform to all the requirements of Article 3.02.04 for construction of the sub-base, Article 3.04.03 for construction of the base and Article 4.06.03 for construction of pavement; MassDOT Standard Specification for Highways and Bridges, latest edition including all addenda except as noted below:

1. Daily samples of completed work will not normally be required; such samples shall be furnished by the Contractor only upon specific request of the Architect, in which case the Contractor shall remove the samples as directed and replace with the new material equal to that in adjacent areas.

2. The surface of the finished base shall not vary by more than 1/4 inch from a 10 foot straight edge applied parallel to the center line of the base.

3.03 Patching

A. Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular patches extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, bituminous asphalt paving at a rate specified in the 460.62 of the referenced standard.

1. Allow tack coat to cure undisturbed before applying asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Fill excavated pavements with asphalt base mix and while still hot, compact. Cover asphalt base course with compacted surface layer finished flush with adjacent surfaces.

D. Portions of pavement courses which become mixed with foreign material or are in any way defective shall be removed, replaced with fresh mixture, and compacted to density of surrounding areas. Bituminous material spilled outside lines of finished pavement shall be immediately and completely removed. Such material shall not be employed in the work.

D. Joints shall present same texture, density, and smoothness as other sections of the course. Continuous bond shall be obtained between portions of existing and new pavements and between successive placements of new pavement. New material at joints shall be thick enough to allow for compaction when rolling. Compaction of pavement, base, and subgrade at joints shall be such that there is no yielding of new pavement relative to existing pavement when subjected to traffic.

E. Contact surfaces of previously constructed pavement (if greater than or equal to two days since binder placed), manholes, and similar structures shall be thoroughly cleaned and painted with a thin uniform coating of bitumen immediately before fresh mixture is placed. Tack coat shall be applied at rate specified in the 460.62 of the referenced standard. Base surface shall be dry and clean when tack coat is applied. Bituminous paving material shall not be placed until vehicle has completely evaporated from tack coat. Adjoining new paving shall be placed before tack coat has dried or dusted over.

F. Earth or other approved material shall be placed along pavement edges in such quantity as will compact to thickness of course being constructed, allowing at least 12 inches of shoulder width to be rolled and compacted simultaneously with rolling and compacting surface. Pavement edge shall be trimmed neatly to line before placing earth or other approved material along edge.

G. No vehicular traffic of any kind shall be allowed to pass over the newly finished surface until it has had time to set. Seventy-two hours will be considered sufficient time for the pavement to set in most cases, but this period may be extended by the Owner’s Representative as required by weather or other reasons. Under all circumstances, damage to the pavement caused by the Contractor’s or public vehicles driving over the pavement before the pavement has fully cured shall be repaired as specified, at no additional cost to the Owner.

3.04 Pavement Marking

A. Do not apply pavement marking paint until layout, colors and placement have been verified with Landscape Architect.
B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material, graffiti plaint, dirt, trash, dust, etc.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, edges. Apply at manufacturer’s recommended rates to provide a minimum wet film thickness.

3.05 Field Quality Control

A. The Owner shall select and retain an independent testing laboratory to provide compaction tests. Compaction tests will be provided for all areas to be paved prior to completing work over the compacted area. Minimum number of tests required, unless directed otherwise by the Architect, is one per each 5,000 square feet of area of pavement.

B. Additional tests at the Contractor's expense will be required if, in the opinion of the Architect, the failure rate justifies it.

C. Work which is shown not to be in conformance with specification requirements will be replaced at the Contractor's expense. Contractor shall pay for retesting of areas which fail.

D. The Contractor shall coordinate and schedule all testing as work progresses. Any scheduled tests which are canceled but billed for shall be paid by the Contractor.

END OF SECTION
PART 1 GENERAL

1.01 Related Documents

A. The General Documents, as listed on the Table of Contents shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 Summary

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install designated Site Improvements and related items as indicated on the Contract Documents, as specified in this Section, and includes, but is not limited to, the following:

1. Benches;
2. Drinking water Fountain

1.03 Related Work Under Other Sections

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 02100 - SITE PREPARATION AND DEMOLITION
2. Section 02200 - EARTHWORK
3. Section 03300 – SITE CAST-IN-PLACE CONCRETE

1.04 References

A. The following standards shall apply to the work of this Section:

2. ASTM: American Society for Testing and Materials

B. National Concrete Masonry Association Standard "Specifications for the Design and Construction of Load Bearing Concrete Masonry." (NCMA)

D. ACI: American Concrete Institute 530-99/530.1-99 Building Code Regulations for Masonry Structures and Specifications for Masonry Structures and Commentaries

E. ASTM: American Society for Testing and Materials
   A82-97a Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
   A153/ Standard Specification for Zinc Coating (Hot-dip) on Iron and A153M Steel Hardware
   A276 Standard Specification for Stainless Steel Bars and Shapes
   B5 Standard Specification for High Conductivity Tough-Pitch Copper Refinery Shapes
   B101 Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction
   C31/C31M Standard Specification for Making and Curing Concrete Test Specimens in the Field
   C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
   C67 Standard Test method for Sampling and Testing Brick and Structural Clay Tile
   C90 Standard Specification for Loadbearing Concrete Masonry Units
   C144 Standard Specification for Aggregate for Mortar Masonry
   C150 Standard Specification for Portland Cement
   C207 Standard Specification for Hydrated lime for Masonry Purposes
   C216 Standard Specification for Facing Brick
   C260 Standard Specification for Air-entraining Admixtures for Concrete
   C270 Standard Specification for Mortar for Unit Masonry
   C426 Standard Test Method for Linear Drying Shrinkage for Concrete Masonry Units
   C827 Standard Test Method for change in Height at Early Ages of Cylindrical specimens from Cementious Mixtures

1.05 Submittals

A. Manufacturer's Literature: Submit copies of each of manufacturer's material descriptions, dimensions, details, and installation instructions for the following. Submit manufacturer's material descriptions for primer coat and finish coat.

1. Benches;
2. Drinking Water Fountain

B. Complete Shop Drawings for the following:

1. Shop Drawings for installation of the drinking water fountain.
1.06 Quality Standards

A. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Metal fabrication shall be accomplished using the highest standards of workmanship. All work shall be executed by experienced mechanics, shall conform to the requirements of the Contract Documents, and meet the following requirements.

1. Individual metal pieces shall be saw cut and carefully fitted together.
2. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves.
3. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arises.
4. Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing, shop priming, or finishing.
5. All surfaces and connections of metal items shall be without visible grinding marks, surface differentiation or variation.
6. All fabricated metal items shall be fine sanded throughout to produce a high standard of surface smoothness.
7. Castings shall have sharp corners and edges and shall be clean, smooth and true to pattern.
8. Welding shall be continuous and shall extend for the entire length of the joints except where specifically indicated on the Contract Documents. All exposed welds shall be ground smooth.
9. The use of gas cutting torch in the field for correcting fabrication errors will be permitted only when the prior written approval of the Owner’s Representative has been obtained for each specific condition.
10. Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed, prior to galvanization, if applicable. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.
11. All welds shall be water tight.
12. All shop connections shall be full seam welded and ground flush and smooth. Field connections bolted unless otherwise permitted as indicated in this Section 02800, Site Furnishings. Draw up all threaded connections tightly, after buttering same with pipe joint compound, to exclude water. Deform threads to prevent loosening for all exposed connections subject to vandalism.

1.07 General Installation

A. Where anchors, bolts or fasteners are exposed, they shall be configured or secured in such a way as to prevent their casual removal by use of vandal-proof heads or fastenings unless otherwise specified on Drawings.

B. All metal inserts, anchor slots, anchors, anchor bolts, fastenings, and other fastening devices, for attachment of site improvement items to pavements, except as otherwise specified under other Sections of this Specification, shall
be in specified, provided, delivered installed and paid for under the work of this Section 02800, Site Furnishings.

C. Unless specifically called out in the Contract Documents, galvanized steel or cast iron sections to be joined shall not be welded after galvanizing but shall be mechanically attached by means of unexposed sleeves and fasteners sufficient to provide secure attachment under normal usage.

D. Free-standing site improvement items shall be set plumb and horizontal regardless of the pitch of the finished surrounding grade unless otherwise shown on the Contract Documents.

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

F. Contractor shall be responsible for the correct location of site improvement items. Take particular care to maintain shapes, plumb and level during the pouring of concrete.

G. All Work shall be accurately set to established lines and elevations and rigidly set in place to supporting construction.

1.08 Coordination

A. The work of this Section 02800, Site Furnishings shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section 02800, Site Furnishings, before installing items specified.

B. Obtain all necessary templates and patterns required from other trades for proper execution of work of this Section 02800, Site Furnishings. Coordinate the delivery of items, templates, and patterns manufactured by other trades to maintain construction schedule. Receive from other trades items to be installed under this Section 02800, Site Furnishings.

1.09 Guarantee

A. The Contractor shall furnish and deliver standard written manufacturer's guarantee in Owner's name covering all materials and workmanship under this Section 02800, Site Furnishings, in addition to, and not in lieu of, guarantee requirements set forth under Section 01100, GENERAL REQUIREMENTS, and other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

B. Supplier shall pay for repairs of any damage to any part of the project caused by defects in his work and for any repair to the materials or equipment caused by replacement. All repairs are to be done to the satisfaction of the Owner’s Representative.
C. Any part of the work installed under this contract requiring excessive maintenance shall be considered as being defective, and shall be replaced by the Supplier during the one year guarantee period at no cost to the Owner.

PART 2 PRODUCTS

2.01 **Furnishings**

A. All furnishings will be as specified in the plans and details or approved equal.

2.02 **Other Furnishings**

A. See Materials Sheet L5 for product and contact information.

2.03 **Concrete**

A. Concrete footings shall be 4,000 pounds per square inch cast-in-place concrete as specified under the work of the Section 03300, SITE CAST-IN-PLACE CONCRETE of this Specification.

2.04 **Grout**

A. Grout as required for anchoring shall be a pourable, quick setting, non-metallic and nonshrinking hydraulic cement grout equal to the following:

1. Five Star Grout
   U.S. Grout Corporation
   425 Stillson Road
   Fairfield, CT 06430
   (800) 243-2206

2. Sika Grout 212
   Sika Corporation
   Lyndhurst, NJ 07071
   (201) 933-8800

3. Harris Construction Grout
   AH Harris & Sons
   10 West Mill St.
   Medfield, MA 02052
   (508) 359-7321

2.05 **Earthwork Materials**

A. All backfill materials, including base and subbase materials, ordinary borrow, drainage fill and sand shall be as specified under the Section 02200, Earthwork of this Specification.
PART 3 EXECUTION

3.01 Earthwork

A. All excavation, filling, compacting and grading of backfill materials, including base and subbase materials, ordinary borrow, drainage fill and structural associated with and used in the installation of the items of this Section 02800, Site Furnishings, shall be as specified under the Section 02200, Earthwork.

3.02 Concrete

A. Concrete footing placement, protection and formwork shall be as specified under the Section 03300, SITE CAST-IN-PLACE CONCRETE. Concrete footings shall be to the sizes noted on the Contract Documents. No calcium chloride will be permitted.

3.03 Furnishings

A. Install all items in accordance with manufacturer’s instructions and in locations shown on the Contract Documents and installed and paid for under this Section 02800, Site Furnishings.

B. The Contractor shall be responsible for timing the delivery of the existing park bench, so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling and vandalism.

C. Please see plans and details for product information and installation instructions at the end of this section.

3.05 Other Furnishings

A. Install all items in accordance with manufacturer’s instructions and in locations shown on the Contract Documents and installed and paid for under this Section 02800, Site Furnishings.

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

3.07 Acceptance Standards

A. Site Improvement items fabricated, provided and delivered and installed under this Section 02800, Site Furnishings including bench, picnic table and wall bench will be rejected by the Owner’s Representative for the following reasons and as determined by the Owner’s Representative:
1. Upon installation horizontal or vertical curves do not meet the shapes and profiles shown on the Contract Documents. Curves that have broken backs, sags, saddles, tangents or kinks will be rejected.
2. Indications of field welding or cutting.
3. Damage such as scrapes, nicks and dents to the finish.
4. Threaded connections are not drawn up tightly. Threads have not been deformed to prevent loosening.
5. Anchorage into concrete or masonry is not solid but is perceptibly loose. Anchorage does not meet the requirements of the Contract Drawings.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Wood Fences and Gates
B. Related Sections:
   1. Earthwork is included in Section 02200.

1.02 REFERENCES
A. American Society of Testing Materials (ASTM):
   1. ASTM A36 “Standard Specification for Carbon Structural Steel”
   3. ASTM A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
   4. ASTM A500 "Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes"
B. American Welding Society (AWS)
   1. AWS D1.1 "Structural Welding Code - Steel"

1.03 SUBMITTALS
A. Submit Product Data and manufacturer’s written instructions for care, installation and maintenance.
B. Shop Drawings:
   1. Show Dimensions, fencing layout, finish, weight and size of members, methods of fastening, and installation details of fence and gates. Provide coordination drawings where inserts or sleeves are required.

PART 2 - PRODUCTS

2.01 WOOD FENCES AND GATES
A. Wood Materials: Western Red Cedar; WRCLA.
   1. Fence (Slats) Boards and Trim: Surfaced One Side, Two Edges (S1S2E); Standard Grade and Better; size and location as indicated on Drawings.
2. Horizontal Supports: Rough Sawn; Custom Knotty Grade; size and location as indicated on Drawings.

3. Posts: Rough Sawn; No. 2 Grade and Better; size and location as indicated on Drawings.

4. Finish: As indicated on Drawings.

B. Steel Framed Gate Materials:

1. Steel tubes: ASTM A500

2. Angles: ASTM A36

3. Plates: ASTM A36

4. Bolts, Nuts, Screws, Clips and Washers: AISI 300 series stainless steel. Exposed screws shall be Phillip's flat head, countersunk unless noted otherwise.

5. Bolts for Field Connections Only: Provide washers under heads and nuts bearing on wood. Draw nuts tight and nick threads of permanent connections. Use beveled washers where bearing is on sloped surfaces.


7. Steel Finish: Paint as specified in Section 09 90 00 (09900). Color to match adjacent enclosure.

C. Fasteners:

1. Nails:
   a. Flat head aluminum with ring or spiral-threaded shank and blunt point.
   b. Length sufficient to penetrate into support framing a minimum of 1-1/2 inch.

2. Bolts and Washers: Hot-dip galvanized in accordance with ASTM A153, unless noted otherwise.

3. Concrete Anchors:
   a. Avendra, LLC Preferred Manufacturers:
      None
   b. Approved Manufacturers:
      "Red-Head"; ITW Ramset/Redhead (800-899-7890)
      "Wej-It"; United Inds. Metals Group (800-952-5063)
      Approved substitution
      Galvanized machine screws or bolts with standard expansion shield.

4. Adjustable (Wood) Post Base:
   a. Avendra, LLC Preferred Manufacturers:
      None
   b. Approved Manufacturers:
      "AB Series"; Simpson Strong-Tie Company, Inc. (800-999-5099)
      Approved substitution
c. Galvanized steel slotted plate and spacer

D. Gate Hardware:
1. Avendra, LLC Preferred Manufacturers:
   a. None
2. Approved Manufacturers:
   a. Stanley Hardware (800-337-4393)
3. Wood Gates:
   a. Hinges: #SC908BP, 1-1/2 pair per leaf.
   b. Slide Bolt: #SP1271, Slide Bolt, 1 each.
   c. Cane Bolt: #CD1009, 1 per leaf.
4. Steel Framed Gates:
   a. Hinges: Ball bearing, galvanized, 1-1/2 pair per leaf.
   b. Latch: Industrial double drive latch assembly with locking device.
   c. Cane Bolt: #CD1009, 1 per leaf.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Construct plumb, square, level and anchored securely with smooth miters and field cuts after joining. Provide adequate support for anchoring.

B. Install gates plumb, level, and secure for full opening without interference. Adjust hardware for smooth operation.

C. Set posts in concrete footings as shown on Drawings.

D. Expansion Bolts:
   1. Install in snug fittings, smoothly drilled holes in accordance with the manufacturer's written instructions.
   2. Place bolts so load acts in shear.

END OF SECTION
SECTION 02920
TURF

PART 1 – GENERAL

1.01 Summary

A. Section Includes:
   1. Seeding.
   2. Hydroseeding.
   3. Erosion-control material(s).

1.02 Submittals

A. Product Data: For each type of product indicated.
   1. Pesticides and Herbicides: Include product label and manufacturer's application
      instructions specific to this Project.
   2. Certification of Grass Seed: From seed vendor for each grass-seed monostand or
      mixture stating the botanical and common name, percentage by weight of each
      species and variety, and percentage of purity, germination, and weed seed. Include
      the year of production and date of packaging.
   3. Certification of each seed mixture for turfgrass includes identification of source
      and name and telephone number of supplier.
   4. Product Certificates: For soil amendments and fertilizers, from manufacturer.
   5. Maintenance Instructions: Recommended procedures to be established by Owner
      for maintenance of turf during a calendar year. Submit for approval by Landscape
      Architect before expiration of required initial maintenance periods.

1.03 Quality Assurance

A. Installer Qualifications: A qualified Landscape Installer whose work has resulted in
   successful turf block, turf and meadow establishment.

1.04 Delivery, Storage and Handling

A. Seed and Other Packaged Materials: Deliver packaged materials in original,
   unopened containers showing weight, certified analysis, name and address of
   manufacturer, and indication of conformance with state and federal laws, as
   applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in
   "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod
   Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass
   Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod
   from breakage and drying.
1.05 **Project Conditions**

A. **Planting Restrictions**: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. **Planting**: April 1*st* - June 15*th*
   2. **Planting**: August 1*st* - October 15*th*

B. **Weather Limitations**: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer’s written instructions.

1.06 **Maintenance Services**

A. **Initial Turf Maintenance Service**: Provide full maintenance by skilled employees of Landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
   1. **Seeded Turf**: 45 days from date of planting completion.
      a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
   2. **Sodded Turf**: 21 days from date of planting completion.

**PART 2 - PRODUCTS**

2.01 **Seed**

A. **Seed Species**: State-certified seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed.

B. **Turfgrass Sod**: Certified, Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

C. **Turfgrass Species**: Sod of Certified, Number 1 Quality/Premium grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed. Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
   1. **Sun and Partial Shade**: Proportioned by weight.
2.02 Inorganic Soil and Amendments

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
   2. Provide lime in form of ground dolomitic limestone.

2.03 Organic Soil and Amendments

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.
   2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.04 Fertilizers

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
   2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
   2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.05 Planting Soils

A. Planting Soil (topsoil) is provided topsoil free of stones one half inch or larger in any dimension and other extraneous materials harmful to plant growth. Topsoil shall meet an approved “loam sand” soil classification (60% sand, 30% silt, 10% clay).
2.06 Mulches

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.07 Pesticides

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.08 Erosion Control Materials

A. Erosion-Control Blankets: Shall be North American Green SC150 biodegradable straw-coconut mat enclosed in a photodegradable plastic mesh or approved equal. Include manufacturer's recommended steel wire staples, six inches long. Staple pattern “A” that uses 0.7 staples per SY shall be used.

PART 2 - EXECUTION

3.01 Examination

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
   a. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   b. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
   c. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   d. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.
3.02  **Preparation**

A.  Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1.  Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.

B.  Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03  **Turf Area Preparation**

A.  Limit turf subgrade preparation to areas to be planted.

B.  Newly Graded Subgrades:  Loosen subgrade to a minimum depth of four inches.  Remove stones larger than one half inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1.  Apply superphosphate fertilizer directly to subgrade before loosening.
   2.  Spread planting soil to a depth of four inches but not less than required to meet finish grades after light rolling and natural settlement.  Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
      a.  Reduce depth of planting soil to allow for soil thickness of sod.

C.  Unchanged Subgrades:  If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
   1.  Remove existing grass, vegetation, and turf.  Do not mix into surface soil.
   2.  Loosen surface soil to a depth of at least six inches.  Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top four inches of soil.  Till soil to a homogeneous mixture of fine texture.
      a.  Apply superphosphate fertilizer directly to surface soil before loosening.
   3.  Remove stones larger than one half inch in any dimension and sticks, roots, trash, and other extraneous matter.
   4.  Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D.  Finish Grading:  Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture.  Grade to within plus or minus one half inch of finish elevation.  Roll and rake, remove ridges, and fill depressions to meet finish grades.  Limit finish grading to areas that can be planted in the immediate future.

E.  Moisten prepared area before planting if soil is dry.  Water thoroughly and allow surface to dry before planting.  Do not create muddy soil.

F.  Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
3.04 Preparation for Erosion Control

A. For erosion-control blanket, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

B. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.05 Seeding

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds five mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.
   2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
   3. Broadcast spread seed.

B. Sow seed at a total rate of 5-3/4 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions. (NIC).

E. Protect seeded areas with slopes not exceeding 1:5 by applying hydromulch.

3.06 Turf Maintenance

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
   1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
   2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of four inches.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of one inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is no more than two inches. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height: 2-1/2 inches

D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
   1. Use fertilizer that will provide actual nitrogen of at least two lb/1000 sq. ft. to turf area.

3.07 Satisfactory Turf

A. Turf installations shall meet the following criteria as determined by Landscape Architect:
   1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding ninety percent over any ten sq. ft and bare spots not exceeding five by five inches.
   2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.08 Turf Maintenance

A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable meadow. Roll, re-grade, and re-plant bare or eroded areas. Provide materials and installation the same as those used in the original installation.
   1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and meadow damaged or lost in areas of subsidence.
   2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. Apply treatments as required to keep meadow and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
   4. Use “glove herbicide” or rubber glove with cotton ball of non selective herbicide and apply to individual plant tissue.

B. Watering: Install and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources and to keep meadow uniformly moist.
1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water meadow with fine spray at a minimum rate of one half inch per week for four weeks after planting unless rainfall precipitation is adequate.

C. Weed Control: Maintain meadow at six inch height of cut for first two years. Conduct fall mowing to a height of four to six inches.

3.09 Pesticide Application

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.10 Cleanup and Protection

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION
SECTION 02930
PLANTS

PART 1 - GENERAL

1.01  Summary

A.  Section Includes:
   1.  Plants (trees, shrubs, perennials, ground cover)
   2.  Planting soils.

1.02  Submittals

A.  Product Data:  For each type of product indicated, including soils for approval.
   1.  Manufacturer’s or vendor’s certified analysis for soil amendments and fertilizer
       materials.

B.  Samples for Verification:  For each of the following:
   1.  Bark Mulch:  1-quart volume of organic mulch in sealed plastic bag labeled with
       composition of materials and source of mulch.  Sample shall be typical of the lot of
       material to be furnished; provide an accurate representation of color, texture, and
       organic makeup.

C.  Maintenance Instructions:  Recommended procedures to be established by Owner for
    maintenance of plants during a calendar year.  Submit for approval by Landscape Architect
    before start of required maintenance periods.

D.  Warranty:  Sample of special warranty.

1.03  Quality Assurance

A.  Installer Qualifications:  A Qualified Landscape Installer whose work over the last five years
    has resulted in successful establishment of plants.

B.  Provide quality, size, genus, species, and variety of plants indicated.

C.  Measurements:  Do not prune to obtain required sizes.

D.  Trees and Shrubs:  Measure with branches and trunks or canes in their normal position.  Take
    height measurements from or near the top of the root flare for field-grown stock and container
    grown stock.  Measure main body of tree or shrub for height and spread; do not measure
    branches or roots tip to tip.  Take caliper measurements six inches above the root flare for
    trees up to four-inch caliper size, and twelve inches above the root flare for larger sizes.

E.  Other Plants:  Measure with stems, petioles, and foliage in their normal position.

F.  Plant Material Observation:  Landscape Architect may observe plant material either at place
    of growth or at site before planting for compliance with requirements for genus, species,
    variety, cultivar, size, and quality.  Landscape Architect retains right to observe trees and
    shrubs further for size and condition of balls and root systems, pests, disease symptoms,
injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected plant material immediately from Project site.

G. Notify Landscape Architect of sources of planting materials seven days in advance of delivery to site.

H. Pre-installation Conference: Conduct conference at Project site.

1.04 **Delivery, Storage and Handling**

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
   1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
   2. Do not remove container-grown stock from containers before time of planting.
   3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.05 **Project Conditions**

A. Field Measurements: Verify actual grade elevations, service and utility locations, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
   1. Planting: **April 1 – June 15**
   2. **September 1 - November 1**

PLANTS
02930-2
C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
   1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.06 Warranty

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
      b. Structural failures including plantings falling or blowing over.
   2. Warranty Periods from Date of Substantial Completion.
      a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
      b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
   3. Include the following remedial actions as a minimum:
      a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
      b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
      c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
      d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.07 Maintenance Service

A. Initial Maintenance Service for Trees, Shrubs, Ground Cover and Other Plants: Provide maintenance by skilled employees of Landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

   1. Maintenance Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

A.
2.01 **Plant Material**

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

C. Transplant existing plants per Planting Plan and Plant Schedule. **NOT APPLICABLE.**

D. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

E. Plant selection at the source does not affect the Landscape Architect’s right of re-inspection and rejection during the progress of the work.

2.02 **Organic Soil Amendments**

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.03 **Fertilizers**

A. Preplant incorporation of phosphorous and potassium into soils should be based on soil test results.
2.05 **Planting Soils**

A. Planting Soil: Existing, native surface topsoil as stockpiled on site. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth. Mix existing, native surface topsoil with the following soil amendments in the following quantities to produce planting soil:

1. Ratio of Topsoil by Volume: **1:2**
2. Ratio of loose Compost by volume: **1:8**
3. Ratio of existing subgrade soil free of rocks greater than one inch: **3:8**
4. Ten pounds of bone meal per CY of planting soil.
5. Supplement with additional planting soil when quantities are insufficient.

2.06 **Mulches**

A. Organic Shredded Bark Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Type: **Shredded Aged Pine.**
2. Size Range: **three inches maximum, one half inch minimum**
3. Color: **Natural.**

PART 3 – EXECUTION

1.01 **Examination**

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

1.02 **Preparation**

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
A. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

B. Lay out plants at locations following Landscape Architect’s on site directions. Adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

C. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

1.03 Planting Area Establishment

A. Loosen subgrade of planting areas to a minimum depth of six inches to permit bonding of planting mix with subgrade. Remove stones larger than two inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

B. Spread planting soil to a depth of six inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

D. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

1.04 Excavation for Trees and Shrubs

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately two times as wide as ball diameter for balled and burlapped, balled and potted, container-grown and fabric bag-grown stock.

2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

4. Maintain required angles of repose of adjacent materials as shown on the Details. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.

5. Maintain supervision of excavations during working hours.

6. Keep excavations covered or otherwise protected overnight.

B. Subsoil and topsoil removed from excavations may be used as a portion of planting soil.
C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

1.05 Tree, Shrub and Vine Planting

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the topmost root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

A. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

B. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare two inches above adjacent finish grades.
   1. Use planting soil for backfill.
   2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops, sides and bottoms of root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
   3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

C. Set balled and potted and container-grown stock plumb and in center of planting pit or trench with root flare two inches above adjacent finish grades.
   1. Use planting soil for backfill.
   2. Carefully remove root ball from container without damaging plant.
   4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   5. Continue backfilling process. Water again after placing and tamping final layer of soil.

1.06 Tree, Shrub and Vine Pruning

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Landscape Architect.
C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

1.07 Planting Area Mulching

A. Mulch backfilled surfaces of planting areas and other areas indicated.

B. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of three inch average thickness, with thirty six inch radius around trunks or stems. Do not place mulch within three inches of trunks or stems.

C. Organic Mulch in Planting Areas: Apply three inch average thickness of organic mulch extending twelve inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within three inches of trunks or stems.

3.08 Plant Maintenance

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.09 Pesticide Applications

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.
3.10 Cleanup and Protection

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before Final Completion remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.11 Disposal

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION
SECTION 03100  
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 Related Work
A. Section 03200 - Concrete Reinforcement.
B. Section 03250 - Concrete Accessories.
C. Section 03300 - Cast-In-Place Concrete.

1.02 Quality Assurance
A. Construct and erect concrete formwork in accordance with ACI 347.

1.03 Reference Standards
A. ACI 318 - Building Code Requirements for Reinforced Concrete.
B. ACI 347 - Recommended Practice for Concrete Formwork.
C. PS 1 - Construction and Industrial Plywood.

1.04 Delivery, Storage and Handling
A. Deliver, handle and store formwork material to prevent warping or damage detrimental to strength of materials or to surfaces to be formed.
B. Ensure formwork surfaces in contact with concrete are not contaminated by foreign matter.

PART 2 - PRODUCTS

2.01 Wood Form Materials
A. Exposed Concrete Surfaces: Plywood conforming to PI 1, minimum veneer Grade B-B, tight fitting, and adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.
B. Unexposed Concrete Surfaces: Plywood, lumber, tight fitting, adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances.
C. Nails, Spikes, Lag Bolts, through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while pouring concrete.

2.02 Prefabricated Forms
A. Steel Type: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.
B. Fiberglass Fabric Reinforced Plastic Forms: Matched, tight fitting and stiffened to support weight of concrete without deflection detrimental to structural tolerance and appearance of finished concrete surfaces.

2.03 Accessories

A. Form Ties: Water sealing snap-in removable type of fixed length, free of devices that will leave holes larger than 1-1/4-inch in concrete surface. Embedded portion of tie after removal of end shall terminate not less than one inch from the formed face of the concrete.

B. Form Release Agent: Colorless mineral oil which will not stain concrete or impair bonding or color characteristics or coating intended for use on concrete.

C. Fillets for Chamfered Corners: Rigid foam plastic, wood, or metal of maximum possible lengths.

D. Flashing Reglets: 24 Gauge galvanized steel, release tape sealed reglet, bent tab anchors, securable to forms, profile to prevent water from entering behind reglet.

E. Formed Construction Joints: Galvanized steel, tongue and groove type knock-out holes to receive dowels, ribbed steel spikes with tongue to fit top screened edge.

PART 3 - EXECUTION

3.01 Workmanship

A. Verify lines, levels and Work Site dimensions for compliance with Contract Drawings before erecting formwork.

B. Assemble formwork to permit easy dismantling and stripping, ensuring concrete is not damaged during form removal.

C. Align joints, make watertight to prevent leakage of mortar.

D. Unless otherwise shown on Contract Drawings, provide 3/4-inch chamfer strips on external corners of beams, expansion joints, columns and walls. Provide 1-1/2-inch chamfer where detailed.

E. Form chases, slots, openings, drips and recesses as detailed, or required.

F. Obtain review of Landscape Architect before framing opening in structural joints, beams, or columns which are not detailed on the Contract Drawings.

G. Provide bracing to ensure stability of formwork. Strengthen forms subject to construction loads.

H. Check and adjust formwork both horizontally and vertically, during placing of concrete.

I. Arrange forms to allow stripping without removal of prime shores where required to remain in place.
3.02 Inserts, Embedded Components and Openings

A. Provide formed openings where required for pipe, conduit, sleeves and other Work embedded in or passing through concrete.

B. Accurately located and set items to be cast directly into concrete.

C. Provide temporary ports or openings to facilitate cleaning and inspection. Locate openings at bottom of forms so that flushing water will drain out.

D. Close temporary ports or openings with tight fitting panels flush with the inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

3.03 Tolerances

A. Design, erect and secure forms to following tolerances:
   1. Variation from Plumb:
      a. For exposed corner columns, control-joint grooves, and other conspicuous lines:
         1. In any 20-ft length: 1/4-inch
         2. Maximum for the entire length up to 100-ft: 1/2-inch

B. Variation from the level or from the grades specified in the contract documents:
   1. Variation in cross-sectional dimensions in the thickness of slabs:
      1. Minus: 1/4-inch
      2. Plus: 1/2-inch

3.04 Cleaning

A. Clean forms as erection proceeds, to remove foreign matter.

B. Remove cuttings, shavings and debris from within forms.

C. Flush completed forms with water to remove remaining foreign matter.

D. Ensure that water and debris drain to exterior through cleanout ports.

3.05 Form Removal

A. Do not remove forms, shores and bracing until concrete has gained sufficient strength to carry its own weight, construction loads and design loads.

B. Verify strength of concrete by compressive test results.

C. Remove formwork progressively in accordance with code requirements.

END OF SECTION
SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 Related Work
A. Section 03300 - Cast-In Place Concrete.

1.02 Quality Assurance
A. Perform concrete reinforcing Work in accordance with CRSI 63 and 65 and ACI 315 unless specified otherwise in this Section.
B. All development and splices of reinforcing steel shall be in accordance with ACI 318. All splices shall be Class B unless otherwise noted.

1.03 Source Quality Control
A. Submit certified copies of mill test report of supplied concrete reinforcing, indicating physical and chemical analysis.

1.04 Reference Standards
A. ACI 318 - Building Code Requirements for Reinforced Concrete.
B. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
C. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.
D. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
E. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
F. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

1.05 Shop Drawings
A. Indicate bar sizes, length, spacings, locations, and quantities of reinforcing steel, and wire fabric, bending and cutting schedules, and supporting and spacing devices.

PART 2 - PRODUCTS

A. Reinforcing Steel: Grade 60 deformed billet steel bars, ASTM A615; plain finish.
C. Welded Steel Wire Fabric: Plain type, ASTM A185; plain finish.

2.02 Accessory Material
A. Tie Wire: Minimum 15 gauge annealed type, or patented system accepted by Landscape Architect.
B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcing during construction conditions.

C. Special Chairs, Bolsters, Bar Supports, Spacers (where adjacent to exposed concrete surfaces): Stainless steel type; sized and shaped as required.

2.03 Fabrication

A. Fabricate concrete reinforcing in accordance with ACI 315.

B. Locate reinforcing splices, not indicated on Drawings, at points of minimum stress. Location of splices subject to review by Landscape Architect.

C. Where indicated, weld reinforcing bars in accordance with AWS D12.1.

D. Fabricate reinforcing steel to the following tolerances:
   2. Depth of Truss Bar: Plus 0, minus 1/2-inch.
   3. Overall dimension of stirrup, ties and spirals: ±1/2-inch.
   4. All Other Bends: ±1-inch.

PART 3 - EXECUTION

A. Place reinforcing supported and secured against displacement. Do not deviate from true alignment.

B. Before placing concrete, ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings which would reduce bond to concrete.

C. Place reinforcing steel to the following tolerances:
   1. Concrete cover to formed surfaces of slabs: ±1/8-inch.
   2. Concrete cover to formed surfaces of walls and beams: ±1/4-inch
   3. Concrete cover to all other surfaces: ±1/4-inch.

END OF SECTION
SECTION 03250
CONCRETE ACCESSORIES

PART 1 - GENERAL

1.01 Related Work
A. Section 03100 - Concrete Formwork.
B. Section 03300 - Cast-In-Place Concrete.
C. Section 03345 - Cast-In-Place Concrete Finishes.

1.02 References
A. ASTM 175 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
B. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 Submittals
A. Manufacturer's printed installation instructions.
B. Provide 6-inch long sample of expansion/construction joint.

PART 2 - PRODUCTS

2.01 Materials
A. Formed Construction Joints: As specified in Section 03100.
   1. Joint Filler: Asphalt impregnated fiberboard; of size detailed; ASTM D175. To be used at all exterior walkways and concrete drives.

PART 3 - EXECUTION

3.01 Installation and Workmanship
A. Locate and form expansion and contraction joints.
B. Install joint fillers and sealants in accordance with manufacturer's printed instructions. Use primers of type recommended by joint filler/sealant manufacturer.
C. Install waterstops continuous without displacing reinforcement. Heat seal joints. Install waterstops on all joints below grade.

END OF SECTION
SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.02 Related Work

A. Section 03100 - Concrete Formwork.
B. Section 03200 - Concrete Reinforcement.
C. Section 03250 - Concrete Accessories.
D. Section 03345 - Cast-In-Place Concrete Finishes.

1.02 Quality Assurance

A. Cast-in place concrete work shall be performed in accordance with ACI 318, unless specified otherwise. Concrete materials and operations will be tested and inspected as the work progresses. Failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the E/A for final acceptance.

B. Testing Agencies

1. The required testing services of Articles 1.02C and 1.02E of this section of the specifications shall be performed by the testing agency as designated in accordance with Section 01000 of these specifications. Initial tests detailed of Articles 1.02C and 1.02D will be provided by the Owner and those of Article 1.02E shall be paid for by the Contractor.

2. The necessary testing services of Article 1.02G shall be performed by a testing agency acceptable to the E/A at the Contractor's expense.

3. All testing agencies shall meet the requirements of ASTM E329.

C. Testing Services

1. The following testing services shall be performed by the designated Testing Agency:

   a. Review and/or check-test the Contractor's proposed materials for compliance with the specifications.

   b. Review and check-test the Contractor's proposed mixture design when required by the E/A.

   c. Secure production samples of materials at plants or stockpiles during the course of the work and test for compliance with the specifications. Tests of cement and aggregates shall be performed to ensure conformance with Specification requirements. Manufacturer's certification that cement materials meet Specification requirements and results of manufacturer's own material tests will be acceptable in lieu of tests by inspection and testing firm. Aggregates testing shall be performed by independent inspection and testing firm, for compliance with ASTM C33,
including limits for deleterious substances, grading and physical property requirements.

d. Conduct strength tests of the concrete during construction in accordance with the following procedures:

1. Secure composite samples in accordance with ASTM C172. Each sample shall be obtained on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.

2. Mold and cure four specimens from each sample in accordance with ASTM C31. Any deviations from the requirements of this Standard shall be recorded in the test report.

3. Test specimens in accordance with ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. One specimen shall be held should additional testing be required and ordered. The acceptance test results shall be the average of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens show any of the above defects, the entire test shall be discarded.

4. Make at least one strength test for each 100 cubic yards or fraction thereof, of each mixture design of concrete placed in any one day.

5. When the total quantity of concrete with a given mixture design is less than 50 cubic yards, the strength tests may be waived by the E/A if, in his judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects.

e. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using ASTM C143.

f. Determine air content of normal weight concrete sample for each strength test in accordance with either ASTM C231, ASTM C173 or ASTM C138.

g. Determine temperature of concrete sample for each strength test.

D. Additional Services When Required

1. The following services shall be performed by the designated agency when required by the E/A:

   a. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the E/A.

   b. Sample concrete at point of placement and perform required tests.
c. Review the manufacturer's report for each shipment of cement and reinforcing steel and conduct laboratory tests or spot checks of the materials as received for compliance with the specifications.

d. Other testing or inspection services as required.

E. Other Services as Needed

1. The following services shall be performed by the designated agency when necessary:

   a. Additional testing and inspection required because of changes in materials or proportions requested by the Contractor.

   b. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specifications requirements.

F. Duties and Authorities of Designated Test Agency

1. Representatives of the agency shall inspect, sample and test the materials and the production of concrete as required by the E/A. When it appears that any material furnished or work performed by the Contractor fails to fulfill specification requirements, the testing agency shall report any such deficiency to the E/A and the Contractor.

2. The testing agency shall report all test and inspection results to the E/A and Contractor immediately after they are performed. All test reports shall include the exact location in the work at which the batch representing a test was deposited. Reports of strength test shall include detailed information on storage and curing of specimens prior to testing.

3. The testing agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirements of the contract documents, nor to approve or accept any portion of the work.

G. Responsibilities and Duties of Contractor

1. The Contractor shall provide the necessary testing services for the following:

   a. Qualification of proposed materials and the establishment of mixture designs.

   b. Other testing services needed or required by the Contractor.

   c. The use of testing services shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the contract documents.

   d. The Contractor shall submit to the E/A the concrete materials and the concrete mix designs from the redi-mix supplier proposed for use for each class of concrete with a written request for acceptance. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. No concrete shall be placed in the work until the Contractor has received such acceptance in writing.

   e. To facilitate testing and inspection, the Contractor shall:

CAST-IN-PLACE CONCRETE

03300-3
1. Furnish any necessary labor to assist the designated testing agency in obtaining and handling samples at the project or other sources for materials.

2. Advise the E/A and the testing agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.

3. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24 hours as required by ASTM C31.

4. Submit copies of mill test reports for shipments of cement and reinforcing steel to the E/A when required.

1.04 Reference Standards

A. ACI 301 - Specifications for Structural Concrete for Buildings.
B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
C. ACI 305 - Recommended Practice for Hot Weather Concreting.
D. ACI 306 - Recommended Practice for Cold Weather Concreting.
E. ACI 318 - Building Code Requirements for Reinforced Concrete.
F. ASTM C33 - Concrete Aggregates.
G. ASTM C94 - Ready-Mixed Concrete.
H. ASTM C150 - Portland Cement.
I. ASTM C171 - Sheet Materials for Curing Concrete.
J. ASTM C260 - Air Entraining Admixtures for Concrete.
K. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
L. ASTM C494 - Chemical Admixtures for Concrete.
M. ASTM C979 - Pigments for Integrally Colored Concrete.

1.05 Submittals

A. Proposed design certificate from supplier for all required design mixes.
B. Certification of finisher.
C. Samples for Color Verification:
   1. Submit sample chip of specified color indicating color additive number and required dosage rate. Samples indicate general color and may vary from concrete finished in field according to Specifications.
1.06 Qualifications

A. Concrete work shall be performed by an American Concrete Institute certified finisher with at least five years’ experience with work of similar scope and quality.

1.07 Schedule and Protection

A. Color Additives: Comply with manufacturer's instructions. Deliver color additives in original, unopened packaging. Store in dry conditions.

B. Avoid placing concrete if rain, snow, or frost is forecast within 24 hours. Protect fresh concrete from moisture and freezing.

C. Schedule concrete pours for early in the morning. Protect work from damage through the day (minimum of eight hours). Cover with plastic sheet until completely set to minimize exposure to wind and hot sun before curing materials are applied.

PART 2 - PRODUCTS

2.01 Concrete Materials

A. Cement: Portland Cement, ASTM C150, Type I.


C. Water: Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material.

2.02 Admixtures

A. Air Entrainment: ASTM C260.

B. Chemical: ASTM C494, Type A - Water reducing. Type B - retarding. Type C - accelerating. Type D - water reducing and retarding. Type E - water reducing and accelerating.

2.03 Curing Materials

A. Curing Compound: Resin based, type; ASTM C309, Type 2 - white pigmented, Class B.

B. Polyethylene Film: 4 mil. thick, white opaque color, ASTM C171.

2.04 Accessories

A. Bonding Agent: Two component modified epoxy resin.

B. Vapor Barrier: 4 mil. unless otherwise shown on the Drawings. Clear polyethylene film, type recommended for below grade application.

C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 2 days and 7,000 psi in 28 days.
2.05 Concrete Mixes

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete of the following strength:
   1. Compressive strength (28 day): 4,000 psi.
   2. Entrained Air Content: As indicated in ACI 301, Table 3.4.1.
   3. Cement Content: Minimum 564 pounds per cubic yard.
   4. Water Cement Ratio: Maximum 0.45.
   5. Slump: 1-inch minimum, 3-inch maximum for footings and substructure walls; 4-inch maximum for slabs, beams, reinforced walls and columns. Loss of slump in pumping shall not exceed 1-1/2-inch.

C. Select proportions for normal weight concrete in accordance with ACI 301, 3.8, Method 1.

D. Use water reducing admixtures only when accepted by Landscape Architect.

E. Use accelerating admixtures only in cold weather and only when accepted by Landscape Architect. If accepted, use of admixture will not relax cold weather placement requirements. Calcium chloride shall not be used.

F. Use retarding admixtures only in hot weather and only when accepted by Landscape Architect.

G. Use air entrained concrete for all concrete exposed to the exterior.

H. Color Additives for Integrally Colored Concrete (NIC):
   1. Manufacturer: Davis Colors manufactured by Davis Colors or approved equal; phone 800-356-4848, e-mail info@daviscolors.com, or internet www.daviscolor.com.
   2. Curing Compound for Colored Concrete: Curing compound shall comply with ASTM C309 and be approved by color additive manufacturer for use with colored concrete. Provide W-1000 Clear Cure & Seal manufactured by Davis Colors or approved equal.
   3. Color Additives: Mix in accordance with manufacturer's instructions. Mix until color additives are uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.
   4. Do not re-temper mix by adding water in field.

2.06 Concrete Colors

A. Concrete Color:
   1. Cement: Color shall be “buff”.

CAST-IN-PLACE CONCRETE
03300-6
2. Sand: Color shall be locally available natural sand.
3. Aggregate: Concrete producer's standard aggregate complying with specifications.
4. Color Additives: NIC

2.07 Expansion Joints

A. Inside of wet deck expansion joint filler shall be preformed, nonbituminous type conforming to ASTM D1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., Elgin, IL 60120, or approved equivalent. Premolded filler shall be one piece for the full depth and width of the joint.

B. Shall be fiber-board joint filler strips outside of wet deck.

PART 3 - EXECUTION

3.01 Placing Concrete

A. Place concrete in accordance with ACI 304.

B. Notify Landscape Architect minimum 24 hours prior to commencement of concreting operations.

C. Concrete to re-use aggregate base material if found to be suitable. Additional aggregate base may be necessary to meet elevations where aggregate is found. If no existing aggregate base is found then the contractor shall provide as part of the base bid.

D. Ensure anchors, seats, plates and other items to be cast into concrete are placed, held securely and will not cause hardship in placing concrete. Rectify same and proceed with Work.

E. Maintain records of poured concrete items. Record date, location for pour, quantity, air temperature, and test samples taken.

F. Ensure reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.

G. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.

H. Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

I. Pour floor slabs in checkerboard or saw cut pattern indicated on Contract Drawings. Saw cut control joints within 24 hours after finishing. Use 3/16-inch thick blade, cutting 1/4-inch into depth of slab thickness.

J. In locations where new concrete is dowelled to existing Work, drill holes in existing concrete, insert steel dowels, and pack solidly with non-shrink grout.
K. Honeycomb or embedded debris in concrete is not acceptable. Notify Landscape Architect upon discovery.

L. Conform to ACI 305 when concreting during hot weather.

M. Conform to ACI 306 when concreting during cold weather.

N. Maintain concrete cover around reinforcing in accordance with ACI 3187 or as otherwise indicated on Contract Drawings.

O. Install vapor barrier under interior slabs on grade. Lap joints minimum 1 foot and seal. Do not disturb or damage vapor barrier while placing concrete reinforcing. If damage does occur, repair areas before placing concrete. Use vapor barrier materials, lapped over damaged areas minimum 6-inches in all directions and sealed.

P. Separate slabs-on-grade from vertical surfaces where shown with 1/2-inch thick joint filler. Extend joint filler from bottom of slab to within 1/2-inch of finished slab surface. Refer to Section 03250 for joint filler requirements.

3.02 Curing and Protection

A. Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury. Maintain concrete with minimal water loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

B. One additional test cylinder shall be taken during cold weather concreting, and cured on the Work Site under same conditions as concrete it represents. (NIC)

C. One slump test and one air test shall be taken for each set of test cylinders taken. (NIC)

D. Follow sampling and testing procedures referred in ASTM C94.

END OF SECTION
SECTION 03345
CAST-IN-PLACE CONCRETE FINISHES

PART 1 - GENERAL

1.01 Related Work
A. Section 03100 - Concrete Formwork.
B. Section 03300 - Cast-In Place Concrete.

1.02 Reference Standards
A. ACI 302.1 - Recommended Practice for Concrete Floor and Slab Construction.
B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

1.03 Delivery of Materials
A. Furnish concrete hardener, sealer and slip resistant coating, in manufacturer's packaging complete with application instructions.

PART 2 - PRODUCTS

2.01 Cement Grout
A. Cement: As specified in Section 03300.
B. Sand: As specified herein and in Section 03300.

2.02 Coatings, hardeners and Sealers
A. Non-Metallic Hardener: Premixed emery type; dry shake in color selected by Landscape Architect from manufacturer's standard range.
B. Slip Resistant Coating: Graded Aluminum Oxide Shake. Color selected by Landscape Architect from manufacturer's standard range.

PART 3 - EXECUTION

3.01 Finishing Horizontal Surfaces
A. Finish concrete surfaces in accordance with ACI 302 and ACI 304.
B. Uniformly spread, screed and consolidate concrete. Do not use grate tampers or mesh rollers. Do not spread concrete by vibration.
C. In areas with floor drains, maintain floor level at walls and pitch surfaces uniformly to drains as indicated on Contract Drawings.
D. Scratch Finish: After the concrete has been placed and leveled to the specified tolerances, roughen surface with stiff brushes, brooms, or rakes before final set.
E. Float Finish: Do not work concrete until ready for floating. During or after the first floating, check surface against allowable tolerances. Cut down high spots and fill low spots to produce a surface within specified tolerances. Immediately after leveling, rel float to a uniform, sandy texture.

F. Trowel Finish: Float-finish concrete as specified above. Trowel to produce a smooth surface relatively free of defects; trowel marks, uniform in texture and appearance, and within the specified tolerances. Grind smooth surface defects which would show through applied floor covering system.

G. Nonslip Broom Finish: Immediately after the concrete has been float finished as specified above, slightly roughen the surface by drawing a broom transversely across the surface.

H. Nonslip Finish: Immediately after the concrete has been float finished as specified above, evenly apply the slip resistant coating material to the surface in accordance with the manufacturer's recommendations. The total application rate shall be 25 pounds per 100 square feet. The nonslip surface shall be completed with a trowel finish as specified above. (NIC)

I. Hardened Finish: Immediately after the concrete has been float finished as specified above, evenly apply concrete hardener to surface in accordance with the manufacturer's recommendations. The total application rate shall be 25 pounds per 100 square feet. The hardener surface shall be completed with a trowel finish as specified above.

3.02 Finished Horizontal Surface Tolerances

A. Scratch Finish: True planes within 1/4-inch in 5-ft as determined by a 5-ft straightedge placed anywhere on the slab in any direction.

B. Float Finish: True planes within 1/4-inch in 10-ft as determined by a 10-ft straightedge placed anywhere on the slab in any direction.

C. Trowel Finish: True planes within 1/8-inch in 10-ft as determined by a 10-ft straightedge placed anywhere on the slab in any direction.

3.03 Schedule of Horizontal Surfaces Finishes

A. Non-slip Broom Finish: Apply to exterior concrete platforms, steps and walks.

3.04 Finished Formed Surfaces

A. Defective Concrete: Remove all honeycombed and other defective concrete down to sound concrete. If clipping is required, the edges shall be perpendicular to the formed surface. The defective areas shall be patched as specified below.

B. Patching Defective concrete: Prepare a bonding grout using a mix of one part cement to one part fine sand passing a No. 30 sieve. Prepare a one part cement to two part sand patching mixture. Substitute white Portland cement for a portion of the gray cement on exposed concrete surfaces to match color of adjacent concrete. Dampen area to be patched with water; brush bonding grout into the surface; apply patching mortar; strike off to a uniform plane; final finish; and cure.

CAST-IN-PLACE CONCRETE FINISHES
03345-2
3.05 Schedule of Formed Surface Finishes

A. Rough Form Finish: Apply to surfaces that are not exposed to view at completion of the Work.

END OF SECTION
SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:
1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes: Execution and completion of Rough Carpentry in accordance with the Specifications and Drawings including but not limited to;
1. Dimensional lumber.
2. Wall, floor, and roof sheathing.
3. Cellulose honeycomb wall, floor and roof panels.

C. Related Sections:
1. Division 01 Section "General Requirements."
2. Division 01 Section "Special Procedures."
3. Division 06 Section "Finish Carpentry."

1.2 REFERENCES

A. General:
1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. ASTM International.

C. American Wood Preservers Association (AWPA).

D. Douglas Fir Protection Association (DFPA).

E. National Fire Protection Association (NFPA)

1.3 Definitions

A. Certified Sustainably Harvested Lumber: Dimensional lumber derived from a Well Managed Forest as certified by one of the following Certification Organizations accredited by the Forest Stewardship Council:
1. Green Cross Certification Program: Scientific Certification Systems
2. Smart Wood Certification Program: Rainforest Alliance
3. Pacific Certified Ecological Forest Products: Institute for Sustainable Forestry

B. Salvaged Lumber: Lumber from deconstruction or demolition of existing buildings or structures. Unless otherwise noted, salvaged lumber shall be delivered clean, de-nailed, and free of paint and finish materials, and other contamination. Provide documentation certifying products are from salvaged lumber sources.

C. Recovered Lumber: Previously harvested lumber pulled from riverbeds or otherwise abandoned. Unless otherwise noted shall be delivered clean and free of contamination. Provide documentation certifying products are from recovered lumber sources.

1.4 SUBMITTALS

A. Submit under provisions of Divisions 01 Section "General Requirements" and "Special Procedures."

B. Certificate: Provide certificate from each manufacturer stating that material is first quality, meets or exceeds the properties of specified materials as specified herein, and is suitable for intended use on this Project. Where recycled lumber materials are used for structural applications or where otherwise noted, include lumber certification and quality grading.

C. Materials
   1. 4’ x 12” timber;
   2. 2”x12” timber

D. LEED Submittals: (NIC)

1.5 QUALITY ASSURANCE

A. Inspection: Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is completed to the point where this installation may properly commence.

B. Discrepancies: In the event of discrepancy, immediately notify the Project Manager. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

C. Lumber may be rejected by the Project Manager, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
1.6 delivery, storage, and handling

A. Materials shall be properly packed and handled while in transit so as to arrive at the job site in undamaged condition. Manufactured materials shall be delivered in suitable containers plainly marked with brand and manufacturer's name.

B. Storage arrangements shall be subject to Project Manager's approval and shall afford every access for inspection and identification of each item. Lumber shall be piled off the ground, on skids, in a manner which prevents twisting or warping and affords proper ventilation, drainage and protection from termites and decay, rain and excessive sun. Plywood shall be protected from dampness. Material shall be protected from the elements and from damage or deterioration.

C. Damaged or deteriorated materials or assemblies shall not be used in the work and shall be replaced at no extra cost to University.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Material shall conform to these specifications and to the applicable current editions of the Standard Specifications of ASTM and CBC. [The source of new lumber shall be certified sustainable harvested lumber.]

B. Lumber Grading:

C. Lumber Grade Marking: Each piece of lumber shall bear the official grade mark of the appropriate inspection bureau of the American Lumber Association, California Redwood Association, WCLIB, etc.

D. Lumber Size and Patterns: Surface four sides, dress sizes to UBC Chapter 23; work to sizes shown. Sizing and surfacing shall be as required and approved for the particular location. Framing shall be sized and where exposed shall be surfaced.


F. Dimensional lumber 2 inches (50 mm) or less in thickness shall have an average moisture content of 19 percent or less but no portion of a shipment shall be over 25 percent. Air dried lumber is desired but, if necessary, lumber may be kiln dried, however, the drying process must be slow and regulated to cause only an amount of checking comparable with air-dried stock. Wood thicker than 2-1/2 inches (63 mm) shall be well seasoned stock, moisture content not to exceed 18 percent.
G. Sills and equipment curbs which rest on concrete shall be foundation grade Redwood or preservative pressure treated Douglas Fir.

H. Framing, blocking, backing, etc., unless otherwise shown, shall be Douglas Fir. All interior wood and plywood used for blocking and built into roofing, or otherwise shown shall receive fire retardant pressure treatment in accordance with paragraph 2.5.B. Exterior stair framing and decking, and wood exposed to the exterior, or otherwise shown, shall receive the preservative type pressure treatment in accordance with paragraph 2.5.A.

I. Dimensional lumber shall be derived from either Certified Sustainable Harvested Lumber or Salvaged and/or Recovered Lumber.

J. Redwood lumber shall be derived from either Certified Sustainable Harvested Lumber or Salvaged and/or Recovered Lumber. No old growth redwood shall be used unless sustainable harvested, salvaged or recovered.

2.2 Wall, floor and roof Sheathing

A. Plywood: See Paragraph 2.1 E.

B. Oriented Strand Board: Phenolic-glued low-formaldehyde board made with Douglas fir veneers and fibers. Plywood / particleboard 5 ply composite sheathing and flooring.

C. Fiberboard Sub-Floor: Structural, noise-deadening fiberboard sub-floor and insulating carpet underlayment
   1. 100 percent post-consumer recycled waste paper.
   2. No added formaldehyde or asbestos.

D. Particleboard: Compressed wood fibers with phenol formaldehyde resin binder.

2.3 LUMBER FASTENINGS (except for preservative pressure treated lumber fastenings)

A. Nails and Spikes: Common Wire unless otherwise noted
   1. Nailing of wood members shall conform to Uniform Building Code and/or as indicated. Box nails are not permitted.
   2. Penetration: half-length of nail into piece receiving point.
   3. To connect pieces 2 inches (25 mm) net in thickness, 16d nails may be used.
   4. Do not drive nails closer together than half their length, nor closer to edge of piece of lumber or timber than 1/4 their length.
   5. Spacing and size of nails to be such that splitting will not occur. Pre-bore holes for nails wherever necessary to prevent splitting. Bore diameter of holes smaller than diameter of nail or spike (3/4 dia.).
   6. For plywood nailing, barbed plywood nails, size and spacing as indicated. Nails shall have edge distances of not less than 3/8 inch (9.5 mm).
   7. Use galvanized nails where exposed to weather or where members are built-in to roofing.

B. Screws: Bright steel wood screws:
   1. Screws are to be turned into place, not driven. Self-tapping where required for fastening to metal framing.
2. Countersink where heads will interfere or as required.
3. Screw bolt holes the same diameter and depth as shank; bore holes for threaded portion of screws with bit no larger than base of thread.
4. Use galvanized or cadmium plated screws on fastenings exposed to weather or where members are built-in to roofing.

C. Bolts: Standard mild steel, square or hex head machine bolts with square nuts and malleable iron or steel plate washers, conforming to ASTM A307.
   1. To be installed in drilled holes the diameter of the bolt, 1/32 inch (0.8 mm) to 1/16-inch (1.6 mm) over size.
   2. Bolting of wood members shall conform to CBC requirements and as called for on the drawings.
   3. Washers: Provide bolts bearing on wood, unless noted otherwise on the drawings, with malleable iron, or steel plate washers under heads and nuts. Do no final bolting until structure has been properly aligned.
   4. Use galvanized bolts, nuts and washers where exposed to weather or where members are built-in to roofing.

   1. Lag screws shall be screwed and not driven into place. Penetration in each timber shall not be less than 2/3 of the length of the lag screw.
   2. Hole shall be bored the same diameter and depth as the shank, after which the hole shall be continued to a depth equal to the length of the lag screw with a diameter no larger than 3/4 of the shank diameter.
   3. Washers: Provide lag screws bearing on wood with malleable iron or steel plate washers under heads.
   4. Use galvanized lag screws and washers where exposed to weather or where members are built-in to roofing.

2.4 ROUGH HARDWARE (except for preservative pressure treated lumber fastenings)

A. Provide rough hardware related to carpentry work which is not specifically called out under other headings. This shall include, but not be limited to, the following:
   1. General: Fastenings, devices, and other rough hardware not specifically indicated on drawings or specified herein shall be submitted for approval prior to installation. Conform to ASTM A7 or A36.
   2. Framing clips, hangers, etc.: Standard products of Universal Company, Simpson, or Silver.
   3. Sheet metal straps: Galvanized sheet steel of gauges and designs indicated.
   4. Expansion anchors shall have a current ICC evaluation report and be size, number and type shown, installed as described in the evaluation report.
   5. Powder Driven Fasteners: shall have a current ICC evaluation report and be size, number and type shown, installed as described in the evaluation report.

2.5 PRESSURE TREATMENT

A. Where called for on the drawings or specified herein, exposed lumber to receive preservative-type pressure treatment shall have a minimum moisture content of 19 percent
after pressure treatment and shall be pressure treated using Ammoniacal copper quaternary compound (ACQ). Preservative shall penetrate a minimum of 3/8-inch (9.5 mm) deep into wood. Materials shall be compatible with stain coatings when specified in Division 09 Section "Painting". Fasteners and connectors used with preservative pressure treated lumber shall be G185 hot dip galvanized, Type 304 stainless steel or Type 316 stainless steel.

1. Dimensioned Lumber Posts: AWPA C-2, retention of 0.4 lbs/c.f. per quality standard for LP-22 for in-ground contact.
2. Dimensioned Lumber (all other): AWPA C-2, retention of 0.25 lbs/c.f. per quality standard LP-2 for above ground use.
3. Pre-treated lumber shall be preserved with ACQ Preserve®, Chemical Specialties Inc.
4. Field treatment shall be Boracol® or Impel® Rods, Chemical Specialties Inc. applied in accordance with the manufacturer’s instructions.

B. All interior wood and plywood used for blocking and built into roofing, or otherwise shown, shall receive fire retardant pressure treatment in accordance with American Wood Preservers Association (AWPA). Treat wood with Kopper's "Non-Com", or Baxter fire retardant treatment, or equal, and provide UL label. Plywood shall have flame spread rating after treatment of 25 or less.

C. Subcontractor shall furnish to the Project Manager, upon delivery of the members to the job, a certificate certifying that the material has been pressure treated as specified.

PART 3 - EXECUTION

3.1 WORKMANNISHP

A. General: Rough carpentry shall produce joints true, tight, and well nailed with members assembled in accordance with the Drawings and with pertinent codes and regulations.

B. Selection of lumber pieces: Carefully select members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.

3.2 WOOD PRESERVATIVE

A. All exterior framing and wood trims coming in contact with concrete or masonry, whether or not Redwood, and not specified or otherwise shown to be pressure treated shall be treated with ACQ Preserve®. Preservatives shall be compatible with stain coatings when specified in Division 09 Section "Painting".

3.3 SITE-APPLIED WOOD TREATMENT

A. Brush apply two coats of preservative treatment on site cut ends and site cut wood in contact with other wood surfaces.

B. Apply preservative treatment in accordance with manufacturer's instructions.

C. Allow preservative to cure prior to erecting members.
3.4 INSTALLATION - LUMBER AND DECKING
A. Maintain joints of 1/16 inch (1.6 mm).
B. Surface Flatness: +/- 1/4-inch (6 mm) in 10 feet (3 m) maximum.

3.5 FRAMING
A. Install framing in strict accordance with the requirements of CBC Chapter 23 unless more stringent requirements are specified herein or shown on the Drawings.
B. Optimum Value Engineering: Where indicated on drawings or, with prior approval by the Project Manager, the following framing techniques may be employed. Nothing in this Section shall supersede requirements of CBC Chapter 23 as modified by Division 01 Section "Lateral Force Procedures", or other requirements in the Drawings or Specifications.
1. Wall studs spaced at 24 inches (600 mm) on center (Verify with Project Manager and ensure that wall finish materials can meet spans)
2. On non-bearing walls, or where upper level framing aligns with lower floor, a single continuous top plate may be used.
3. Built up headers may be used in lieu of solid lumber.
4. Frame corners with two studs and framing clips.
5. Use blocking for attachments in lieu of continuous stud.
7. Layout framing to take advantage of sheathing or siding dimensions.

3.6 CLEANUP
A. At the end of each shift and upon completion of the work, remove debris, rubbish and surplus materials from the site which resulted from work under this section. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill. Take positive measures to ensure that saw dust and wood shavings do not enter the storm drainage system.

3.7 Waste management
A. Conform with Division 01 Section “Construction Waste Management.”
B. Separate wood waste in accordance with the Waste Management Plan.
C. Separate stained, painted and treated lumber from clean lumber and place in designated area for hazardous materials.
D. Separate and store separately in a clean and dry location the following categories for salvage or re-use on site:
   1. Sheet materials larger than 2 square feet (1.19 m).
   2. Framing members larger than 16 inches (400 mm).
   3. Multiple offcuts of sizes larger than 12 inches (300 mm).
E. The following categories may be re-used in the manufacture of particle board or MDF.
1. Composite wood, (for example, plywood, OSB, LVL, I-Joist, parallel strand, MDF, particleboard).
2. Clean dimensional lumber.

F. Set aside damaged wood for acceptable alternative uses, for example use as bracing, blocking, cripples, or ties.

G. Do not burn in an open fire, wood stove, fireplace or other non-industrial incinerator lumber that is less than a year old or wood treated with creosote, pentachlorophenol, CCA, ACA, or other pressure treatment.

H. Separate the following categories for disposal and place in designated areas for hazardous materials: treated, stained, painted, or contaminated wood.

I. Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

END OF SECTION
A.1 WORK

Under this item the Contractor shall furnish all labor, materials and equipment necessary or required to construct a shade structure in accordance with plans and specifications and to the satisfaction of the Engineer. The work shall include all excavation for footings, new footings, anchor plates, wood and all hardware and fasteners necessary or required.

A.2 SUBMITTALS

Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

A.3 MATERIALS

LUMBER, GENERAL


2. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
   - NLGA - National Lumber Grades Authority (Canadian).
   - SPIB - Southern Pine Inspection Bureau.
   - WCLIB - West Coast Lumber Inspection Bureau.
   - WWPA - Western Wood Products Association.

3. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of Inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

4. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
WOOD-PRESERVATIVE-TREATED MATERIALS

1. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

2. **Do not use chemicals containing chromium or arsenic.**

3. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber to a maximum moisture content of 19. Treat indicated items and the following:
   - Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing and flashing.
   - Wood blocking and similar concealed members in contact with masonry or concrete on the exterior of the building.

BOARDS

1. Exposed Boards: Where boards will be exposed in the finished work, provide the following:
   - Moisture Content: 19 percent maximum.
   - Species and Grade: Eastern white pine, D Select per NELMA or NLGA rules.
   - Species and Grade: Western or Idaho white pine, Choice per NLGA or WWPA rules.
   - Species and Grade: Western red cedar, A grade per NLGA or WWPA rules.

2. Concealed Boards: Where boards will be concealed by other work, provide lumber with 19 percent maximum moisture content and of following species and grade:
   - Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.

MISCELLANEOUS LUMBER

1. General: Provide lumber for support or attachment of other construction, including can’t strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

2. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

3. Moisture Content: 19 percent maximum for lumber items are not specified to receive wood preservative treatment.

4. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

FASTENERS

General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

3. Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with Type 304 stainless steel.
• Nails, Wire, Brads, and Staples: FS FF-N-105.
• Power-Driven Fasteners: CABO NER-272.
• Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

**METAL FRAMING ANCHORS**

1. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and acceptable to authorities having jurisdiction.

2. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 (ASTM A 653M, Z180) coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

**4A.4 EXECUTION**

1. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
2. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
3. Fit carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
4. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
5. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
6. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
7. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

**4a.5 MEASUREMENT AND PAYMENT**

The Contractor shall receive the lump sum price bid for construction of a new clear cedar fence, plinth and bank.

The Lump Sum price bid shall include the cost of all labor, materials and equipment necessary or required including excavation and installation of footings, all lumber, fasteners and sealant complete in accordance with the plans and specifications and to the satisfaction of the Engineer.

**END OF SECTION**
SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 The General Conditions, Supplementary Conditions and applicable portions of Division 1 of this Specification are a part of this section, which shall consist of all labor, equipment and material necessary to complete the work specified.

1.02 Description of Work

A. Install new electrical system to include but not limited to; connection to utility pole, connection to breaker panel, spray park command center, court lighting system, below grade receptacle, etc.

B. Coordinate all work with that of the sprinkler work.

1.03 Job Conditions

A. The General Contractor is responsible to visit the site and become familiar with the conditions.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.01 All electrical work shall be performed in accordance with all applicable codes.

END OF SECTION
INTRODUCTION

The following report are guidelines for the care and maintenance of a lawn bowling turf under normal conditions. The maintenance of a lawn bowling green has very specialized needs more like a golf green than that of a typical lawn. The specialized grasses, shorter heights of cut, and foot traffic require a detailed daily maintenance schedule that must be adhered to in order to maintain the desired playability and aesthetics. The first and most important aspect of maintaining a bowling green begins with construction. The Contractor must ensure a level surface with proper root zone mix, drainage and irrigation is key to its ongoing maintenance. Once the green is properly constructed, the following key maintenance categories must be addressed:

- Mowing schedules
- Irrigation schedules
- Fertility
- Pest control
- Weed control
- Thatch maintenance
- Topdressing
- Infrastructure maintenance
- Equipment selection and maintenance
- Labor

***Each category will be looked at in detail, but no plan can substitute for a knowledgeable turf professional who can react and adapt to changing environmental conditions and can recognize necessary adjustments and practices to meet the needs of bowlers.
TABLE OF CONTENTS

1. Performance

2. Mowing and rolling

3. Irrigation

4. Fertility and pest management

5. Cultural practices

6. Integrated Pest Management

7. Equipment Needs

Attachments:

1. World Bowls Performance Standards for Flat Green Bowls Surfaces
1. The green is constructed be level +/- 1/8th inch. Any topdressing, aeration or other cultural practices must not change the elevations.

2. The Green Speed is measured by taking the number of seconds a bowl from the time of its delivery to the moment it comes to rest approximately 87'-7” from the mat line. A pace of 13-14 seconds for a bowl roll out must be maintained. Adjustments to irrigation, mowing, and rolling will be necessary on a seasonal basis to maintain this roll.

3. The Greens are divided north – south (16’ wide) and east – west (14.1’ wide) into rinks. Rink boundary brackets are located along the bank.

4. The “World Bowls Performance Standards For Flat Green Bowls Surfaces” is included as part of this Manual.
Mowing and Rolling

1. Mowing:
   a. Mowing should be completed with a suitable walk behind reel mower. The mower should be a sixteen-blade reel mower such as a Toro 1000 or similar style mower designed for cutting golf greens. Mowers should be checked before each mowing, should be back lapped at least once per week, and should be sharpened monthly. Bed knives should be replaced at least once per season and the operator should be observant of any imperfections in the cut. One stone can put a mower out of adjustment and risk damage to the grass surface.

   b. Mowing heights can vary and will affect bowl roll. Cutting between 0.125 to 0.1875 inches would be a good starting point. The lower the cut, the faster the bowl will roll though maintenance of the surface at lower heights goes up.

   c. The greens should be cut five times a week during the growing season to maintain a smooth consistent surface. The exception to this is times of very heavy weather stress such as right after a heavy rain or during heat above 85 degrees. It is important to vary your direction of mow everyday to keep grasses upright and avoid grain and “leggy” bentgrass. Grass should also be brushed or groomed regularly to avoid this.

2. Rolling:
   a. Rolling is undertaken to create smooth and consistent pace. There are several brands on the market, but all perform the same task of smoothing grass. It is typically less stressful to roll consistently than it is to mow more frequently. Rolling five times per week would be a good starting point and adjust according to your needs

Sample Mowing and Rolling Schedule

<table>
<thead>
<tr>
<th>MON</th>
<th>TUES</th>
<th>WED</th>
<th>THURS</th>
<th>FRI</th>
<th>SAT</th>
<th>SUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mow up and down</td>
<td>Mow left to right</td>
<td>Mow bottom left to upper right</td>
<td>Mow upper left to bottom right</td>
<td>Mow up and down</td>
<td>Mow left to right</td>
<td>Mow bottom left to upper right</td>
</tr>
<tr>
<td>Roll</td>
<td>No Roll</td>
<td>Roll</td>
<td>Roll</td>
<td>NO Roll</td>
<td>Roll</td>
<td>Roll</td>
</tr>
</tbody>
</table>


IRRIGATION

Irrigation tends to be one of the more misunderstood and difficult practices to get right to meet the green growth and playing requirements. A bowling green with good drainage and proper root zone mix, will follow watering practices that should be based on the principle that less is more. Below are several guidelines to keep in mind:

- Bent grass prefers to be on the dry side;
- When watering, water deep but infrequently;
- Irrigate early morning prior to play;
- Use a TDR Moisture meter to understand how much water is needed and how often to water;
- Excessive moisture can lead to disease and mechanical stress;
- Frequently check to make sure no sprinklers or pipes are leaking;
- During times of high heat and humidity, use a hose to lightly syringe the green as opposed to using the irrigation system as you are only trying to cool the grass as opposed to adding additional moisture;
- Use weather as your guide but rely on the moisture meter to establish an accurate watering schedule.
- Irrigation should be limited to the replacement of lost soil moisture and the evapotranspiration loses of the turf.
FERTILITY AND PEST MANAGEMENT

This category has a great deal of subjectivity, but this list provides several guidelines to work within. This category will also include two sub-categories of growth regulation and wetting agents, both items will go a long way to help manage your bowling green. A Commonwealth of Massachusetts commercial certified pesticide applicator license is required.

1. Fertility:
   a. Application: Fertilizers are applied through a spray as a liquid or as a dry granular. Both are good and have advantages and disadvantages. When appropriate, nitrogen applications should be made using slow release sources such as natural organic sources, IBDU, methylene ureas, and coated ureas.
   b. Granular fertility will allow larger volumes of material to be spread, especially if carbon based organic fertility is used. Granular fertilizers must be or greens grade quality to ensure the size of the granule is small. Larger SGN sizes can cause spotting and will affect mowing.
   c. All fertilizer applications should be timed to occur at the time of active plant uptake.
   d. Liquid fertility allows for much greater control and lower more frequent applications. Liquids are usually more readily available to the plant, but more applications are needed.
   e. Nitrogen, Phosphorus and Potassium are the three main nutrients with Nitrogen being the largest by far. Other micronutrients such as calcium magnesium and manganese are also important at lower quantities. The general goal would be to use 4-5 lbs of nitrogen per 1000ft/season but this can vary.
   f. Chelated Iron is another micronutrient than can quickly increase the green color associated with healthy turf.
   g. Applications should not be made immediately preceding a significant storm event.
   h. Application rates should be limited to the documented needs of the turf given an understanding of site-specific soil deficiencies.

2. Pest Management
   a. The three main categories of pests that must be managed are weeds, insects and fungus
b. **Weeds:** Weed control can be broken down into two categories: Broadleaf and grassy. Broadleaves are things such as dandelion and plantain and usually less of a problem on low cut turf. Grassy weeds such as crabgrass and goose grass should be controlled as a pre-emergent early in the season. Usually one application of a pre-emergent product will be enough.

c. **Insects:** Grubs and weevils are typical pests that need to be addressed. Grubs can be treated once a year and typically are an easily controlled pet. Weevils, and most notably the bluegrass weevil can be a problem if you have a predominance of Poa Annua. Not usually a problem on a newly constructed green.

d. **Fungicides** must applied regularly to treat a variety of diseases. Dollar spot, Pythium, anthracnose and take-all patch are common diseases. Snow mold in winter can also be a problem. A detailed analysis on a regular basis is required to know what to apply and when.

3. **Wetting agents:**
   
a. Are products that can either retain moisture or, more importantly allow whatever to pass through soil more efficiently.

4. **Growth regulators:**
   
a. These materials can put the plants energy into root production vs. leaf production, slowing top growth and increasing root mass.

**Grow-In Period Fertility Program**

Following are basic guidelines for a grow-in fertility program. Initial fertility requirements will be based on the results of soil tests conducted on the existing topsoil and prepared topmixes on the courts and the known nutrient requirements of the turf species selected. Soils will be analyzed for pH, soil nitrogen reserves, calcium, magnesium, phosphorus, potassium, manganese, zinc, and copper availability and balance.

The objective of the grow-in program is the rapid establishment of a high quality turf cover to minimize erosion and potential weed infestation. Accordingly, applications of line will be made as necessary to adjust pH to be within the range of 5.5 and 6.5 and up to 50% of applied nitrogen fertilizer should be of a water soluble form. At least 50% of applied nitrogen should be from a slow release source, with a heavy use of organics to build up the microbial activity and reduce pest infestation.

**Turf Grass Establishment Period**

The turf grass establishment period consists of the first and second years following the germination of the turf. The basic fertility requirements during this period are as follows. These applications should be adjusted accordingly during this period if desired growth is not
achieved or if clipping weights/examination of foliage indicate that reduced applications would be suitable:

<table>
<thead>
<tr>
<th>Nitrogen</th>
<th>Phosphorus</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23,000 sf</td>
<td>4.0 lbs/1000sf/year</td>
<td>based on soil test</td>
</tr>
</tbody>
</table>

**Turf Grass Post-Establishment Period**

The post-establishment period consists of the life of the course subsequent to the first two years following germination of the turf. Fertilizer applications should be based on the results of analytical soil tests and examination of turf conditions. Estimates of anticipated application rates for this period are as follows:

<table>
<thead>
<tr>
<th>Nitrogen</th>
<th>Phosphorus</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23,000 sf</td>
<td>2.5 lbs/1000sf/year</td>
<td>based on soil test</td>
</tr>
</tbody>
</table>
CULTURAL PRACTICES

Cultural practices include aeration, grooming, over-seeding, verti-cutting and various other techniques. These processes help relieve compaction, reduce thatch building and keep turf healthy over the long term. Neglecting these practices will dramatically affect the health and playing conditions of the lawn bowling green and can lead to the need for drastic repairs in the future.

1. **Aeration (Hollow Tine):** This practice pulls many small cores out of the green which are then dragged, returning the soil back the green and leaving the organic thatch matter to be removed from the green. Thatch buildup increases disease, creates a squishy surface, holds moisture and makes a less desirable playing surface. Spring and fall hollow tine aeration keeps this thatch in check and creates a desirable playing surface.

2. **Venting (Solid Tine):** Similar to aeration, venting creates holes without removing material. The benefit is to reduce compaction increase water porosity and to facilitate gas exchange. This should happen several times throughout the season.

3. **Verti-cutting:** Cuts grass vertically to avoid sideways growth, and grain.

4. **Topdressing:** is the process of lightly spreading sand (similar as verified via soil test, as the existing rootzone mix) on the surface of the green once per year. This sand smooths and firms the surface while diluting organic material in the soil. A typical application rate is 0.20 cubic yards/1000 sf.

5. **Control Usage:** Limit or re-schedule games due to wet playing conditions can save a field from severe compaction. Control usage the best you can with seasonal temperatures and rainfall.

**Sample Cultural practice schedule:**

<table>
<thead>
<tr>
<th>Aeration</th>
<th>venting</th>
<th>Verti-cutting</th>
<th>topdressing</th>
<th>Brushing/grooming</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x per year</td>
<td>4x per year</td>
<td>2x per year</td>
<td>1x per year</td>
<td>Every month</td>
</tr>
</tbody>
</table>
INTEGRATED PEST MANAGEMENT

All pest control activities will adhere to integrated pest management (IPM) practices. IPM is an approach to pest control which seeks to anticipate and address the full range of physical, cultural, and biological factors affecting the development of pest populations. This approach does not seek, as a goal, the eradication of pest populations; rather, it seeks to prevent the growth of pest populations and/or disease infestations above acceptable threshold levels. To achieve these goals an IPM program is one that must be flexible and reduce reliance on any single mechanism such as chemical pesticide applications. Given that this is a holistic approach to pest control, the implementation of an IPM program has the direct benefit of reducing the use of chemical pesticides in the maintenance program.

The implementation of an IPM program requires the disciplined completion of a specific protocol of tasks. The results of each task are synthesized to ensure an integrated approach to decision making. The results of some tasks serve as base data on the characteristics of the site and local pest population while the results of others serve as feedback relative to the effectiveness of the control program. Regardless of the ultimate application of the information generated, each task is critical to the successful implementation of IPM. Description of the specific tasks, in sequential order, follows below:

Initial Information Gathering

The gathering of information on potential pest populations ensures that as the turf becomes established the superintendent has the knowledge and tools necessary to anticipate and address likely pest problems. The background information to be gathered during this task should include:

1. Identification of likely pest species and information on their specific life cycles and their physical, cultural, and biological requirements.

2. Identification of all applicable controls available for each identified pest species. These controls would include cultural, biological, and chemical options.

3. Information on pest infestations and successful control strategies experienced in the area of the site.

There are many potential pests of turf grasses including the fungal species Pythium and Rhizoctonia, the bacteria Xanthomonas, various insects and nematodes, weeds such as nutseedge, and mammals such as shrews, moles, and ground hogs. An initial list of potential pests is provide below. It must be recognized that this list is not exhaustive. The list is provided solely for the purposes of providing the superintendent with a foundation for an expanded list to be developed as a site specific history of pest activity is established:
Sources of initial information include university extension services, USGA Green Section agronomists, local exterminators, local lawn care professionals, and superintendents of area golf courses. Each of these potential sources should be consulted personally.

**Monitoring of Pests and Non-target Organisms**

Monitoring consists of the frequent examination of each management area to determine the status of pest and non-pest organisms. Information to be gathered includes the identification of species present, their level of activity, and the extent of impact. Monitoring is essential to the superintendent’s ability to make early and accurate diagnoses of pest presence and threat prior to the pest reaching unacceptable levels.

Monitoring for weed, insect, and small animal pests can be done through visual inspection of the turf surface, thatch and root zones. The intensity of monitoring activities for weed and insect pests should be adjusted to reflect the life cycles of the potential pests. For example, monitoring for specific weed pests should be intensified when the species are most likely to germinate given the time of the growing season and specific environmental conditions conducive to such germination. While turf will not display symptomatic signs before weed germination, symptoms of moderate insect infestations may be detectable. Accordingly, monitoring for insect pests should include sample counts to both establish an action threshold and determine when the threshold is exceeded.
Monitoring for early disease and fungal detection is more difficult. Early detection often is impossible and the rapidity and severity of damage caused by such diseases as Pythium blight dictate the need for preventative applications of fungicides when and if environmental conditions are favorable for the development of the disease. The incidence of disease has been found to be closely linked to measurable environmental conditions, primarily high temperatures and humidity, degree of sun exposure, and leaf wetness. Optimum temperatures for the development of a number of diseases are as follows:

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>OPTIMUM TEMPERATURE RANGE(F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollar Spot</td>
<td>60 to 85</td>
</tr>
<tr>
<td>Snow Mold</td>
<td>68 to 77</td>
</tr>
<tr>
<td>Pythium Root Rot</td>
<td>52 to 70</td>
</tr>
<tr>
<td>Pythium blight</td>
<td>74 to 93</td>
</tr>
<tr>
<td>Summer patch</td>
<td>83 to 87</td>
</tr>
<tr>
<td>Brown patch</td>
<td>70 to 90</td>
</tr>
<tr>
<td>Yellow tuft</td>
<td>48 to 75</td>
</tr>
<tr>
<td>Necrotic ring spot</td>
<td>59 to 82</td>
</tr>
</tbody>
</table>

A number of diagnostic tools have become available in recent years to aid in the early detection of diseases, but their effectiveness remains spotty. These tools range from simple predictor models using readily collected environmental data to diagnostic kits utilizing biochemical information. Examples of the predictor models include those developed for the Pythium blight by Nutter et al. (1983). An example of the biochemical diagnostic kits is that developed by the Agri-Diagnostic Associates. The Agri-Diagnostics detection kit includes immunoassays for four diseases: Pythium blight, Brown patch, Yellow patch, and Dollar spot.

**Establishing Damage Thresholds and Action Levels**

As the objective of the IPM is the control of pest populations at acceptable levels, it is crucial that sound efforts be made to establish acceptability thresholds for each pest. The threshold of acceptability will vary for each pest. The setting of thresholds involves consideration of economics and the tolerance of patrons. The superintendent will establish appropriate thresholds based on these considerations.
Action levels are levels of synthesized information which indicate that damage thresholds are or are about to be exceeded. Such synthesized information will include weather and cultural data, the specific period of the pest life cycle, and the accumulated knowledge of previous experiences controlling the pest on the site. Although some guidance on the initial setting of action levels can be obtained, the levels thus established should be set very conservatively and adjusted upward only as site-specific history information has been developed. Initially, the superintendent should consult with golf course superintendents in the area to establish action thresholds.

Define Effective Treatments

The full range of potentially effective treatments for each pest should be identified and assessed as to its applicability to given situations. This range would include biological, cultural, and chemical treatments. Appropriate cultural practices which have the effect of reducing pest infestations to levels below the action level are discussed herein under the heading of CULTURAL MANAGEMENT PROGRAM. The following discussion focuses on biological and chemical control treatments.

Biological control is defined as the regulation of pest populations by their natural enemies, including antagonists, parasites, and predators. Biological controls, if target specific, can be effective. However, frequently this effectiveness is unpredictable. This unpredictability means that the superintendent will be taking a risk in selecting such treatment that may place the turf in jeopardy. For this reason a decision to select a biological control must be made early in order to provide an opportunity to implement other strategies.

In general, biological control efforts have been targeted to insect pests. Research on biological control of disease and weed problems has only recently begun. One effectively proven biological control is the use of bacteria Bacillus popillae to produce milky spore disease which, in turn, controls the growth of White grub populations. It has been suggested that predatory nematodes be considered for the control of Japanese beetle grubs and black cutworms. Other biological controllers of insect populations include such small mammals as moles and shrews. These small mammals, however, often cause more damage to the turf than the insects.

Chemical pesticide applications are essential elements of any effective IPM program. As with cultural and biological controls, chemical applications should be made only as necessary to prevent the pest infestations from surpassing acceptable thresholds and only if the application constitutes the best available control. Best available control refers to the control effort which will achieve the desired result at an acceptable cost and minimum environmental impact relative to other available options. Environmental impact in this context includes damage to non-target species, water quality and air quality.

It is anticipated that a number of currently available pesticides will be used and that yet to be developed pesticides eventually will be used when appropriate. Given the constantly evolving
nature of the chemical industry, it is impossible to identify all the chemical pesticides to be employed over the life of the facility. At best, a list of currently available and acceptable pesticides may be provided together with a set of operating guidelines for the use of these and future products.

The following basic guidelines will govern the use of chemical pesticides:

1. Use pesticides only as a component of IPM and only to the extent that they represent best available control either singly or in combination with other non-chemical control mechanisms.
2. Use only those pesticides which have been registered for use in the Commonwealth of Massachusetts.
3. Store and apply pesticides in strict conformance with label directions.
4. Use new products as they become available only to the extent that they represent best available control relative to existing products.
5. A Commonwealth of Massachusetts commercial certified pesticide applicator license is required.

**Making the Treatment Decision**

The decision making process is the essence of IPM. Decisions must be made by the superintendent based on the best available data and knowledge of the site gained by site specific experiences. The goal of all decisions is to utilize the best available control so that acceptability thresholds for each turf pest are not exceeded.

**Evaluation of Treatment and Record-Keeping**

These tasks provide the feedback information necessary to ensure the selection of best available control over time. The data base established through the completion of these tasks represents the site specific experience garnered through the implementation of IPM. Each control effort should be followed by a review of the treatment's effectiveness and detailed records should be kept in a computerized data base for enhanced retrieval and correlative analysis. Records should specify the location of treatments, the severity of the infestation, the type and level of treatment applied, the date of treatment, and the specific environmental conditions encountered at the management area immediately prior to, during, and immediately following treatment.
BASIC EQUIPMENT NEEDS

MOWER:
Toro Greensmaster (30” reel)

Roller:
GreensIRON 6200 roller
Aerator:
Toro 648 (rent)

Sprayer:

Dry Line Marker: