Town of Needham
Department of Public Works
Public Services Administration Building, 500 Dedham Avenue
Needham, Massachusetts 02492
Telephone (781) 455-7550

ACKNOWLEDGEMENT OF RECEIPT

Release Date	**July 2, 202**
Bid Title	**Installation of Eliot Playground Equipment**
Bid Number	**27CSG048C**
Number of Documents	The Bid Package consists of 2 PDF documents. Returning this form confirms receipt of all the documents.
Pre-Bid Meeting	**10:00am July 9, 2026 at Eliot School 135 Wellesley Ave. Needham, MA 02492**
Questions Due	**July 15, 2026 at 5:00pm to dpwbids@needhamma.gov**
Bids are Due	**July 22, 2026 at 11:00am,** Administration Office of the Department of Public Works located at the Public Services Administration Building, 500 Dedham Ave., Needham, MA, 02492
Please provide the requested information below as acknowledgment that you have received our bid package noted above. It is **recommended** that interested bidders complete this **acknowledgment and return via email to dpwbids@needhamma.gov**. Only by doing this, will the Town be able to provide notification of any addenda or answered questions relating to this bid. **Only those companies or individuals shown on the Distribution Register will receive addenda to this bid. By completing and returning this acknowledgement will ensure you are recorded on the Distribution Register.** Proposals from companies or individuals **not** acknowledging the addenda may be rejected as **not responsive.**	
Name of Company or Individual	
Name / Title of Contact	
Address	
City/Town, State, Zip Code	
Telephone Number	
Fax Number	
Email Address	
Signature	
Date	
Addenda will be posted to the Town's website. Please check the website for addenda before submitting your bid to the Town. Bidders who access the bid package from the Town's website are responsible for checking the website periodically for any addenda that may be issued by the Town.	

Installation of Eliot Playground Equipment
27CSG048C

Release Date	**July 2, 2026**
Pre-Bid Conference	**10:00am July 9, 2026 at Eliot School 135 Wellesley Ave. Needham, MA 02492**
Deadline for Questions	**July 15, 2026 at 5:00pm**
Bids Due	**July 22, 2026 at 11:00am** **Director of Administration** **PSAB** **500 Dedham Ave.** **Needham, MA 02492**

(Advertised in the Hometown Weekly issue of Thursday, July 2, 2026)
(Advertised on the MNPA's website Thursday, July 2, 2026)
(Published in Central Register issue on Wednesday, July 8, 2026)
(Advertised in CommBuys on Thursday, July 2, 2026)

LEGAL NOTICE

Town of Needham
Invitation for Bid (IFB)
Bid # 27CSG048C
Installation of Eliot Playground Equipment

The Town of Needham is accepting sealed bids for **Installation of Eliot Playground Equipment**. Copies of the Invitation for Bid (IFB) package will be available beginning **July 2, 2026,** at the Administration Office of the Public Works Department, 500 Dedham Ave., Needham, MA 02492 Monday through Friday during normal business hours, or from the Town's web site www.needhamma.gov/bids.aspx and will be available until the submission deadline.

A pre-bid meeting with be held at **10:00am** on **July 9, 2026 at the Eliot School 135 Wellesley Ave. Needham MA,02492**. Attendance is encouraged but not required.

Sealed bids must be submitted no later than **11:00am, July 22, 2026,** to the Administration Office of the Public Works Department, Town of Needham, 500 Dedham Ave., Needham, MA 02492. LATE BIDS WILL NOT BE CONSIDERED. Bids will be publicly opened after the submission deadline on July 22, 2026 at 11:00am. The Town reserves the right to reject any and all bids as determined to be in the best interests of the Town and to waive minor informalities.

Kathleen King
Town Manager
July 2, 2026

IFB 27CSG048C
Installation of Eliot Playground Equipment
Procurement in Brief

Primary Procurement Contact	**Ashley Ellis, Management Analyst** **781-455-7550 x72368**
Contract Manager	**Tom Ryder, Town Engineer**
Bid Package Available	**July 2, 2026-** Information and details of bidding requirements may be obtained at the Administration Office DPW, PSAB, 500 Dedham Ave., Needham, MA 02492, or online at the Town's web site http://www.needhamma.gov/bids.aspx.
Pre-Bid Meeting	**July 9, 2026 at 10:00am Eliot School 135 Wellesley Ave . Needham MA 02492**
Bid Deposit	**5% bid deposit is required as part of bid**
Deadline for Written Questions	**July 15, 2026 at 5:00pm** By Mail: DPW - 500 Dedham Ave., Needham, MA 02492 By Email: dpwbids@needhamma.gov **Questions are to be clearly labeled as: QUESTIONS - Installation of Eliot Playground Equipment, 27CSG048C**
Addenda	If any changes are made to this bid, an addendum will be issued. Addenda will be posted on the Town's webpage and emailed to all bidders on record as having received the bid package.
When and where bids are due	**11:00am, July 22, 2026, Administration Office DPW, Public Service Administration Building, 500 Dedham Ave., Needham, MA 02492.** **LATE BIDS WILL NOT BE CONSIDERED.**
Where bids will be opened	**Charles River Room, Public Service Administration Building, 500 Dedham Avenue, Needham, MA 02492 (immediately following submission deadline)**
Contract Award	**Anticipated July 2026** Approval of Town Manager and Town Counsel is REQUIRED.
Contract Length	**This Agreement shall be for a term commencing upon execution and ending September 30, 2026.**

Upon Award of Contract	
Payment Bond	**50% payment bond**
Performance Bond	**100% Performance Bond, if required**
Insurance	Refer to Contract Terms

* Facsimile transmissions for written inquiries must be sent prior to the above date and time deadlines. Any hand delivery or facsimile received after the due date and time will not be addressed. The time/date stamp machine located in the receiving office will govern for the date and time requirements mentioned in the table above and throughout this document. Please allow enough time for hand delivery or facsimile transmissions.

** The time for award may be extended by the Town. The Town reserves the right to change, delay, cancel, or expedite the contract award date. The Bidder agrees that the offer is effective for (a) at least ninety (90) calendar days from the opening date of the bids (b) a contract is executed, or (c) this bid is cancelled, whichever of (a), (b) or (C) occurs first. The Town reserves the right to reject any and all bids as determined to be in the best interests of the Town and to waive minor informalities.

PART 1 – GENERAL CONDITIONS AND SUBMISSION REQUIREMENTS

1.01 Intent

The Town of Needham (hereinafter referred to as the "Town"), acting through its Town Manager, invites highly qualified bidders to submit sealed bids to perform all labor necessary for Installation of Eliot Playground Equipment.

All bids are subject to the provisions of M.G.L. Chapter 30, 39M. The Town will award the contract to the lowest responsible and eligible bidder as set forth in Section 1.15. The Town of Needham reserves to itself the right to accept or reject any and all bids, or to allow or deny variations from these specifications. Such actions will be deemed to be in the best interest of the Town. Unless sooner rejected or accepted, all bid proposals must be firm and continue in effect for a minimum of ninety (90) calendar days from the date of bid opening.

1.02 Proposed Contract Term

The initial term of this agreement shall commence upon execution and be operational by September 30, 2026. The successful Bidder must enter into the Form Agreement prepared by Town Counsel (Sample Available Online).

The Town may terminate the contract at any time upon written notice for any reason including its own convenience or for cause, including but not limited to, failure to perform the work required under the contact, failure to document satisfactorily to the Town amounts being charged, failure to have any necessary local, State or Federal licenses and/or permits, failure to pay any and all required taxes, failure to comply with any local, State or Federal regulations pertaining to services to be provided, failure to promptly correct any performance or lack of performance which conflicts with the Town's use, and failure for satisfactory behavior of all staff and management. In the case of a termination for cause, the Town shall give the Contractor a written notice as provided in the Agreement.

1.03 Pre-Bid Conference and Requests for Interpretation

Refer to Procurement in Brief for details.

Bidders shall promptly raise the issue of any ambiguity, inconsistency, or error, which they may discover upon examination of the bid documents, the work site or any other conditions which apply to the work. Inquiries concerning any part of this Bid shall be directed to the individual(s) listed under the **Procurement in Brief.** Bidders should note that **oral communications are <u>not binding</u> on the Town and only written responses by the Town will be considered.** All requests/questions must be <u>submitted in writing</u>. Questions may be delivered by hand, or email as referenced under the **Procurement in Brief** by the deadline. Questions that may be asked during any pre-bid conference should also be sent in writing in order to receive an official response. Requests properly presented that in the opinion of the Town require interpretation, correction, or change in the Bid Documents will result in an issuance of an Addendum to the Bid Documents. Such Addendum shall subsequently become part of the contract. The Town will forward responses to all persons who are on record as receiving the bid package. Questions received after the due date will not be responded to unless the Town determines it is necessary. Bidders, please allow enough time for hand delivery or facsimile transmissions.

1.04 Information About Changes to the Bid (Addenda)

In the event that changes/additions are made to this bid, an addendum will be issued to every person (entity) on record as receiving the bid package. Addenda will be emailed, if an email address was not provided, then it will be faxed. If a fax number was not provided, then the addenda will be mailed. Addenda will also be posted to the website. Please check back on the website for addendums before submitting your bid to the Town. Bidders may not be notified individually of Addendums.

1.05 Bid Submission

The bidder shall submit his/her proposal upon the bid forms supplied within these specifications. The bidder shall specify the unit prices as requested for each bid item. All bids shall be signed correctly with ink; in order to qualify, the bidder must provide bids for each required item within a section. All bids shall be submitted to the Director of Administration, Town of Needham, Administration Office, 500 Dedham Avenue, Needham, MA 02492. Each bid shall be sealed in an envelope on which is clearly indicated: Name & Address of Bidder, IFB 27CSG048C, Installation of Eliot Playground Equipment, due 11:00am, July 22, 2026. All submitted bids shall include Invitation for Bids, Bid Information, Bid Scope of Work, and all Addenda issued, and all portions of the BID FORMS must be completed and submitted in order for a submission to be deemed acceptable. Bidders will submit insurance certificates validating current coverage at the time of bid submission. Bids received at the Administration Office after the time of opening of bids designated in the IFB will be returned to the bidder unopened. **Bids will be publicly opened and read aloud immediately following the bid submission deadline in the Charles River Room at the Public Services Administration Building, 500 Dedham Avenue, Needham, MA 02492**.

1.06 Bid Deposit

All bids must be accompanied by a bid deposit in an amount that is not less than five percent (5%) of the value of the bid. They shall be made payable to the Town of Needham and shall be in the form of certified check, treasurer's or cashier's check issued by a responsible bank or trust company, or a bid bond issued by a surety licensed to do business in the Commonwealth of Massachusetts; and shall be conditioned upon the faithful performance by the principal of the agreements contained in the bid.

1.07 Bid Form

All bids must be made on the attached bid forms.

Bids shall be firm for the duration of the contract. No price adjustments will be allowed. Fuel surcharges or vehicle charges or adjustments will not be allowed. Payment for materials and/or service will be made only after satisfactory performance or all requirements of the specification and upon approval by the Director of Public Works or his designate. The Town reserves the right to accept or reject any or all bids, wholly or in part, and to make the award in the best interest of the Town.

1.08 Bond Requirements

Labor and Materials Bond (Payment Bond)

Pursuant to M.G.L. c. 149, § 29, the Contractor shall furnish a payment bond from a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Town, in an amount of one half of the total Contract price for payment for labor performed or furnished and materials used or employed therein, when the Contract is executed. The payment bond shall be on the form provided by the Town.

It is distinctly agreed and understood that any changes made in the drawings and specifications for this work, whether such changes increase or decrease the amount of work required, or any change in the manner or time of payments made by the Owner to the Contractor, shall in no way void, release or affect the liability and surety on the bond given by the Contractor.

1.09 Insurance Requirement

Insurance Certificates indicating coverage for general liability, property damage, and workers' compensation as outlined in Sample Agreement available online and must include the Town of Needham as additionally insured (at time of award). The selected bidder shall take out and maintain during the life of this contract Workers' Compensation Insurance for all employees employed on the site of this project, in a manner and to the extent provided by Chapter 152 of the General Laws and shall provide the Town with written evidence showing compliance with this statute at the time of award.

The selected bidder shall indemnify and save the Town harmless from and against all claims, suits, damages, and outlays resulting from or by reason of loss, damage or injury of or to any person or property, wherever located which shall be caused by any action or operation under this agreement.

1.10 OSHA Training

The bidder certifies that all employees to be employed at the worksite shall have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least ten (10) hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee (Chapter 306 of the Acts of 2004).

1.11 DCAMM Certification

DCAMM Certification as a General Contractor for this project is **not required**.

1.12 Statement of Compliance

The Contractor shall submit a Statement of Compliance stating that persons employed by the award recipient are paid in accordance with the provisions of Sections 26 to 27H of Chapter 149 the General Laws (i.e. "The Prevailing Wage Law"). The selected Bidder will not be permitted to either assign or underlet the contract, nor assign either legally or equitably any monies there under, or its claim thereto without the previous written consent of the Town.

1.13 Prevailing Wage Rates

The state prevailing wage law, MGL Chapter 149, Section 27B requires contractors and subcontractors to submit certified payroll records to the Town. Contractors and subcontractors must submit weekly payroll records either by (1) first class mail, or (2) electronic mail. Furthermore, every weekly submittal of payroll records must contain a signed statement by the employer that indicates (1) that the records are correct, and (2) the rate of wages that each worker receives. Please feel free to contact the Department of Labor Standards at (617) 626-6953 if you have any questions. Questions about enforcement of the prevailing wage law may be directed to the Attorney General's Fair Labor and Business Practices Division at (617) 727-3465.

1.14 Duration of Bid Prices

All bids are to remain valid for 90 days after the opening of the bids.

1.15 Contractor Selection

The Town will review all bids and will award one contract to the lowest responsible and eligible bidder.

The Town reserves to itself the right to accept or reject any and all bids, or to allow or deny variations from these specifications.

In the event that there is a **tie bid** between two (2) responsible and eligible bidders, the award of the contract will be determined by a coin toss. The bidder's whose submission was received earliest shall be assigned "Heads" in the coin toss. In the event that there is a **tie bid** with three (3) or more responsible and eligible bidders, the award shall be made by a draw by lot limited to those bidders. The coin toss/draw by lot shall be scheduled within two (2) business days from when it was determined by the Town to be a tie bid. The bidders involved shall be given an opportunity to attend. The coin toss/drawing shall be witnessed by at least three (3) Town officials. The tie breaker event shall be held at the location of bid submission during regular business hours.

Upon bidder selection, the Town of Needham will request required documents, including any insurances

and bonds, then email the contract package to be signed by the Bidder. The Town of Needham will then counter sign the contracts and will return one complete contract to the Bidder. The Town's Standard Contract is available online. Bidders are expected to review the sample contract "Short Form Agreement". Unless otherwise noted by the Town, the terms and conditions contained therein are **NOT** negotiable.

It is the intention of the Town of Needham not to award a contract under this or any other proposal if the Contractor cannot furnish satisfactory evidence that he/she has the ability and experience to perform this class of work and that he/she has sufficient capital and equipment to enable him/her to prosecute the work successfully and to complete it within the time named in the contract. The Town of Needham reserves the right to reject this or any other proposal or to award the contract as is deemed to be to the best interest of said Town.

1.16 General Safety, Licenses, & Performance

The Contractor's personnel working on this project must hold all necessary licenses and permits to perform the work required under this contract as required by the Town of Needham under the Commonwealth of Massachusetts regulations. The Contractor must submit the names and all qualifying materials of the site supervisor that will be assigned to this project. All work will be done in accordance with applicable industry standards, codes, and regulations, and/or manufacturer's specifications. The Contractor is responsible for providing adequate safety measures during work to ensure protection of life and property. Any Town buildings, grounds and surrounding property damaged by the Contractor will be restored to its original state, at the cost of the Contractor.

The Contractor shall be informed that there is a thirty (30) day cancellation clause in this contract for improper service. Complaints not rectified within a reasonable length of time from day of notice as determined by the Town may cause the Town to notify the Contractor by registered or certified mail that the contract will be cancelled thirty days from the date of the letter. Any defective workmanship shown to be caused by improper or faulty installation shall cause the Contractor to correct, repair and/or replace all material and labor at no cost to the Town. The Contractor will warrant that all workmanship shall be first class and shall be performed by persons qualified and licensed in their respective trades.

Any additional work that is performed beyond this agreement must be approved by the appropriate Town authority. The absence of approval from the appropriate Town authority will be considered a violation of the contract.

1.17 Site Maintenance and Inspection

The selected contractor will be responsible for maintaining the work site in a safe and orderly fashion on a daily basis. The Contractor is responsible for the proper securing of all items associated with the project, including but not limited to: debris, tools, material, scaffolding, ladders, etc. The Contractor is responsible for the repair or replacement of any item, equipment, space, or area which may be damaged by the Contractor during the execution of this project. The Contractor is responsible for the removal and disposal of all debris and materials generated from this project.

1.18 Private Property

Before any work is performed on private property, the Contractor must have in his/her possession a RIGHT OF ENTRY form signed by the property owner. The Town may assist the Contractor in obtaining permission.

1.19 Dig Safe Law

Before proceeding with excavation operations, the Contractor shall notify the State of Massachusetts Underground Plant Damage Prevention System (Dig Safe) at 1-888-344-7233 and shall make such supplemental investigations.

1.20 Private Utilities Coordination

Coordination with private utilities is the sole responsibility of the Contractor (including natural gas, electricity, telephone, cable, etc.). The Contractor shall be responsible for notifying Dig Safe prior to any start of work. Any assistance the Town may offer in coordinating with private utilities shall not absolve the Contractor's responsibility to coordinate with private utilities as necessary to accomplish the contract work. The Contractor shall be responsible and liable for all damages to the existing utilities and structures.

1.21 Public Utilities Coordination

Coordination with public utilities is the sole responsibility of the Contractor (including water, sewer, and drain). The Contractor shall be responsible to call the Water, Sewer & Drain Inspectors at least 48 hours prior to the start of work to schedule said inspections at 781-455-7550, Mon.-Fri. 8:30am – 5:00pm. The Water Sewer, & Drains Inspectors must inspect the work. Any assistance the Town may offer in coordinating the public utilities shall not absolve the Contractor's responsibility to coordinate with public utilities as necessary to accomplish the contract work. The Contractor shall be responsible and liable for all damages to the existing utilities and structures. At the Contractor's request the Town will supply water from hydrants for work. The use and operation of Town of Needham fire hydrants is restricted to Town employees only. The Town will set up a fire hydrant connection assembly each day to supply water as needed. The Contractor is responsible for proper connection to the hydrant assembly and may operate the click valve only.

1.22 Traffic Controls

The Contractor shall furnish all local Police Officers to direct traffic and to keep the traffic off any part of the roadway in which construction is being carried out on, as, in the opinion of the Engineer are necessary for such purpose. Arrangements for officers shall be made well in advance of the work schedule for each day. If for any reason the Contractor cancels work for that day, and the Needham Police Department is not given advance notice, the Contractor will be responsible for that officer's wages. If the contractor has performed work that has not been accepted by the town and has to be redone to meet the specification, then the contractor is responsible for the expense of the police details due to poor workmanship or warrantee issues. Except in the instance above, the Owner will reimburse the Contractor for all other police details. The contractor must submit payments directly to the Needham Police Department or other police department's that have supplied officers to the job site and supply copies of invoices to the Department of Public Works showing the invoice has been paid **prior to submitting for reimbursement**. The Contractor shall not be reimbursed before this documentation has been provided.

1.23 Material Disposal

The Contractor, at no additional cost to the Town, shall dispose of all material that has been removed from each location.

1.24 Quantities

Unless otherwise stated, the quantities set forth herein are ESTIMATES ONLY. Any quantities indicated on the Bid Price Form or elsewhere in the bid package are estimates only and are given solely as a basis for the comparison of bids. The Vendor shall have no claim for additional compensation, or refuse to do the work called for, or provide the requested items, by reason of the actual quantities involved being greater or lesser by any amount than those called for in the bid.

1.25 Subcontracting

The Contractor shall keep the work under his personal control and shall not assign by power of attorney or otherwise, or sublet the work or any part thereof, without the previous written consent of the Owner. Should the Contractor require the services of one or more subcontractors, the Contractor shall submit to the Owner, at the time of submittal of bids, the name, and references for the subcontractor(s) for review

and approval by the Owner. Said subcontractor(s) shall not begin any work or bring any equipment, etc., onto the site until such approval is given. Under no circumstances shall the Contractor subcontract more than forty percent of the work on the project. The Contractor shall be responsible for the operations of any subcontractor(s) and the subcontractor shall be subject to the directions of the Contractor's project supervisor. **If the general contractor plans to use subcontractors for any part of the project, they must submit a list of subcontractors for the Town Engineer to approve with their bid submission.**

1.26 Invoices & Reporting

Upon verification that the work has been completed, invoices must be sent to Town of Needham, Administration Division, Department of Public Works, 500 Dedham Avenue, Needham, MA 02492 or **dpwadmin@needhamma.gov**. Each bill shall contain a cover sheet listing the broken-out labor and materials cost, and back-up documents including materials costs, and other relevant information. Certified payroll will be required. Invoices shall not be processed for payment until the above information is provided in a format acceptable to the Director of Administration or their designee. Invoices for on-call services must specify the cost of labor, hours worked, and cost of materials for each project. Invoices shall be itemized by units and by location or project.

1.27 Payment

Payment shall be made on the amount of work performed based upon the unit prices placed on the bid forms. Payment shall be made upon submission of an invoice and acceptance of the work by the Director of Public Works, or their designated agent. The payment of these amounts shall be considered full and complete payment for all labor, material, and equipment necessary, including traffic control, to perform the specified work.

The Town will not be responsible for payment of any charges not itemized to the Town's satisfaction. Pre-payment is NOT allowed. Invoices must include the Town's purchase order number.

Invoices for services must include the location, date and times of the work, the type of the services performed; the number of hours or units to be charged, and the name of the person who authorized the work.

1.28 CORI/SORI

See Article 30 of Sample Agreement.

1.29 Supplemental Equal Opportunity Anti-Discrimination & Affirmative Action Program

This contract is subject to the Supplemental Equal Opportunity Anti-Discrimination and Affirmative Action Program (EEO/AA) provisions attached to the Project Manual.

1.30 Submission Requirements

Quality Requirements

- ✓ **All bidders must furnish proof of a minimum of three (3) continuous years in business.**
- ✓ **All bidders must provide owner contact information for five (5) contracts of similar nature and scope completed within the last five (5) years.**

Submission Requirements

1. The bid is to be submitted and addressed as follows: Director of Administration, Public Service Administration Building, 500 Dedham Ave., Needham, MA 02492.

2. The bid is to be clearly marked IFB 27CSG048C, Installation of Eliot Playground Equipment.

3. Bidder must acknowledge all addenda related to this IFB, if any.

4. Bidder must submit a completed **Bid Form A: Bid Form** or an exact copy, signed by an individual authorized to negotiate for and contractually bind the Bidder. All prices must be reflective of all costs for delivery. No price adjustments will be allowed. Fuel surcharges or vehicle surcharges or adjustments will not be allowed.

5. Bidder must submit a completed **Bid Form B: Bidder Information Response** form.

6. Bidder must submit a completed **Bid Form C: Authentication Form.**

7. Bidder must submit a signed **Bid Form D: Certificate of Good Faith.**

8. Bidder must submit a completed **Bid Form E: Certificate of Compliance with Massachusetts Tax Laws** or Certificate of Good Standing issued by the Massachusetts Department of Revenue.

9. Bidder must submit a completed **Bid Form F: Certificate of Compliance for Public Construction More than $10,000.00.**

10. Bidder must provide the required number of references. For each, provide the following: a contact person and title, customer's name, address, telephone number, email, and a brief description of the actual services provided (sample format included in bid package as **Bid Form G**).

11. Bidder must submit a completed **Bid Form H: Certificate of Authority** (attached) or **Corporate Resolution;** if applicable.

12. Bids must be received and time stamped no later than the deadline stated in the **Procurement Schedule** (Where and When Bids are Due). LATE BIDS WILL NOT BE CONSIDERED.

13. A **Bid Deposit** is required.

14. Delivery, if required, will be at the expense of the Bidder. Any and all damages that may occur due to packaging or shipping will be at the sole responsibility of the Bidder.

15. Any additional requirements as required in the Scope of Service.

The Town reserves the right to reject any and all bids as determined to be in the best interests of the Town and to waive minor informalities.

PART 2 – SCOPE OF WORK

2.01 General

The contractor will furnish all materials, equipment, and labor to perform all required work to complete the relocation and installation of the Newman School to the lot playground, located at 1155 Central Ave, Needham MA 02492. Attached are the plans and specifications

2.02 Hours of Work

Normal hours of work shall be between the hours of 7:00 am and 3:30 pm, Monday through Friday, unless otherwise specified. No work shall be performed on Saturdays, Sundays, Holidays, or any other times other than normal hours of work without express permission from the Director of Public Works or their designee. All work in this contract will be identified by the Director of Public Works and shall be constructed in accordance to Town Specification or as directed by the Director.

2.03 Response Time

The Contractor must designate an employee or contact with the authority to speak on behalf of the Contractor for initiating requests for service. The Town will select a designee or designees to initiate work on behalf of the Town.

A request for service will be generated in writing (including email or mail) for work as scheduled. For emergency work, the first point of contact may be a phone call with a follow-up written request.

The Contractor must respond to emergency calls within two (2) hours after receipt of notification. The Contractor must respond to on-call immediate response calls within forty-eight (48) hours after receipt of notification. The Contractor must respond to scheduled work within forty-eight (48) hours after receipt of notification and schedule work to be completed within two (2) weeks.

Failure to meet these obligations may subject the Contractor to penalties of $500 per business day for noncompliance. Failure to meet these objectives may subject the Contractor to loss of contract and the Contractor may be assessed the difference between their bid price and the next lowest responsible and eligible bidder.

2.04 Supervision

The Contractor shall designate a project supervisor in writing upon a receipt of awarded contract. Any change in supervision shall require prior approval in writing of the Director of Public Works or their designee. Failure of the Contractor to comply with this requirement may result in the Town, after one written warning, and at its sole option, charging a penalty of $200 per day until an approved project supervisor is on site. The project supervisor shall be present at each project during the execution of work. Once project has begun, the Contractor shall pursue and coordinate all work in a continuous and diligent manner until all work is completed, unless otherwise directed by the Director of Public Works or their designee. The Contractor shall employ a minimum of 2 competent workers on site daily. Failure to comply with this requirement may result in a penalty of $200 per business day of noncompliance as determined by the Director of Public Works.

2.05 Specifications

The contractor will furnish all materials, equipment, and labor to perform all required work as specified in the attached specifications and plans, included but not limited to;

The contractor shall provide the following Material:

- Erosion control, straw wattle and silt fence
- New chain-link fencing per plans
- Poured in Place rubber playground surfacing
- Concrete material, steel rebar reinforcement, associated concrete accessories.
- Subbase for material for new Playground area
- Bituminous asphalt walkways
- Loam and seed at disturbed areas

The Contractor Shall:

- Demo and remove existing items per plans and specs.
- Complete all site work per plans and specs.
- Furnish and install poured in place rubber surfacing materials
- Furnish and install structural concrete foundations for shade structures, playground equipment and all other misc., items per plans and specs.
- Install playground equipment provided by ME Obrien, pre-purchased by the Town of Needham.
- Furnish and install new chain-link fencing per plans and specs.
- Install and maintain all required erosion controls for duration of construction.
- Work areas should be kept clean daily.
- Any dumpster or trash removal will be included in the contractor's cost proposal.
- Contractor to provides a two-year warranty of labor and workmanship.

PART 3 – CHECKLIST AND REQUIRED FORMS FOR SUBMISSION

Installation of Eliot Playground Equipment
27CSG048C

Company Name: _____

☐ Bidder has completed and returned the **Acknowledgment of Receipt** form (via email).

☐ Bidder has completed, signed, and enclosed the **Bid Form A: Bid Price Form** or an exact copy.

☐ Bidder has provided a list of all vehicles and equipment they own that will be available for use during the contract.

☐ Bidder has completed, signed, and enclosed the **Bid Form B: Bidder Information Response** form.

☐ Bidder has completed, signed, and enclosed the **Bid Form C: Authentication Form.**

☐ Bidder has completed, signed, and enclosed the **Bid Form D: Certificate of Good Faith**.

☐ Bidder has completed, signed, and enclosed the **Bid Form E: Certificate of Compliance with Massachusetts Tax Laws** or Certificate of Good Standing issued by the Massachusetts Department of Revenue.

☐ Bidder must submit a completed **Bid Form F: Certificate of Compliance for Public Construction More than $10,000.00.**

☐ Bidder has provided at least five (5) references on the **Bid Form G: Professional Reference Form** of which at least three (3) is a governmental unit (municipal/county/regional district/state agency/special district).

☐ If the bid submission is signed by someone other than the Owner/President of the company, a completed **Bid Form H: Certificate of Authority of Corporate Resolution** for the person who signed the proposal or a valid Corporate Resolution stating the individual has the authority to submit the proposal on behalf of the Company and can bind the Company to the contract if awarded.

☐ The Bid Deposit (Bond) enclosed.

☐ List of Subcontractors, if any

☐ Bidder acknowledged all addenda, if any
Addendum Number 1 dated _____
Addendum Number 2 dated _____
Addendum Number 3 dated _____
Addendum Number 4 dated _____
Addendum Number 5 dated _____

This form must be completed and filed with bid submission

Bid Form A: Bid Sheet
Installation of Eliot Playground Equipment
27CSG048C

	Bid Item	Total Anticipated Cost
A	Total Not to Exceed Contract Price for the Installation of Eliot Playground Equipment	**$**
	General Bid Requirements	
B	Warranty on Materials (in months)	
C	Warranty on Labor (in months)	
D	Prompt Payment Discount	**__%__/ Days**

Bidder Acknowledges Addenda #: _____

Company Name: _____ Number of Years in Business: _____

Address: _____

Authorized Signature: _____

Printed Name & Title: _____

This form must be completed and filed with bid submission

Bid Form B: Bidder Information Response
Installation of Eliot Playground Equipment
27CSG048C

Legal Name of the Bidder: _____

Company Name: _____

Company Address: _____

City State Zip: _____

Company Web Address: _____

Company Telephone:_____ Company Fax Number: _____

State of Incorporation (Date): _____

If the bidder is a partnership, give full names and addresses of all partners; and if an individual, give residential address if different from business address.

Company Contacts – Required

Individual submitting the bid: (This is the individual who should sign the Certificate of Good Faith)

Name: _____ Title: _____

Mailing Address: _____

Telephone: _____ Fax Number: _____

Email Address: _____

Individual to be contacted about the bid: (If different from the individual submitting the bid)

Name: _____ Title: _____

Mailing Address: _____

Telephone: _____ Fax Number: _____

Email Address: _____

Best Times to Contact: _____

Individual authorized to contractually bind the company: (This will be the individual whose name and title will appear in the contract documents and will execute the contract if the contract is awarded to the company)

Name: _____ Title: _____

Mailing Address: _____

Telephone: _____ Fax Number: _____

Email Address: _____

Best Times to Contact: _____

1. Has the bid been signed by a person legally authorized to commit the Bidder (Company) to the contract, if awarded? ☐ **Yes** ☐ **No**

2. Is the Bidder prepared to provide the insurances as required? ☐ **Yes** ☐ **No**

3. Has the Bidder placed any conditions or restrictions with its bid to the Town which conflict with the Scope of Services? (If yes, the bid may be deemed conditional.) ☐ **Yes** ☐ **No**

4. Has the Bidder identified any and all exceptions to the Town's specifications and are they included in the submission? ☐ **Yes** ☐ **No**

5. Is the Bidder prepared to execute the Town's contract, if awarded? ☐ **Yes** ☐ **No**

Signature of the Bidder: _____

Printed Name and Title of Signatory: _____

Date: _____

This form must be completed and filed with bid submission

Bid Form C: Authentication Form
Installation of Eliot Playground Equipment
27CSG048C

The undersigned agrees that, if selected as the Contractor for any or all of the above bid items, the Contractor shall be obligated to provide those services in accordance with the terms of these specifications at the bid price upon receipt of a fully executed contract.

Name of Bidder: _____

Address: _____

Authorized Signature: _____

Printed Name and Title: _____

Date: _____ Phone Number: _____

Fax Number: _____ Email: _____

This form must be completed and filed with bid submission

Bid Form D: Certificate of Good Faith
Installation of Eliot Playground Equipment
27CSG048C

The undersigned hereby certifies that s/he will comply with all laws and regulations applicable to awards made subject to Massachusetts General Laws, Chapter 30 Section 39M.

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Bidder Name: _____ Date: _____

Signature of Individual Submitting Bid: _____

Individual Full Name and Title: _____

Business Address: _____

This form must be completed and filed with bid submission

Bid Form E: Certificate of Compliance with Massachusetts Tax Laws
Installation of Eliot Playground Equipment
27CSG048C

[Certificate of Good Standing issued by the Massachusetts Department of Revenue dated no earlier than 90 days before the bid submission deadline may be submitted in place of this certificate.]

Pursuant to M.G.L. c.62C, §49A , the undersigned acting on behalf of the Contractor* certifies under the penalties of perjury that the Contractor is in compliance with all laws of the Commonwealth relating to taxes including payment of all local taxes, fees, assessments, betterments and any other local or municipal charges (unless the Contractor has a pending abatement application or has entered into a payment agreement with the entity to which such charges were owed), reporting of employees and contractors, and withholding and remitting child support.**

(1) Contractor: _____ Date: _____

Print Name: _____

Social Security Number: _____

Corporation, Association, or Partnership: _____

Federal Tax ID Number or Social Security Number: _____

(2) By: _____ Date: _____
(Authorized Corporate Signature)

Name and Title: _____

Note to Contractor***: Please sign at (1) or (2), whichever applies.

In order to comply with all laws of the Commonwealth relating to taxes, the undersigned certifies that Contractor (check applicable item):

1. _____ has filed all tax returns and paid all taxes required by law; or
2. _____ has filed a pending application for abatement of such tax; or
3. _____ has a pending petition before the appellate tax board contesting such tax; or
4. _____ does not derive taxable income from Massachusetts Sources such that it is subject to taxation by the Commonwealth

* As used in this certification, the word "Contractor" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.
** The provision in this Certification relating to child support applies only when the Contractor is an individual.
*** Approval of a contract or other agreement will not be granted until the Town of Needham receives a signed copy of this Certification.

This form must be completed and filed with bid submission

Bid Form F: Certificate of Compliance for Public Construction More than $10,000.00
Installation of Eliot Playground Equipment
27CSG048C

The undersigned agrees that, if selected as Contractor, s/he will within five days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Town, execute a contract in accordance with the terms of this bid. The undersigned hereby certifies that s/he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that's/he will comply fully with all laws and regulations applicable to awards made subject to M.G.L. Chapter 30 39M. The undersigned agrees that, if selected as the Contractor for any or all of the above bid items, he/she shall be obligated to provide those services in accordance with the terms of these specifications at the bid price upon receipt of a fully executed contract.

The undersigned certifies, under pains and penalties of perjury that:

1. The Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;
2. All employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration and the time the employee begins works and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee;

Name of Company: _____

Signature: _____

Printed Name and Title of Signatory: _____

Business Address: _____

City, State, Zip: _____

Telephone: _____ Fax: _____

Email Address: _____

This form must be completed and filed with bid submission

Bid Form G: Professional References
Installation of Eliot Playground Equipment
27CSG048C

Customer: _____

Mailing Address: _____

Period of Service (MM/YYYY): _____ through _____

Is this a Municipal or other Governmental Unit?: ☐ Yes ☐ No

Project Name: _____

Primary Contact: _____ Title: _____

Telephone: _____ Ext: _____

Email: _____

Customer: _____

Mailing Address: _____

Period of Service (MM/YYYY): _____ through _____

Is this a Municipal or other Governmental Unit?: ☐ Yes ☐ No

Project Name: _____

Primary Contact: _____ Title: _____

Telephone: _____ Ext: _____

Email: _____

(Make as many copies as necessary. A minimum of 5 references required)

THIS FORM OR SUBSTITUTE WITH THE REQUESTED INFORMATION MUST BE FILED WITH BID SUBMISSION

Bid Form H: Certificate of Authority
Installation of Eliot Playground Equipment
27CSG048C

Complete Only If Applicable

1. I hereby certify that I am the Clerk/Secretary of _____
(insert full name of Corporation)

2. corporation, and that _____
(insert the name of officer who signed the contract and bonds.)

3. is the duly elected _____
(insert the title of the officer in line 2)

4. of said corporation, and that on _____
(insert a date that is **ON OR BEFORE** the date the officer signed the **contract and bonds.**)

at a duly authorized meeting of the Board of Directors of said corporation, at which all the directors were present or waived notice, it was voted that

5. _____ the _____
(insert name from line 2) (insert title from line 3)

of this corporation be and hereby is authorized to execute contracts and bonds in the name and on behalf of said corporation, and affix its Corporate Seal thereto, and such execution of any contract of obligation in this corporation's name and on its behalf, with or without the Corporate Seal, shall be valid and binding upon this corporation; and that the above vote has not been amended or rescinded and remains in full force and effect as of the date set forth below.

6. ATTEST: _____ AFFIX CORPORATE
(Signature of Clerk or Secretary)* SEAL HERE

7. Name: _____
(Please print or type name in line 6)*

8. Date: _____
(insert a date that is **ON OR AFTER** the date the officer signed the **contract and bonds.)**

The name and signature inserted in lines 6 & 7 must be that of the Clerk or Secretary of the corporation.

Project Manual

Eliot Elementary School Rec Improvements

Issued for Bidding

Contract No. N5001-014

Town of Needham, Massachusetts

June 2026

Tighe & Bond

53 Southampton Road,
Westfield, MA 01085

Eliot Elementary School Rec Improvements
Town of Needham
Needham, MA

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SECTION 02200

SITE PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Clearing and grubbing
2. Grading
3. Stripping and stockpiling of soil and sod

1.2 SUBMITTALS

A. Submit construction methods and equipment that will be utilized for the clearing, grubbing, and waste material disposal specified within this Section.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

A. Except as otherwise directed, cut, grub, remove and dispose of all trees, stumps, brush, shrubs, roots and any other objectionable material within the limits of the Work on the site and where required to construct the work.

B. Protect trees or groups of trees, designated by the Engineer to remain, from damage by all construction operations by erecting suitable barriers, or by other approved means. Conduct clearing operations to prevent falling trees from damaging trees designated to remain.

1. All damage done to the trees by the Contractor's operation shall be trimmed and painted where cut as directed or as necessary to provide adequate vertical clearance for construction activities. The dressing or paint shall be applied no later than two days after the cuts are made.
2. Use all necessary precautions to prevent injury to other desirable growth in all areas. Contractor shall assume full responsibility for any damage.

C. Protect areas outside the limits of clearing from damage. No equipment or materials shall be stored in these areas.

D. No stumps, trees, limbs, or brush shall be buried in fills or embankments.

3.2 DISPOSAL OF MATERIALS

A. Remove all tree trunks, limbs, roots, stumps, brush, foliage, other vegetation and objectionable material from the site and dispose of in a legal manner.

B. Burning or direct burial of cleared and grubbed materials on-site will not be permitted.

3.3 GRADING

A. In preparation for placing loam, perform grading to the lines, grades and elevations shown on the Drawings, and otherwise directed by the Engineer and perform in such a manner that the requirements for formation of embankments can be followed. All material encountered, regardless of its nature, within the limits indicated, shall be removed and disposed of as directed. During the process of grading, maintain the subgrade in such condition that it will be well drained at all times. Install temporary drains and drainage ditches to intercept or divert surface water that may affect the work when necessary.

B. If at the time of grading it is not possible to place material in its final location, stockpile material in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses.

D. Stones or rock fragments larger than 4 inches in their greatest dimensions will not be permitted in the top 12 inches of the finished subgrade of all fills or embankments except along the access roadways and rip-rap where shown on the Drawings.

E. In cuts, loose or protruding rocks on the excavated slopes shall be barred loose or otherwise removed to line or finished grade of slope. Cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings or as directed by the Engineer.

3.4 DUTCH ELM WOOD

A. Dutch Elm diseased wood shall be disposed of in accordance with any local regulations.

B. Where the work includes the removal of elm trees or the limbs of elm trees, such trees or limbs thereof shall be disposed of immediately after cutting or removal and in such a manner as to prevent the spread of Dutch Elm disease. This shall be accomplished by covering them with earth to a depth of at least 6 inches in areas outside the right-of-way locations where the Contractor has arranged for disposal.

C. Where the work includes the removal and disposal of stumps of elm trees, such stumps shall be completely disposed of immediately after cutting in the manner specified above.

END OF SECTION

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SECTION 02220

DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. The Contractor shall furnish all labor, materials, tools, equipment, and apparatus necessary and shall do all work required to complete the demolition, removal, and alterations of existing facilities as indicated on the Drawings, as herein specified, and/or as directed by the Engineer. The work in general includes the demolition and legal disposal of materials shown to be removed on the drawings and as required for new construction. Note that this site was previously developed and occupied by other structures and that subsurface elements from previous construction may exist.

2. All equipment, piping, and other materials that are not to be relocated or to be returned to the Owner shall become the property of the Contractor and shall be disposed of by them away from the site of the work and at their own expense.

3. All demolition or removal of existing structures, utilities, equipment, and appurtenances shall be accomplished without damaging the integrity of existing structures, equipment, and appurtenances to remain, to be salved for relocation, or stored for future use. Such items that are damaged shall be either repaired or replaced at the Contractor's expense to a condition at least equal to that which existed prior to the start of work.

4. Obtain permission from Engineer and/or owner before abandoning or removing any existing structures, materials, equipment and appurtenances.

1.2 DEFINITIONS

A. Demolish – To tear down, segregate waste streams and lawfully recycle or dispose of all debris generated in the process including structure contents.

B. Limit of Work – Area delineated on Drawings that defines the extent of demolition work under the Contract.

1.3 SUBMITTALS

A. Informational Submittals

1. Copies of any authorizations and permits required to perform the Work, including disposal/recycling facility permits.

1.4 REGULATORY REQUIREMENTS

A. Contractor is solely responsible for obtaining permits or approvals which may be required to perform the work of this section, including all costs, fees and taxes required or levied, except for the following permits that will be obtained by the Owner:

1. N/A

B. Notify and obtain such permits or approvals from agencies having jurisdiction over demolition prior to starting work.

C. Complete, sign and submit a Notice of Intent to be covered under EPA's General Permit for Construction Activity. Comply with the requirements of the site-specific Stormwater Pollution Prevention Plan that is appended to this Project Manual.

D. Comply with all applicable federal, state, and local environmental, safety and health requirements regarding the demolition of structures and other site features and recycling or disposal of demolition debris, as applicable.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 PROJECT MANAGEMENT

A. Provide a full-time Project Superintendent who shall serve as a direct communication among the Contractor, subcontractors, and the Owner.

B. Require all subcontractors to provide a foreman or superintendent. That individual must be on site at all times that the subcontractor is working.

3.2 EXAMINATION

A. Verify site conditions before proceeding with demolition work. Field check the accuracy of the Drawings and inspect structures and utilities prior to start of work and notify the Engineer in writing, of any hazardous conditions and/or discrepancies. Primary structures and other site features are shown on the Drawings and/or in the appended photographs; other smaller structures, including, but not limited to, concrete walks and pads, miscellaneous signs, lamp posts, railings, and fencing may not be shown on the Drawings, but may exist within the Limit of Work and shall be demolished.

1. Unknown Site Conditions - The information provided on the Drawings and in the Specifications is believed accurate. Field verify all information. Bear full responsibility for obtaining all locations of underground structures, utilities and their connections. Maintain services to buildings outside the limits of work.

2. Interior Elements - Interior features including but not necessarily limited to structural elements, walls, partitions, equipment, piping or other building facilities are not shown on the drawings and must be visually inspected Inspect and appraise all features and facilities to be demolished or removed for salvage. Investigate to assure the condition of the work to be demolished and take all precautions necessary to ensure safety of people and property.

3.3 PREPARATION

A. Remove and/or stabilize all overhead hazards, prior to commencing work near any building. Where hazards cannot be stabilized, mark and control areas below hazards to prohibit access below the hazards. This shall be performed with caution tape, saw horses, safety fence or other types of barricades as determined by applicable safety codes.

3.4 HAZARDOUS MATERIALS

A. Lead Paint

1. A number of state, federal and local agencies regulate work which involves lead paint. Paint coatings on the structures to be demolished that contain lead. This lead could present a hazard to workers and requires regulatory compliance with 29 CFR 1926.62 "Lead in Construction."

2. Of specific concern is the cutting of steel components using torch methods. If the Contractor intends to torch cut painted steel, lead paint must be removed from the area to be cut with a chemical stripper or other means prior to cutting. Sufficient paint must be removed from the area to prevent volatilization of lead during the heating of the steel. Other means of controlling worker exposure to lead will be acceptable provided that they are addressed in the Lead Exposure Control Plan outlined in Section 01350 and that they meet the requirements of 29 CFR 1926.62.

3. Where activities may generate leaded dust or impact a leaded surface, regulate work area so that dust migration is contained properly within the regulated area. Once the work is complete, properly clean up and dispose of leaded dust and materials.

B. Oil and Hazardous Material Contamination

1. There is no known soil contamination at the site. However, contaminated soil may be encountered during excavation

2. Contractor personnel working in areas of the site where contamination is likely to be encountered shall be appropriately trained.

3. When working in areas of the site where contamination is likely to be encountered, Contractor's Site Safety Officer shall monitor the work area in accordance with Section 01350, Article 1.5.

3.5 DEMOLITION

A. Demolish the buildings, underground utilities and related appurtenances by methods that will not cause damage to surrounding structures, underground and overhead utilities, or other existing items and structures that are to remain in place.

B. Promptly and properly manage all debris as the demolition progresses. Construct and/or prepare material staging/stockpile areas at locations approved by the Engineer.

C. Buildings

1. Demolish all buildings within the Limit of Work as indicated on the Drawings.

2. Segregate various building materials to facilitate recycling of salvageable materials and to facilitate crushing and reuse of asphalt, brick and concrete.

3. Barricade work area as necessary to protect workers and general public from falling debris.

4. Do not leave unstable structures unattended. Plan the workday so that all structures are stable at the end of each work day.

D. Miscellaneous Site Structures and Features

1. Trees – Trees are an important resource and shall be treated as such. Unless specifically noted to be demolished, protect all trees and obtain approval of the Engineer prior to removing or pruning any other trees.

3.6 BITUMINOUS CONCRETE PAVEMENT REMOVAL OR RECLAMATION

A. Remove or reclaim bituminous concrete pavement within Limit of Work as indicated on the Drawings. Legally dispose of bituminous concrete pavement underlain with concrete off site along with the underlying concrete.

3.7 DISPOSAL

A. Legally dispose of or recycle all materials from demolition as well as equipment and other materials that are within the buildings. The disposal site shall be permitted to accept the waste stream by the applicable State Agency. Perform the loading of demolition materials in a manner that prevents materials and activities from generating excessive dust and ensures minimum interference with roads, sidewalks and streets both onsite and offsite.

B. Provide evidence that the demolition materials have been received at a legal disposal, recycle, reuse or salvage location. Such proof may include truck weigh slips from an approved disposal facility or documentation of transfer of title. Transport of all materials off site shall be in accordance with applicable Department of Transportation Regulations. All materials leaving the site shall become the property of the Contractor.

3.8 SITE RESTORATION

A. Prior to any backfilling, document the location of any structures that remain in place through construction photographs and by obtaining swing ties to and elevations of any structures to be buried. Progress payments may be withheld if current documentation is not maintained.

B. Backfill areas from which structures were removed to match the surrounding grade or to achieve the final grades indicated on the Drawings.

C. Restore damaged areas of the site or neighboring properties in accordance with and stabilize slopes in accordance with the erosion and sedimentation control requirements of the Contract and the stormwater permit.

D. Loam and seed all disturbed areas in accordance.

END OF SECTION

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SECTION 02315

EXCAVATION, BACKFILL, COMPACTION AND DEWATERING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Excavation, backfill and compaction for paved areas, pads and other structures
2. Excavation, backfill and compaction for subsurface utilities
3. Removal, handling and disposal of rock not covered under Section 02410
4. Temporary dewatering systems

B. Related Sections

1. Section 02320 - Borrow Materials
2. Section 02410 - Rock Excavation

1.2 REFERENCES

A. ASTM D1557-07 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

B. Federal Register 40 CFR Part 122, United State Environmental Protection Agency (USEPA) Administered Permit Programs (National Pollution Discharge Elimination System or NPDES), Storm Water Discharge

C. ASTM D1556-07 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

D. ASTM D2487-06e1 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

E. ASTM D6938-08a - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

F. 29 CFR Part 1926 Subpart P - OSHA Excavation Regulations 1926.650 through 1926.652 including Appendices A through F

G. 520 CMR 14.00 Excavation and Trench Safety

H. Commonwealth of Massachusetts Highway Department “Standard Specifications for Highways and Bridges,” latest edition

1.3 DEFINITIONS

A. Benching - A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

B. Earth Retention Systems - Any structural system, such as sheeting and bracing or cofferdams, designed to retain in-situ soils in place and prevent the collapse of the sides of an excavation in order to protect employees and adjacent structures.

C. Excavation - Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

D. Protective System - A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include earth retention systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

E. Registered Professional Engineer - A person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

F. Shield System - A structure that is designed to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built in accordance with 29 CFR 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

G. Sloping - A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

H. Temporary Dewatering System – A system to lower and control water to maintain stable, undisturbed subgrades at the lowest excavation levels. Dewatering shall be provided for all pipelines, structures and for all other miscellaneous excavations.

I. Trench - A narrow excavation (in relation to its length) made below the surface of the ground, of at least three feet in depth. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m).

1.4 SUBMITTALS

A. Performance data for the compaction equipment to be utilized

B. Construction methods that will be utilized for the removal of rock

C. Modified Proctor Test (ASTM D1557) results and soil classification (ASTM D2487) for all proposed backfill materials at the frequency specified below:

1. For suitable soil materials removed during Excavation, perform one test for every 1,000 cubic yards of similar soil type. Similarity of soil types will be as determined by the Engineer.

2. For borrow materials; perform tests at frequency specified in Section 02320, Borrow Materials.

D. Compaction test results (i.e. ASTM D6938 or ASTM D1556) at a frequency of one test for every 100 cubic yards of material backfilled or at a minimum of one test per lift. The Engineer will determine the locations and lifts to be tested. The Contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.

1. Methods and equipment proposed for compaction shall be subject to prior review by the Engineer. Compaction generally shall be done with vibrating equipment. Static rolling without vibration may be required by the Engineer on sensitive soils that become unstable under vibration. Displacement of, or damage to existing utilities or structure shall be avoided. Any utility or structure damaged thereby shall be replaced or repaired as directed by the Engineer.

2. Additional compaction testing may be required when there is evidence of a change in the quality of moisture control or the effectiveness of compaction.

a. Any costs associated with correcting and retesting as a result of a failure to meet compaction requirements shall be borne by the Contractor.

3. If all compaction test results within the initial 25% of the total anticipated number of tests indicate compacted field densities equal to or greater than the project requirements, the Engineer may reduce frequency of compaction testing. In no case will the frequency be reduced to less than one test for every 500 cubic yards of material backfilled.

4. The Contractor is cautioned that compaction testing by nuclear methods may not be effective where trenches are so narrow that trench walls impact the attenuation of the gamma radiation, when adjacent to concrete that impacts the accuracy of determining moisture content, or where oversize particles (i.e. large cobbles or coarse gravels) are present. In these cases, other field density testing methods may be required.

1.5 QUALITY ASSURANCE

A. All Excavation, Trenching, and related Earth Retention Systems shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P), 520 CMR 14.00, and other State and local requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

1.6 PROJECT CONDITIONS

A. Notify Dig Safe and obtain Dig Safe identification numbers.

B. Notify utility owners in reasonable advance of the work and request the utility owner to stake out on the ground surface the underground facilities and structures. Notify the Engineer in writing of any refusal or failure to stake out such underground utilities after reasonable notice.

C. Make explorations and Excavations to determine the location of existing underground structures, pipes, house connection services, and other underground facilities in accordance with Paragraph 3.2.D of this Section.

D. In accordance with 520 CMR 14.00, no person shall, except in an emergency, make an excavation in any public way, public property, or privately owned land until a permit is obtained from the appropriate designated permitting authority. For this project, the permit should be obtained from Town of Hopedale Highway Department.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill material is subject to the approval of the Engineer and may be either material removed from excavations or borrow from off site. Fill material, whether from the excavations or from borrow, shall be of such nature that after it has been placed and properly compacted, it will make a dense, stable fill.

B. Satisfactory fill materials shall include materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, SW, and SP. Additional requirements are included in Section 02320.

C. Satisfactory fill materials shall not contain trash, refuse, vegetation, masses of roots, individual roots more than 18 inches long or more than 1/2 inch in diameter, or stones over 6 inches in diameter. Unless otherwise stated in the Contract Documents, organic matter shall not exceed minor quantities and shall be well distributed.

D. Satisfactory fill materials shall not contain frozen materials nor shall backfill be placed on frozen material.

E. Excavated surface and/or pavement materials such as gravel or trap rock that are salvaged may be used as a sub-grade material, if processed to the required gradation and compacted to the required degree of compaction. In no case shall salvaged materials be substituted for the required gravel base.

2.2 CONTROLLED DENSITY FILL

A. Controlled density fill shall be flowable, excavatable and shall require no vibration for placement. Compressive strength at 28 days shall be 30 to 80 psi and the slump shall be 10 to 12 inches.

2.3 DEWATERING MATERIALS

A. Provide silt fence in accordance with Section 01570.

B. Provide silt filter bags (Dandy Dewatering Bag, Dirtbag, JMP Environ-Protection Filter Bag, or equal) of adequate size to match flow rate.

PART 3 EXECUTION

3.1 PREPARATION

A. Public Safety and Convenience

1. Adhere to the requirements of 520 CMR 14.00 for all excavation work.

2. Take precautions for preventing injuries to persons or damage to property in or about the Work.

3. Provide safe access for the Owner and Engineer at site during construction.

4. Do not obstruct site drainage, natural watercourses or other provisions made for drainage.

3.2 CONSTRUCTION

A. Earth Retention Systems

1. Provide Earth Retention Systems necessary for safety of personnel and protection of the Work, adjacent work, utilities and structures.

2. Maintain Earth Retention Systems for the duration of the Work.

3. Sheeting

a. Systems shall be constructed using interlocking corner pieces at the four corners. Running sheet piles by at the corners, in lieu of fabricated corner pieces, will not be allowed.

b. Drive sheeting ahead of and below the advancing excavation to avoid loss of materials from below and from in front of the sheeting.

c. Sheeting is to be driven to at least the depth specified by the designer of the earth retention system, but no less than 2 feet below the bottom of the Excavation.

4. Remove earth retention system, unless designated to be left in place, in a manner that will not endanger the construction or other structures. Backfill and properly compact all voids left or caused by the withdrawal of sheeting.

a. Remove earth retention systems, which have been designated by the Engineer to be left in place, to a depth of 3 feet below the established grade.

B. Excavation

1. Perform excavation to the lines and grades indicated on the Drawings. Backfill unauthorized over-excavation in accordance with the provisions of this Section, at no additional cost to the Owner.

2. Excavate with equipment selected to prevent damage to existing utilities or other facilities. Hand excavate as necessary to locate utilities or avoid damage.

3. Sawcut the existing pavement in the vicinity of the excavation prior to the start of excavation in paved areas, so as to prevent damage to the paving outside the requirements of construction. The sawcut shall be neat in appearance with no ragged lines; trim pavement as necessary.

4. Perform excavation in such a manner as to prevent disturbance of the final subgrade. The Engineer or Owner may require the final six inches of excavation be performed by hand, with the use of a smooth-faced bucket, or other means acceptable to the Engineer or Owner, at no additional cost if

subgrade disturbance is considered excessive as judged by the Engineer or Owner.

5. During excavation, material satisfactory for backfill shall be stockpiled in an orderly manner at a distance from the sides of the excavation equal to at least one half the depth of the excavation, but in no case closer than 2 feet.

    a. Excavated material not required or not suitable for backfill shall be removed from the site and disposed of in accordance with local, State and Federal laws and regulations.

    b. Perform grading to prevent surface water from flowing into the excavation.

    c. Pile excavated material in a manner that will endanger neither the safety of personnel in the excavation nor the Work itself. Avoid obstructing sidewalks and driveways.

    d. Hydrants under pressure, valve pit covers, valve boxes, manholes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the Work is completed.

6. Grade or create berms or swales to direct surface water from excavations to appropriate structures designed to accommodate storm water. If no structures exist, direct water to areas that minimize impacts to adjacent structures and properties.

7. Make pipe trenches as narrow as practicable and keep the sides of the trenches undisturbed until backfilling has been completed. Provide a clear distance of 12 inches on each side of the pipe.

8. Perform the excavation in such a manner as to prevent disturbance of the final subgrade. If excessive subgrade disturbance is occurring, as judged by the Owner or Engineer, then the final 6 inches of the excavation shall be performed by hand, with the use of a smooth-faced bucket, or other means acceptable to the Engineer or Owner, at no additional cost to the Owner.

    a. Grade the excavation bottom to provide uniform bearing and support for the bottom quadrant of each section of pipe.

    b. Excavate bell holes at each joint to prevent point bearing.

    c. Remove stones greater than 6 inches in any dimension from the bottom of the trench to prevent point bearing.

9. If satisfactory materials are not encountered at the design subgrade level, excavate unsatisfactory materials to the depth directed by the Engineer and properly dispose of the material. Backfill the resulting extra depth of excavation with satisfactory fill materials and compact in accordance with the provisions of this Section.

C. Backfill and Compaction

1. Unless otherwise specified or indicated on the Drawings, use satisfactory material removed during excavation for backfilling trenches. The Engineer

may require stockpiling, drying, blending and reuse of materials from sources on the Project.

2. Spread and compact the material promptly after it has been deposited. When, in the Engineer's judgment, equipment is inadequate to spread and compact the material properly, reduce the rate of placing of the fill or employ additional equipment.

3. Prior to backfilling or placement of structures, excavated subgrades shall be proof compacted with either 10 passes of a 10-ton vibratory drum roller for open excavations or 6 passes of a large, reversible, walk behind vibratory compactor capable of exerting a minimum force of 2,000 pounds in trench or pit excavations. Soft or weak spots shall be over-excavated and replaced with compacted Granular Fill or compacted Crushed Stone wrapped in a non-woven geotextile, as directed by the Owner or their representative. If proof compaction will prove detrimental to the subgrade due to the presence of groundwater, static rolling may be allowed at the discretion of the Engineer or Owner.

4. Soil bearing surfaces shall be protected against freezing and the elements before and after concrete placement. If construction is performed during freezing weather, structures shall be backfilled as soon as possible after they are constructed. Insulating blankets or other means shall be used for protection against freezing at the discretion of the Engineer or Owner.

5. When excavated material is specified for backfill and there is an insufficient amount of this material at a particular location on the Project due to rejection of a portion thereof, consideration will be given to the use of excess material from one portion of the Project to make up the deficiency existing on other portions of the Project.

    a. Use borrow material if there is no excess of excavated material available at other portions of the Project.

6. Backfilling and compaction methods shall attain 95% of maximum dry density at optimum moisture content as determined in accordance with ASTM D1557.

7. Do not place stone or rock fragment larger than six inches in greatest dimension in the backfill.

8. Maximum loose lift height for backfilling existing or borrow material shall be 12 inches, unless satisfactory compaction is demonstrated otherwise to the Engineer through field-testing. In no case shall loose lift height for backfilling exceed 3 feet.

9. Do not drop large masses of backfill material into the trench endangering the pipe or adjacent utilities.

10. Install pipe in rock excavated trenches on a 3/4" crushed stone bedding with a minimum depth of 6 inches. Shape the stone bedding at the pipe bells to provide uniform support. Encase the pipe in the 3/4" crushed stone bedding to a grade 6 inches over the top of the pipe and the full width of the trench.

11. Backfill from the bottom of the trench to the centerline of the pipe with the specified material. This initial backfill is to be placed in layers of no more than 6 inches and thoroughly tamped under and around the pipe. This initial backfilling shall be deposited in the trench for its full width on both sides of the pipe, fittings and appurtenances simultaneously.

12. Electrical conduit not encased in concrete, shall be backfilled with sand borrow conforming to the requirements of Section 02320. The backfill shall be placed in the trench for its full width and shall extend to 12 inches over the conduit.

13. Where excavation is made through permanent pavements, curbs, paved driveways, or paved sidewalks, or where such structures are undercut by the excavation, place the entire backfill to sub-grade with granular materials and compact in 6 inch layers, unless satisfactory compaction is demonstrated otherwise to the Engineer through field-testing. Use approved mechanical tampers for the full depth of the trench. If required, sprinkle the backfill material with water before tamping so as to improve compaction. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required to correct the problem, and shall then be refilled and properly compacted with the surface restored to required grade at no additional expense.

14. The Contractor shall not place backfill against or on structures until they have attained sufficient strengths to support the loads to which they will be subjected, without distortion, cracking, or other damage. As soon as possible after the structures are adequate, they shall be backfilled with suitable backfill material.

15. Place and compact backfill around manholes, vaults, pumping stations, gate boxes or other structures in six inch layers unless satisfactory compaction is demonstrated otherwise to the Engineer through field-testing, from a point one foot over the pipe. Exercise care to protect and prevent damage to the structures.

16. Install impervious trench dams where stone borrow is used for pipe bedding to prevent groundwater from following along the stone bedding. Install dams every 100 feet.

D. Dewatering

1. Obtain the following construction dewatering permits, as required:

   a. US EPA Dewatering General Permit

2. Provide, operate and maintain adequate pumping, diversion and drainage facilities in accordance with the approved dewatering plan to maintain the excavated area sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures nor cause excessive disturbance of underlying natural ground. Locate dewatering system components so that they do not interfere with construction under this or other contracts.

3. Conduct operations so as to prevent at all times the accumulation of water, ice and snow in excavations or in the vicinity of excavated areas so as to prevent water from interfering with the progress or quality of the work.

4. Take actions necessary to ensure that dewatering discharges comply with permits applicable to the Project. Dispose of water from the trenches and excavations in such a manner as to avoid public nuisance, injury to public health or the environment, damage to public or private property, or damage to the work completed or in progress.

5. Repair any damage resulting from the failure of the dewatering operations and any damage resulting from the failure to maintain all the areas of work in a suitable dry condition, at no additional cost to the Owner.

6. Exercise care to ensure that water does not collect in the bell or collar holes to sufficient depth to wet the bell or collar of pipes waiting to be jointed.

7. Take precautions to protect new work from flooding during storms or from other causes. Control the grading in the areas surrounding all excavations so that the surface of the ground will be properly sloped to prevent water from running into the excavated area. Where required, provide temporary ditches for drainage. Upon completion of the work, all areas shall be restored to original condition.

8. Brace or otherwise protect pipelines and structures not stable against uplift during construction.

9. Do not excavate until the dewatering system is operational and the excavation may proceed without disturbance to the final subgrade.

10. Unless otherwise specified, continue dewatering uninterrupted until the structures, pipes, and appurtenances to be installed have been completed such that they will not float or be otherwise damaged by an increase in groundwater elevation.

11. Temporarily lower the groundwater level at least two feet below excavations to limit potential “boils”, loss of fines, or softening of the ground. If any of these conditions are observed, submit a modified dewatering plan to the Engineer within 48 hours. Implement the approved modified plan and repair any damage incurred at no additional cost to the Owner.

12. When subgrades are soft, weak, or unstable due to improper dewatering techniques, remove and replace the materials in accordance with Section 02320 at no additional cost to the Owner.

13. Notify the Engineer immediately if any settlement or movement is detected of survey points adjacent to excavations being dewatered. If settlement is deemed by the Engineer to be related to the dewatering, submit a modified dewatering plan to the Engineer within 24 hours. Implement the approved modified plan and repair any damage incurred to the adjacent structure at no additional cost to the Owner.

14. Dewatering discharge:

    a. Install sand and gravel, or crushed stone, filters in conjunction with sumps, well points, and/or deep wells to prevent the migration of fines from the existing soil during the dewatering operation.

b. Transport pumped or drained water without interference to other work, damage to pavement, other surfaces, or property. Pump water through a silt filter bag or other approved sedimentation device prior to discharge to grade of drainage system.

c. Do not discharge water into any sanitary sewer system.

d. Provide separately controllable pumping lines.

e. The Engineer reserves the right to sample discharge water at any time.

15. Install erosion/sedimentation controls for velocity dissipation at point discharges onto non-paved surfaces.

16. Removal

a. Do not remove dewatering system without written approval from the Engineer.

b. Backfill and compact sumps or ditches with screened gravel or crushed stone in accordance with Section 02320.

c. Remove well points and deep wells. Backfill abandoned well holes with cement grout having a water cement ratio of 1 to 1 by volume.

3.3 PROTECTION

A. Protection of Existing Structures

1. All existing foundations, conduits, wall, pipes, wires, poles, fences, property line markers and other items which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. Should such items be damaged, they shall be restored by the Contractor to at least as good condition as that in which they were found immediately before the Work began.

B. Accommodation of Traffic

1. Streets and drives shall not be unnecessarily obstructed. The Contractor shall take such measures at his own expense to keep the street or road open and safe unless otherwise indicated.

2. Construct and maintain such adequate and proper bridges over excavations as may be necessary or as directed for the safe accommodation of pedestrians and vehicles. Provide substantial barricades at crossings of trenches, or along the trench to protect the traveling public.

3. Where deemed necessary, such additional passageways as may be directed shall be maintained free of such obstructions. All material piles, open excavations, equipment, and pipe which may serve as obstructions to traffic shall be protected by proper lights, signage, or guards as necessary.

4. All traffic controls shall be in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.

C. Erosion and Sedimentation Control

1. Take all necessary steps to prevent soil erosion.
2. Plan the sequence of construction so that only the smallest practical area of land is exposed at any one time during construction.
3. Temporary vegetation and/or mulching shall be used to protect critical areas exposed during construction as judged by the Engineer.

END OF SECTION

SECTION 02317

UNDERGROUND WARNING TAPE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Underground Warning Tape

1.2 SUBMITTALS

A. Shop Drawing Submittals

1. Product Data

PART 2 PRODUCTS

2.1 MATERIALS

A. Metallic warning tape for underground piping shall be polyethylene tape with metallic core for easy detection and location of piping with a metal detector.

B. Tape shall be 6 inches wide.

C. Tape shall be as manufactured by Seton Name Plate Corp., New Haven, CT; Presco Detectable Underground Warning tape, Sherman, Texas; Blackburn Manufacturing, Neligh, NE; Mercotape, Hachensach, NJ; or equal.

D. The warning tape shall be heavy gauge 0.004 inch polyethylene and shall be resistant to acids, alkalis and other soil components. It shall be highly visible in the following colors with the associated phrases stamped in black letters and repeated at a maximum interval of 40 inches.

Type of Utility	Color	Warning Message
Storm Drain	Green	CAUTION - STORM DRAIN BURIED BELOW
Water	Blue	CAUTION – WATER LINE BURIED BELOW

E. The tape shall be of the type specifically manufactured for marking and locating utilities.

PART 3 EXECUTION

3.1 INSTALLATION

A. All buried pipe and fittings shall be installed with metallic-lined underground warning tape located no more than 24 inches below final grade to allow detection by a metal detector.

END OF SECTION

SECTION 02320

BORROW MATERIALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Gravel Borrow (MASSDOT - M1.03.0 Type B)
2. Processed Gravel (MASSDOT - M1.03.1)
3. Granular Fill
4. Sand Borrow
5. Stone Borrow
6. Ordinary Borrow

B. Related Sections

1. Section 02315 – Excavation, Backfill, Compaction and Dewatering

1.2 REFERENCES

A. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

B. ASTM C117 - Standard Test Method for Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

D. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb./ft3)

E. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)

F. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)

G. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

H. AASHTO – Standard Specification for Transportation Materials and Methods of Sampling and Testing

I. Commonwealth of Massachusetts Highway Department “Standard Specification for Highways and Bridges” 1988 Edition as amended

1.3 SUBMITTALS

A. Representative Samples of borrow materials taken from the source. Tag, label, and package the Samples as requested by Engineer. Provide access to the borrow site for field evaluation and inspection.

B. Provide sieve analysis (ASTM C136) and permeability analysis (ASTM D2434) from certified soils testing laboratory for all borrow materials. Take and test a sample, at no additional cost to the Owner for each 1,500 c.y. of borrow material placed.

C. Provide modified proctor analysis (ASTM D1557) from certified soils testing laboratory for all borrow materials.

1. Take and test a sample of low permeability soil for each 5,000 cy of material placed, or as directed by the Engineer.

2. All other borrow materials shall be tested once unless more frequent testing is deemed necessary by the Engineer or Owner due to material variation.

D. The Engineer reserves the right to require more frequent testing than that which is specified above should the borrow characteristics change.

1.4 QUALITY ASSURANCE

A. No borrow shall be placed prior to the approval of Samples by the Engineer.

1.5 PROJECT/SITE CONDITIONS

A. Existing Conditions

1. Comply with any environmental requirements and restrictions.

2. Keep all public and private roadway surfaces clean during hauling operations and promptly and thoroughly remove any borrow or other debris that may be brought upon the surface before it becomes compacted by traffic. Frequently clean and keep clean the wheels of all vehicles used for hauling to avoid bringing any dirt upon the paved surfaces.

PART 2 PRODUCTS

2.1 GRAVEL BORROW (MASSDOT - M1.03.0 TYPE B)

A. Gravel Borrow shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.

Gradation requirements for Gravel Borrow shall be determined by AASHTO-T11 and T27 and shall conform to the following:

Sieve	Percent Passing
½ inch	50 – 85
No. 4	40 – 75
No. 50	8 – 28
No. 200	0 - 10

Maximum size of stone in Gravel Borrow shall be 3 inches.

2.2 PROCESSED GRAVEL BORROW (MASSDOT - M1.03.1)

A. The compacted Processed Gravel Borrow to be used for gravel access roads and pavement subbase, or other area where a firm, free-draining subgrade is needed shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.

B. Gradation requirements shall conform to the following:

Sieve	Percent Passing
3”	100
1 ½”	70 – 100
¾”	50 – 85
No. 4	30 – 60
No. 200	0 - 10

C. Stockpile the processed materials in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

2.3 GRANULAR FILL

A. Granular Fill to be used as fill material to achieve gravel base grade beneath structures, pavement, or other area requiring structural fill shall consist of inert material that is hard, durable stone and sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.

B. Gradation requirements for Granular Fill shall conform to the following:

	Percent by Weight Passing Through	
Sieve Size	Minimum	Maximum
2/3rds loose lift thickness	100	--
No. 10	30	95
No. 40	10	70
No. 200	0	15

2.4 SAND BORROW

A. Sand Borrow material shall be supplied from an off-site borrow area approved by the Engineer. Testing of the off-site Sand Borrow shall be at the Contractor’s expense.

B. Sand Borrow shall consist of clean, inert, hard, durable grains of quartz or other hard, durable, rock, free from loam or clay, surface coatings and deleterious materials. The allowable amount of material passing a No. 200 sieve as determined by ASTM-C117 shall not exceed 10% by weight.

C. Material shall consist of a clean, non-plastic, granular material conforming to the requirements of a SW, SP or SM under the Unified Soil Classification System (USCS) (ASTM D2487).

D. The material shall have the characteristics that when placed and compacted, the soil particles will bind together so as to form a solid, stable surface capable of supporting rubber-tired vehicular traffic during wet weather periods as well as extended dry weather periods. The borrow material shall not contain fines to the extent that the surface layer becomes "greasy" when wet.

E. The material shall not contain stones larger than 3/8 inch in diameter.

F. Material consisting of frozen clogs, ice and snow will be rejected.

G. All sand borrow material to be used shall be subject to approval by Engineer, and Engineer reserves the right to reject any borrow material from the job that does not meet the above requirements.

2.5 STONE BORROW

A. Crushed Stone Borrow

1. Crushed stone borrow shall consist of one of the following materials:

a. Durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15% of the total weight. Thin stones shall be considered to be such stones whose average width exceeds 4 times their average thickness. Elongated stones shall be considered to be stones whose average length exceeds 4 times their average width.

b. Durable crushed gravel stone obtained by artificial crushing of gravel boulders or fieldstone with a minimum diameter before crushing of 8 inches.

2. The crushed stone shall be free from clay, loam or deleterious material and not more than 1.0% of satisfactory material passing a No. 200 sieve will be allowed to adhere to the crushed stone.

3. The crushed stone shall have a maximum percentage of wear as determined by the Los Angeles Abrasion Test (AASHTO-T-96) as follows:

a. For Class 1 Bit. Conc. 30%**

b. For Cement Concrete Aggregate 45%***

c. Crushed Stone for Subbase 45%

**Crushed stone for this use shall consist of crushed or shattered natural rock only. Crushed gravel stone will not be permitted.

***Except for 5000 psi or greater cement concrete and prestressed concrete which shall be 30%.

4. 3/4" Crushed stone shall conform to the following gradation:

	Percent by Weight Passing Through	
Sieve Size	**Minimum**	**Maximum**
¾" Crushed Stone		
1"	100	--
¾"	90	100
½"	10	50
3/8"	0	20
No. 4	0	5

2.6 ORDINARY BORROW

Ordinary borrow shall have the physical characteristics of soils designated as type GW, GP, GM, SW, SP or SM, under USCS and shall not be specified as gravel borrow, sand borrow, special borrow material or other particular kind of borrow. It shall have properties such that it may be readily spread and compacted for the formation of embankments. The borrow shall not include rocks with a major dimension greater than 8 inches.

PART 3 EXECUTION

3.1 INSTALLATION

A. Prior to the placement of borrow material, site preparation shall be completed as required by the Contract Documents, and approved by the Engineer.

B. Ensure that all materials are properly stockpiled on site to prevent contamination by other materials.

C. Place borrow material over the entire area in uniform lifts and compact in accordance with Section 02315.

D. Utilize on-site soils prior to using off-site borrow provided on-site soils meet the requirements of the specifications.

E. Utilize gravel borrow in all locations where a surface treatment has not been specified but requires a firm finish surface.

F. Processed gravel for pavement subbase is intended to provide a stable foundation for sidewalk repair where a gravel base has been specified.

G. Borrow shall be used as a replacement for unsuitable materials where poor soil conditions are encountered during the progress of the work, where approved by the Engineer. Borrow type will be determined by the Engineer. Borrow material used as a replacement for unsuitable soil is not intended to be an aid to dewatering.

H. Shape borrow used for pipe foundation material so that it supports the pipe properly and will not damage the pipe, bells, collars, or the pipe fittings.

I. Place all borrow to keep it free of other materials and to prevent segregation.

END OF SECTION

SECTION 02410

ROCK EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Rock excavation for trenches and structures.

B. Related Sections

1. Section 02315 – Excavation, Backfill, Compaction and Dewatering

1.2 DESCRIPTION

A. Removal of boulders greater than 1 cubic yard in volume is included under this Section of work. Removal of boulders under 1 cubic yard in volume is not considered part of this work and is considered a part of the work specified under Section 02315.

B. Rock excavation shall mean solid ledge rock which in the opinion of the Engineer requires for its removal, drilling and blasting, wedging, sledging, firing, or breaking up with power operated tools.

C. Material removed solely with a power-operated excavator or loose, previously blasted ledge, broken stone, weathered rock, which may be encountered during structure excavation and trenching operations is not considered rock excavation.

D. Bedrock removal by means of blasting will not be permitted within any trench or excavation for proposed subsurface utility piping and structure installation.

1.3 SUBMITTALS

A. Alternative rock excavation methods will be required for the project. Such methods may include, but are not limited to, hoe ramming in conjunction with rock perforation, or drilling and injecting expansive gels. A complete description of the proposed rock excavation method, prepared by a qualified contractor familiar with non-blasting rock removal methods, is required. The Contractor must show experience with design and execution of rock removal by the proposed method adjacent to existing utilities and/or structures. A minimum of five projects of similar size and scope are required to be submitted.

1. The method description shall include a plan illustrating locations of all required drilling, data sheets on any chemicals or materials used, anticipated excavation rates, and levels of anticipated vibrations.

a. The Contractor will be held to the same standards detailed above and below in regards to protection of the existing building and utility. A submittal detailing a structure monitoring program, both seismic and settlement, is required.

B. A description of the measures that will be taken to protect the project area and adjacent properties from fly-rock.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 BACKFILL

A. Backfill must be with material from the excavation or where the excavated material is considered unsuitable for backfill, with material wasted from other area of the job or, when directed by the Engineer in writing, with ordinary borrow. No stones, rocks, or boulders greater than 6" in diameter shall be used as backfill.

B. Minimum excavation and clearance within rock trenches shall be per Section 02315.

END OF SECTION

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SECTION 02516

HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

1.1 SUMMARY

A. Section Includes

1. High density polyethylene (HDPE) pipe for:

a. Storm drainage lines

2. Types of HDPE piping specified in this Section include:

a. Corrugated exterior, corrugated interior, slotted pipe

b. Corrugated exterior, corrugated interior, solid wall pipe

c. Corrugated exterior, smooth interior, solid wall HDPE pipe

B. Related Sections

1. Section 02315 – Excavation, Backfill, Compaction and Dewatering

2. Section 02320 – Borrow Materials

1.2 REFERENCES

A. AASHTO M252 –Corrugated Polyethylene Drainage Pipe

B. AASHTO M294 – Corrugated Polyethylene Pipe, 300- to 1200-mm Diameter

C. AASHTO MP7 – Corrugated Polyethylene Pipe, 1300- to 1500-mm Diameter

D. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable

E. ASTM D2239 – Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter

F. ASTM D2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

G. ASTM D2683 – Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

H. ASTM D2737 – Standard Specification for Polyethylene (PE) Plastic Tubing

I. ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

J. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

K. ASTM F405 – Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings

L. ASTM F667 – Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings

M. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

N. ASTM F894 – Standard Specification for Polyethylene (PE) Large-Diameter Profile Wall Sewer and Drain Pipe

1.3 SUBMITTALS

A. Submit product data on the pipe, fittings, and accessories.

B. Prior to first shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the appropriate ASTM standards specified herein.

1.4 QUALITY ASSURANCE

A. Use an adequate number of skilled laborers, equipment of adequate size, capacity, and quantity to perform the work of this Section, and its related Sections, in a timely manner.

1.5 DELIVERY, STORAGE AND HANDLING

A. When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used. Wire rope or chain shall not be used to handle pipe.

PART 2 PRODUCTS

2.1 MANUFACTURER – GENERAL

A. The manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these specifications.

B. Pipe and fittings from different manufacturers shall not be interchanged for the same type of pipe and application.

2.2 PIPE IDENTIFICATION

A. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding five-feet:

1. Name and/or trademark of the pipe manufacturer.

2. Nominal pipe size.

3. Dimension ratio.

4. The letters “PE” followed by the polyethylene grade in accordance with the ASTM designation, followed by the hydrostatic design basis in PSI.

5. A production code from which the date and place of manufacture can be determined.

2.3 CORRUGATED EXTERIOR/SMOOTH INTERIOR HDPE PIPE AND FITTINGS

A. General

1. The polyethylene pipe and fittings shall comply with AASHTO M294, Type S (smooth wall interior).

2. Piping shall be manufactured by Advanced Drainage Systems, Inc., or equal.

3. Pipe material and fittings shall be high density polyethylene meeting ASTM D3350 minimum cell classification 324420C (4”-10”) or 325420C (12”-60”).

4. Installation shall be in accordance with ASTM D2321.

5. Pipe shall be joined with the bell-and-spigot joint. Gaskets and joint lubricant shall be utilized.

6. Minimum parallel plate pipe stiffness shall be as recommended for each specified diameter pipe per ASTM Test Method D2412.

7. The pipe and fittings shall be free of foreign inclusions and visible defects. The ends of the pipe shall be cut squarely and cleanly so as not to adversely effect joining.

8. The nominal size of the pipe and fittings is based on the nominal inside diameter of the pipe. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings and gaskets supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Engineer.

2.4 JOINTS FOR CORRUGATED PIPING

A. General

1. Joints of corrugated pipe sections and fittings other than smooth interior, shall be made with split couplings, corrugated to engage the pipe corrugations, and shall engage a minimum of 4 corrugations, 2 on each side of the pipe joint. Where required by the Engineer, a neoprene gasket shall be utilized with the coupling to provide a soil tight joint.

2. Joints of smooth interior, corrugated pipe sections shall be as per manufacturer's instructions utilizing gasketed PVC or HDPE joints meeting ASTM D-3212.

3. Installation shall be in accordance with ASTM Recommended Practice D-2321 or as specified by the Engineer or local approving agency.

B. Leak Resistant/Silt-Tight Pipe

1. Pipe shall provide soil-tight joints with built-in gaskets. Bee joints shall be same as the outside diameter of the pipe.

2. Shall be ADS, N-12 IB ST (soil-tight joint type) piping, or equal.

3. Meets silt-tight & leak resistant (not defined as watertight) joint requirements.

4. For non-watertight connections, exterior HDPE culvert coupling may be used with dedicated ties.

5. Polyethylene flared end sections shall be manufactured to the same criteria as mainline pipe sections.

6. Non-Watertight Manhole Connections - To be made with non-shrink grout.

C. Watertight Pipe

1. Provides superior watertight performance.

2. Meets ASTM D3212 requirements of 10.8 PSI for 10 minutes with no leakage.

3. Shall be ADS, N-12 IB WT (watertight joint type) piping, or equal.

D. Manhole Boot Connection

1. Watertight seal made with rubber manhole boot as manufactured by Press Seal, or equal.

2. Alternatively, watertight seal made by Alok, or equal, in which case maximum insertion angle is 7 degrees.

E. Watertight Seals for Corrugated HDPE Pipe - Shall be NPC Corrugated Pipe Adapter compatible with Kor-N-Seal manhole connector.

2.5 CORRUGATED INTERIOR/EXTERIOR SLOTTED HDPE PIPE

A. Corrugated, slotted, HDPE tubing shall meet AASHTO M-252. Slotted tubing shall be supplied factory wrapped in a polyester geotextile filter sock. The filter sock shall have a minimum weight of 3.0 oz/square yard, a minimum burst strength of 100 psi, and an apparent opening size of 35.

B. A manufacturers' certification that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished to the Engineer upon request.

C. There shall be a minimum soil cover of 12 inches, as measured from the top of the pipe, for H-20 loading conditions.

D. Filter Fabric Wraps

1. Extra strong synthetic materials are to be used with perforated drainage pipe to prevent infiltration of fine soil particles while allowing water to flow freely.

2. Material shall be ADS Sock, as manufactured by Advanced Drainage Systems.

PART 3 EXECUTION

3.1 PREPARATION

A. The Contractor shall verify that the surface has been prepared to the proper line and grade by shooting invert elevation grades.

3.2 INSTALLATION

A. Open-Cut Installations

1. Pipe is to be lifted or rolled into position, not dragged over the prepared bedding.

2. The pipe is to be set at the slope and grades indicated on the plans. Ensure pipe remains at proper grades by shoring it.

3. All HDPE piping shall be bedded in 6" of crushed stone unless noted otherwise.

4. Crushed stone shall be used as backfill to a point of 6" above the top of the pipe unless noted otherwise.

5. Open-Trench Installations - Prepare the area in accordance with Section 02315 – Excavation, Backfill and Compaction.

6. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 inch per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.

7. Install piping and fittings true to alignment and grade. If necessary, each length of pipe shall be cleaned out before installation.

8. shall extend along the pipe 12 inches on each side of the joint.

9. tightened according to the tightening and torque pattern of the manufacturer.

END OF SECTION

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SECTION 02530

MANHOLES AND CATCH BASINS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Precast concrete manholes
2. Precast concrete catch basins
3. Cast iron manhole frames and covers
4. Cast iron catch basin frames and grates

1.2 REFERENCES

A. AASHTO – American Association of State Highway and Transportation Officials, Standard Specifications for Highways and Bridges, most recent edition

B. ASTM C32 - Standard Specification for Sewer and Manhole Brick (made from clay or shale)

C. ASTM A48 – Standard Specification for Gray Iron Castings

D. ASTM C150 – Standard Specification for Portland Cement

E. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes

F. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections

G. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals

H. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

1.3 SUBMITTALS

A. Submit Shop Drawings, showing all details of construction, including, but not limited to, structure dimensions, reinforcing, joints, and pipe connections to structures.

B. Submit on all materials and products included in this specification, including, but not limited to, precast concrete structures, manhole rungs, manhole frames and covers, dampproofing coating, brick masonry, mortar, non-shrink water-proof grout, catch basin frames and grates and manhole chimneys.

C. Submit weights of manhole frames and covers and catch basin frames and grates.

D. Submit design calculations including verification of adequate anti-flotation features and lateral earth pressures. Calculations shall verify that the manhole structure has been designed to withstand the burial depth, submergence due to flooding, flotation, and dead and live loads.

1.4 QUALITY ASSURANCE

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representative of the Owner. Such inspection may be made at the place of manufacture, or at the Site after delivery, or at both places, and the materials shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though samples may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. Materials which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, at no additional cost to the Owner.

B. At the time of inspection, the materials will be carefully examined for compliance with the latest ASTM designation specified and these Specifications, and with the approved manufacturer's drawings. Manhole sections will be inspected for general appearance, dimension, "scratch-strength," blisters, cracks, roughness, and soundness. The surface shall be dense and close-textured.

C. Imperfections in manhole sections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs will be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at 7 days and 5,000 psi at 28 days, when tested in 3 inch by 6 inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

D. Personnel shall have confined space entry training as appropriate for the work to be performed.

E. Manholes and catch basins shall be designed for lateral earth pressures and to resist flotation.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE MANHOLE AND CATCH BASIN SECTIONS

A. Precast concrete barrel sections and transition top sections, shall conform to ASTM C478 and the following requirements:

1. The wall thickness shall not be less than 5 inches for 48 inch diameter reinforced barrel sections, 6 inches for 60 inch diameter reinforced barrel sections and 7 inches for 72 inch diameter reinforced barrel sections.

2. Top sections shall be eccentric except that flat top sections shall be used where shallow cover requires a top section less than 4 feet as shown on the Drawings.

3. Barrel sections shall have tongue and groove joints.

4. All sections shall be cured by an approved method and shall not be shipped nor subjected to loading until the concrete compressive strength has attained 3,000 psi and not before 5 days after fabrication and/or repair, whichever is longer.

5. Precast concrete barrel sections with precast top slabs and precast concrete transition sections shall be designed for a minimum of AASHTO HS20-44 loading plus the weight of the soil above at 120 pcf.

6. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on each precast section.

7. Precast concrete bases shall be monolithically constructed. The thickness of the bottom slab of the precast bases shall not be less than the barrel sections or top slab whichever is greater. Precast concrete bases shall be constructed with a 6 inch extended base, unless otherwise shown on the Drawings.

8. Knock out panels for piping shall be provided in precast sections at the locations shown on the Drawings. They shall be integrally cast with the section, 2½ inches thick and shall be sized as shown on the Drawings. There shall be no steel reinforcing in knock out panels.

9. The side wall height of the base section shall be a minimum of 12 inches above the top of the pipe coming into the manholes and catch basins.

10. A 4'-0" deep sump shall be provided below catch basin outlet pipes.

2.2 MANHOLE FRAMES AND COVERS

A. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30B or ASTM A48, Class 35B.

B. Manhole covers shall have a diamond pattern, pickholes and the word "SEWER" or "DRAIN", as appropriate, cast in 3 inch letters. Manhole frame and covers shall be manufactured by East Jordan Iron Works; Mechanics Iron Foundry; Neenah Foundry or equal.

C. Manhole frames and covers shall be approved for use by the Massachusetts Department of Transportation – Highway Division.

D. Manhole frames and covers shall comply with the detail shown on the Drawings.

E. Manhole frames and covers shall be designed for a minimum of AASHTO HS20-44 loading.

2.3 CATCH BASIN FRAMES AND GRATES

A. Catch basin frames and grates shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Grate and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30B or ASTM A48, Class 35B.

B. The catch basin frames and grates shall comply with the details shown on the Drawings.

C. Catch basin frames and grates shall be designed for a minimum of AASHTO HS20-44 loading.

2.4 JOINTING PRECAST MANHOLE SECTIONS

A. Tongue and groove joints of precast manhole sections shall be sealed with a preformed flexible joint sealant. The preformed flexible joint sealant shall conform to ASTM C990.

2.5 MANHOLE RUNGS

A. Manhole rungs shall be drop front design, 14 inches wide with an abrasive step surface, steel reinforced, copolymer, polypropylene, plastic. Manhole rungs shall conform to OSHA requirements.

2.6 FLEXIBLE PIPE TO-STRUCTURE CONNECTORS

A. The flexible pipe-to-structure connectors shall be designed to provide a positive seal between the connector and the structure wall and between the connector and the pipe.

B. The flexible boot shall be manufactured of EPDM synthetic rubber in accordance with ASTM C443 and C923 and shall be 3/8 inch thick or greater.

C. The external bands shall be made entirely of 304 series non-magnetic stainless steel.

D. The flexible connectors shall be provided with a wedge-type or toggle-type expander to secure the pipe in the structure opening.

E. The flexible connectors shall meet the following criteria, in accordance with ASTM C923:

1. Shall not leak when subjected to a head pressure of 10 psi for 10 minutes.

2. Shall have the ability to deflect 7 degrees in any direction without leakage under the head pressure conditions described above.

3. Shall not leak when subject to a load of 150 lbs./in. pipe diameter and the head pressure conditions described above.

2.7 NON-SHRINK, WATER-PROOF GROUT

A. Non-shrink, water-proof grout shall be Hallemite; Waterplug; Embeco; or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation

1. Construct manholes and catch basins to the dimensions shown on the Drawings and as specified. Protect all work against flooding and flotation.

2. Set precast concrete barrel sections so as to be plumb and with sections in true alignment with a ¼ inch maximum tolerance to be allowed.

3. Install the precast sections in a manner that will result in a watertight joint. Seal the joints of precast concrete barrel sections with the preformed flexible joint sealant used in sufficient quantity to fill 75% of the joint cavity. Fill the outside and inside precast section joints with hydraulic cement and finish flush with the

adjoining surfaces. Plug holes in the concrete barrel sections required for handling or other purposes with a hydraulic cement or concrete and rubber plugs, and finish flush on the inside.

4. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides.

B. Pipe Connections

1. Stubs

a. Connect pipe stubs for future extensions to the structures as shown on the Drawings and close the stub end by a suitable watertight plug.

2. For pipes with smooth exterior surfaces (PVC, ductile iron, HDPE pressure pipe, steel, etc), use flexible pipe-to-structure connectors.

3. Where flexible pipe-to-structure connectors cannot be used, such as pipes with rough, irregular or corrugated exterior surfaces (concrete, corrugated metal, HDPE drainage pipe, etc):

a. After the new pipe has been set in place, completely fill the hole around the new pipe and structure with non-shrink, hydraulic cement.

b. Place a 6 inch thick concrete encasement a total of 12 inches in length around the pipe stub adjacent to the exterior wall of the structure. Concrete shall have a 28 day compressive strength of 3,000 psi.

C. Manhole Rung Installation

1. Steel reinforced copolymer polypropylene plastic steps shall be press fitted by hand driven hammer into preformed holes in cured precast sections, on 12 inch centers, by the precast concrete manufacturer.

3.2 CLEANING

A. Clean new manholes and catch basins of silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

SECTION 02740

HOT MIX ASPHALT (HMA) PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. HMA Sidewalk

2. HMA Courts

B. For the purposes of this Section, Hot Mix Asphalt (HMA) and bituminous concrete have the same meaning.

C. Related Requirements

1. Section 02315 - Excavation, Backfill, Compaction and Dewatering

1.2 REFERENCES

A. Commonwealth of Massachusetts Department of Public Works "Standard Specifications for Highways and Bridges," latest Edition

B. ASTM D2041 - Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

C. AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 1990 Edition, as amended

D. AASHTO M 320

E. TAI - (The Asphalt Institute) - MS-3 Asphalt Plant Manual

F. TAI - (The Asphalt Institute) - MS-8 Asphalt Paving Manual

1.3 SUBMITTALS

A. Job mix formula for each mix specified under this Section.

B. Certificate indicating the mixes specified meet or exceed the requirements specified herein.

1.4 QUALITY ASSURANCE

A. Paving Contractors Qualifications

1. Paving contractors shall be experienced in paving HMA basketball courts. Engineer may request project experience and references to ensure paving subcontractors are qualified to provide quality HMA Courts. Subcontractor shall have a minimum of five (5) courts and references to provide. If paving subcontractor does not have qualifications, engineer may request alternative subcontractor be selected.

B. Perform Work in accordance with [TAI Manual MS-8., Commonwealth of Massachusetts Department of Public Works "Standard Specifications for Highways and Bridges," latest Edition].

C. Mixing Plant: Conform to [TAI Manual MS-8., Commonwealth of Massachusetts Department of Public Works "Standard Specifications for Highways and Bridges," 1988 Edition as amended].

D. Obtain materials from same source throughout.

PART 2 PRODUCTS

2.1 MATERIALS

A. General

1. Bituminous materials shall conform to the requirements of these Specifications.

2. Bitumen delivered to a project or to a mix plant must be accompanied by a proper certificate signed by the producer's authorized representative. Shipments of material not accompanied by a certificate will not be accepted for use in the Work.

B. Hot Mix Asphalt Paving shall be Class I, Type I-1, as specified in Sections 460 and M3.11.0 of the above referenced Massachusetts Department of Public Works "Standard Specifications for Highways and Bridges," latest edition.

C. Hot Mix Asphalt

1. Hot Mix Asphalt materials shall meet the requirements of M3.11.0 of the above referenced Massachusetts Department of Public Works "Standard Specifications for Highways and Bridges," latest edition.

2. Only Performance Graded Asphalt Binder grades PG 64-28 or PG 52-34 will be used as modifiers and shall meet the requirements of AASHTO M 320.

PART 3 EXECUTION

3.1 PAVING – GENERAL

A. Maintain pavement under this Contract during the guarantee period of one year and promptly (within 3 days of notice given by the Engineer) refill and repave areas which have settled or are otherwise unsatisfactory for traffic.

B. All pavement thicknesses referred to herein are compacted thicknesses. Place sufficient mix to ensure that the specified thickness of pavement results.

C. Regardless of temperature, no permanent mix conforming to the requirements of these specifications shall be placed after October 31 or before May 1 of any year.

D. When the air temperature falls below 50°F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.

E. Existing drainage patterns shall not be altered by the new pavement construction unless otherwise shown on the Drawings.

F. Furnish and spread calcium chloride on disturbed surfaces to control dust conditions when necessary, or upon direction of the Engineer.

G. In no case will pavement be placed until the gravel base is dry and compacted to at least 92.0% maximum density at optimum moisture content.

H. All pavement edges that have been damaged shall be sawcut again if necessary to re-establish a straight clean line between the existing pavement and trench patch.

I. Tack Coats

1. Apply tack coat on the binder prior to placing the top course. The tack coat shall be RS-1 emulsion and shall be applied at a rate of 0.05 gallons per square yard on binder courses and streets to be overlayed.

2. The edges of the existing pavement where the joints are to be formed shall be thoroughly coated with tack coat to ensure adhesion between the two pavements.

3. The contact surfaces of curbs, castings, and other structures shall be painted with a tack coat prior to placement of paving.

J. Top course mixes shall provide for 4% air voids in the finished product. The initial in-place voids shall not exceed 7.5%. Final in-place voids shall not be below 2.5%. Additional asphalt content shall not be added for the sole purpose of reducing the in-place voids. If the in-place voids are too high or the paving is expected to occur during cold weather, more compactive effort will be required to adjust the void content rather than increasing the asphalt content.

K. Breakdown rolling shall not occur before the HMA has cooled to a temperature of 320 degrees Fahrenheit, and shall be completed before the HMA mat has cooled to a temperature of 275 degrees Fahrenheit. Intermediate rolling shall be completed prior to the HMA mat attaining a temperature of 200 degrees Fahrenheit. Finish rolling shall be completed prior to the HMA mat attaining a temperature of 150 degrees Fahrenheit. Roller and paver speeds shall be agreed upon with the Engineer prior to placing HMA to ensure mix temperature requirements will be met.

L. Thermal segregation of the HMA shall be limited to a maximum of 20 degrees Fahrenheit.

M. Cascading HMA material on the top of the finished mat with rakes or shovels will not be permitted. Coarse Aggregate dislodged as a result of unavoidable hand work shall be removed from the surface prior to rolling.

N. Place and compact HMA materials by steel-wheeled rollers of sufficient weight to compact the HMA to 92.5% of the calculated **T**heoretical **M**aximum **D**ensity (TMD) in accordance with ASTM D2041.

O. Along curbs, structures and all other places not accessible with a roller, the paving mixture shall be thoroughly compacted with tampers. Such tampers shall not weigh less than 25 pounds and shall have a tamping face no more than 50 square inches in size. The surface of the mixture after compaction shall be smooth and true to the established line and grade.

P. No vehicular traffic shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled to below 140 degrees Fahrenheit or sufficiently to prevent distortion or loss of fines. HMA delivery trucks (loaded or empty) shall not be permitted on the newly completed pavement until the asphalt has cooled to below 90 degrees Fahrenheit. If the climatic or other conditions warrant, the period of time before opening to traffic may be extended at the discretion of the Engineer.

Q. Following all paving, the area along the edge of all pavement shall be backed up with gravel, or loam and seed as required, so that it is flush with the adjacent paving. Whenever possible, the final surface of the backup material shall slope away from the surface edge for drainage runoff.

R. Following all paving, clean all catch basins and remove and dispose of all debris.

3.2 PAVING –BINDER COURSE

A. Place binder course as soon as possible after the gravel base has been prepared, shaped and compacted for all streets.

B. Binder course shall be for the full-width top course.

C. Structure Adjustments

1. All manhole frames, catch basin frames and utility boxes are to be lowered prior to placement of the base and/or binder course. After placing the binder course, they shall be raised to the grade of the binder course until such time as the top course is placed, unless the period of time between the placement of the binder course and the placement of the top course is less than 2 weeks, in which case the frames may be raised to the grade of the top course. All excavated materials removed for raising of the frames and utility boxes are to be replaced with concrete. This ring of concrete shall be filled flush with the surrounding binder course.

2. Adjustments to existing municipally owned utility structures and appurtenances such as drainage manholes, catch basins and gate valve boxes, both within the area of excavation and within the existing paved surface, will be carried out by the Contractor prior to installation of the top course. The raising of other structures (privately owned utilities) as required to properly complete the final paving work should be completed by the structure owners. It is the responsibility of the Contractor to coordinate all such work and to assure that all structures are properly raised in a timely manner.

D. Prepare the binder course for placement of the top course. The base shall be graded prior to the placement of the binder course. The binder course shall be regraded, placing additional HMA where settling has occurred, repairing the existing surface and replacing broken or damaged sections at no additional cost to the Owner. The binder course surface shall be in all respects acceptable to the Engineer before the final pavement is placed. The surface shall then be broom cleaned.

E. When top course is placed on a new binder course, a butt joint shall be provided between new pavement and any adjoining road surfaces.

F. The final surface shall be properly graded and cambered to provide a smooth surface of proper cross-section and blended into all adjacent existing pavements. Any permanent pavement repair that in the opinion of the Engineer does not meet this requirement, or that will form puddles 1/16-inch deep or greater shall be repaired or replaced at the Contractor's expense.

G. The finished top course shall blend smoothly with all rim elevations of catch basins, manhole covers, gate box covers, and any other utilities, and shall in no way interfere with or alter the existing surface drainage.

H. Repair shall be neat in appearance and shall blend in with the existing adjoining pavement.

END OF SECTION

SECTION 02775

COURT SURFACING AND PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Court surfacing and painting

1.2 QUALITY ASSURANCE

A. Surfacing Contractors Qualifications

1. Surfacing contractors shall be experienced in acrylic surfacing of basketball courts. Engineer may request project experience and references to ensure paving subcontractors are qualified to provide quality court surfacing. Subcontractor shall have a minimum of five (5) courts and references to provide. If surfacing subcontractor does not have qualifications, engineer may request alternative subcontractor be selected.

PART 2 PRODUCTS

2.1 MATERIALS

A. A. General:

B. B. Crack Sealant – use for sealing cracks up to ½-inch wide in asphalt pavement:

1. 100 percent acrylic emulsion elastomeric crack sealant.

2. Non-Volatile Material: 61 percent, plus or minus 5 percent.

C. C. Crack Filler – use for filling cracks up to 1 inch wide in asphalt pavement

1. 100 percent acrylic emulsion trowel-grade crack filler.

2. Chemical Characteristics, by Weight, Minimum:

a. Acrylic Emulsion: 10.0 percent.

b. Hiding Pigment: 0.2 percent.

c. Mineral Inert Fillers: 78.0 percent.

d. Film Formers, Additives: 1.8 percent.

e. Water: 8.5 percent.

f. Weight per Gallon at 77 Degrees F: 15.2 lbs., plus or minus 1.0 lbs.

g. Non-Volatile Material: 80 percent, plus or minus 5 percent.

D. Acrylic Patch Binder – use for leveling and repairing low spots and depressions up to ¾-inch deep in asphalt pavement:

1. 100 percent acrylic emulsion liquid binder.

2. Mix on-site with sand and cement.
3. Fills Cracks in Asphalt up to 1" in width.
4. Weight per Gallon at 77 Degrees F: 8.8 lbs., plus or minus 0.5 lbs.

E. Acrylic Resurfacer - apply to asphalt surfaces or previously colored acrylic surfaces in preparation of color coating system.

1. 100 percent acrylic emulsion resurfacer.
2. Mix on-site with silica sand.
3. Chemical Characteristics, by Weight, Minimum:
   a. Acrylic Emulsion: 44.0 percent.
   b. Hiding Pigment: 2.0 percent.
   c. Mineral Inert Fillers: 5.0 percent.
   d. Film Formers, Additives: 0.2 percent.
   e. Water: 45.0 percent.
4. Weight per Gallon at 77 Degrees F: 8.5 lbs., plus or minus 0.5 lbs.
5. Non-Volatile Material: 27.5 percent, plus or minus 5.0 percent.

F. Color Coating – apply as final color coats

1. 100 percent acrylic emulsion coating.
2. Mix on-site with silica sand and water.
3. Weight per Gallon at 77 Degrees F: 9.2 lbs., plus or minus 0.5 lbs.

G. Line Markings:

1. Primer – use as primer for line markings and prevents bleed-under for sharp lines.
2. 100 percent acrylic emulsion primer, clear drying.
   a. Chemical Characteristics, by Weight, Nominal:
      1) Acrylic Emulsion: 38 percent.
      2) Hiding Pigment: 0.0 percent.
      3) Mineral Inert Fillers: 7 percent.
      4) Film Formers, Additives: 1 percent.
      5) Water: 50 percent.
   b. Weight per Gallon at 77 Degrees F: 8.9 lbs., plus or minus 0.5 lbs.
   c. Non-Volatile Material: 29 percent, plus or minus 5 percent.
3. Line Paint – use for final line marking:

a. Pigmented, 100 percent acrylic emulsion line paint.

b. Chemical Characteristics, by Weight, Nominal:

c. Acrylic Emulsion: 26 percent.

d. Pigment: 15 percent.

e. Mineral Inert Fillers: 13 percent.

f. Additives: 5 percent.

g. Water: 41 percent.

4. Weight per Gallon at 77 Degrees F: 10.65 lbs., plus or minus 0.75 lbs.

5. Non-Volatile Material: 45 percent, plus or minus 5 percent.

PART 3 EXECUTION

3.1 GENERAL

A. Surfacing contractor/subcontractor shall provide a written statement of acceptance of the asphalt surface to the Engineer prior to applying surface coating systems.

B. Materials shall only be applied during seasonable weather when the air temperature and bituminous surface temperature are within the ranges recommended by the manufacturer.

C. The acrylic material shall not be applied when the wind or other conditions cause a film of dust to be deposited on the pavement surface after cleaning and before the material can be applied.

D. The filling of tanks, pouring of materials or cleaning of equipment shall not be performed on unprotected pavement surfaces unless adequate provisions are made to prevent spillage of the material.

E. No work will be permitted between sundown and sunrise without written permission from the Engineer.

F. All material shall be placed in a workmanlike manner, which shall result in regulation tennis and basketball courts.

3.2 SURFACE PREPARATION

A. New bituminous surfaces shall cure for 21 days or per manufacturer's requirements before application of asphalt tennis court and basketball court surface color coating system.

B. Protect adjacent surfaces and landscaping from contact with asphalt tennis court and basketball court surface color coating system.

C. Prepare surfaces in accordance with manufacturer's instructions.

D. Remove dirt, dust, debris, oil, grease, vegetation, loose materials, and other surface contaminants which could adversely affect application of asphalt tennis court surface and basketball surface color coating systems. Pressure wash entire surface.

3.3 CRACK REPAIR AND LEVELING

A. Repair cracks, depressions, and surface defects in accordance with manufacturer's instructions before application of filler course and color coating.

B. Prior to application of the acrylic resurfacer, the court surface should be flooded with water and allowed to drain for one hour at 70 degrees Fahrenheit. "Birdbath" areas (areas holding 1/16" or more water at the deepest point) shall be filled using acrylic patch binder compatible with the underlying surfacing materials and the new surfacing materials to be applied. Patching and leveling materials shall be applied in accordance with the manufacturer's recommendations. Ensure surface repairs are flush and smooth to adjoining surfaces.

3.4 RESURFACER AND COLOR COAT

A. Two coats of sand-filled acrylic resurfacer shall be applied to provide smooth underlayment for application of color coating in accordance with the manufacturer's recommendations. Typical application rate is between 0.07 to 0.09 gallons of undiluted resurfacer per yard or as required by surface roughness and porosity.

B. Two coats of acrylic color coat shall be applied in accordance with the manufacturer's recommendations. Typical application rate is between 0.04 to 0.07 gallons of undiluted color coat per yard. Unless otherwise directed by the Owner, the color of the court areas shall be blue and the color of the areas outside the court area shall be green.

3.5 LINE MARKING

A. The playing lines shall be accurately located and marked in accordance with rules of the United States Tennis Association for the tennis court, National Federation of High School Association for the basketball court, and painted with a textured line paint recommended or approved by the manufacturer of the color finish material.

B. Apply line markings primer, after masking tape has been laid, to seal voids between masking tape and court surface to prevent bleed-under when line paint is applied.

C. Application for the marking material shall be such as to provide uniform film thickness throughout the coverage area. Stripe ends shall be clean cut and square, with a minimum of material beyond the cutoff.

D. White base lines shall not be more than 4" wide and playing lines not more than 2" wide.

E. QuickStart lines shall not be white but shall be installed using a color of the same color family as the court areas (blue) as approved by the Owner. QuickStart lines shall terminate 3" from all white playing lines.

F. All pavement markings not conforming to the requirements of the Contract shall be removed and replaced or otherwise repaired to the satisfaction of the Engineer. Removal of unacceptable work shall be accomplished with suitable blasting or grinding equipment unless other means are approved by the Engineer.

G. The painting should be done by skilled painters in a workman like manner in accordance with the manufacturer's standard printed instructions. At no time should the playing lines or the line dimensions vary more than ¼-inch from the exact measurement.

END OF SECTION

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SECTION 02790

RUBBER PLAY SURFACING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents including the Procurement/ Contracting Requirements, General Requirements and Appendices apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to, the following:

1. Poured-in-place two-layer rubber-urethane playground surfacing system consisting of a top surface over rubber base mat over crushed stone sub-base.

1.3 RELATED WORK UNDER OTHER SECTIONS

A. Section 02315 – Excavation, Backfill, Compaction & Dewatering

B. Section 02320 – Borrow Materials

C. Section 02880 – Playground Equipment

1.4 REFERENCES

A. Comply with applicable requirements of:

1. Commonwealth of Massachusetts, MassDOT Standard Specifications.

2. Provide labor, materials, equipment and services to comply with requirements.

3. ASTM: American Society of Testing Materials:

a. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.

b. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

c. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

d. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.

e. ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.

f. ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.

g. ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

4. CPSC No. 325, "Handbook for Public Playground Safety"

1.5 DEFINITIONS

A. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur".

B. TPV: Thermoplastic Vulcanizate.

1.6 SUBMITTALS

A. Submittals: in accordance with Section 00700 – General Conditions.

B. Product Data: Submit manufacturer's specifications, installation instructions and product data for:

1. Resilient Play Surfacing Wearing Surface

2. Resilient Play Surfacing Rubber Base Course

C. Shop Drawings: submit:

1. Layout, cross sections, drainage, installation, and edge termination. Include patterns made by varying colors of surfacing. Include details of graphics.

D. Samples: Submit manufacturer's color verification samples for the color mix A of 9" x 9" (229 x 229 mm) minimum for initial review and up to two (2) additional samples for each color mix A as requested by Landscape Architect.

E. Certificates: submit Certificate of qualifications of the Poured-in-place resilient playground surfacing installer.

F. Closeout Submittals: Submit the following:

1. Warranty documents specified herein

2. Maintenance Data: For the playground surface system to be included in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Surface Installed Qualifications: Company specializing in outdoor resilient surfaces in the USA. The applicator shall be approved and trained, with a minimum of five (5) years' documented experience and have completed 5 public playgrounds in the past 5 years. Conditions of all surface substrates with respect to structural performance shall be evaluated and approved by the surface installer prior to application of surface system.

B. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.

C. Impact attenuation testing shall be performed by a National Recreation and Parks Association/National Playground Safety Institute (NRPA/NPSI) Certified Playground Safety Inspector (CPSI) and trained in the proper operation of the Triax test equipment.

D. Impact attenuation testing shall be performed according to ASTM 1292 in presence of BPRD within 30 days of installation. As a precondition of surfacing acceptance, the Contractor shall provide the testing results in writing. Up to 10 drop test locations will be required at each separate play area.

E. International Play Equipment Manufacturers Association (IPEMA) certified.

F. Impact attenuation requirements: Gmax test scores shall be less than 200 and HIC scores shall be less than 1000 or current ASTM 1292 standard, whichever is stricter.

G. If the surfacing does not meet the safety standards or impact attenuation performance requirements, the contractor will be required to bring the surfacing up to compliance with 30 days or less. The extent of failure and the determination of replacement will be at the discretion of the Owner. Should they be found during or after installation, and violations of the C.P.S.C. Guidelines, ASTM, ADA or impact attenuation performance requirements shall be corrected to the satisfaction of the Owner's Representative. Any proposed corrective work shall be reviewed and approved the Owner's Representative before corrective work begins.

1.8 DELIVERY AND STORAGE

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum temperature of 40 degrees F (4 degrees C) and a maximum temperature of 90 degrees F (32 degrees C).

1.9 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's Representative's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

B. Proper drainage is critical to the longevity of the PlayBound Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system in affected areas; and void the warranty.

C. Warranty Period: Contractor shall provide a written five (5) year performance guarantee from date of substantial completion for any defects in material or workmanship. The manufacturer shall provide a written guarantee for ten (10) years from date of installation against decay and biochemical degradation calling for replacement of defective materials during the guarantee period. Contractor shall install system to comply with manufacturer's warranty requirements.

1.10 PROJECT/SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements. Install surfacing system when minimum ambient temperature is 40 degrees F (1 degree C) and rising during the installation process. Do not install in steady or heavy rain.

PART 2 PRODUCTS

2.1 POURED-IN-PLACE PLAYGROUND SURFACING SYSTEM

A. Manufacturer: Surface America, Inc., or approved equal

1. Contact: PO Box 157, Williamsville, NY 14231; Telephone: (800) 999-0555, (716) 632-8413; E-mail: info@surfaceamerica.com; website: http://www.surfaceamerica.com

a. Alternate Approved Manufacturers

1) Duraflex: 205 Boring Drive, Dalton, GA 30721; Telephone: 1-877-881.8477; website: duraflexsurfacing.com

2) Creative Recreational Systems, Inc.: 470 Atlantic Avenue, 4th Floor, Boston, Massachusetts 02210; Telephone: (508) 469-0822; website: creativesystems.com

B. 'Extreme-10' poured-in-place playground surfacing system (no substitutions), including the following:

1. PlayBound Poured-In-Place Primer:

a. Material: Urethane

2. PlayBound Poured-in-Place Basemat:

a. Material: Blend of 100% recycled SBR (styrene butadiene rubber) and urethane.

b. Thickness: Varies. Thickness to be coordinated with play equipment manufacturer and play equipment fall height requirements. Minimum thickness for play area beyond the extents of the play equipment fall use zones.

c. Formulation Components: Blend of strand and granular material.

3. PlayBound Poured-In-Place Top Surface:

a. Material: Blend of recycled EPDM (ethylene propylene diene monomer) rubber aliphatic urethane binder (Extreme-10).

b. Thickness: Topical top surface wear course to be thickened at slide exists and under swings.

c. Dry Static Coefficient of Friction (ASTM D2047): 1.0.

d. Wet Static Coefficient of Friction (ASTM D2047): 0.9.

e. Dry Skid Resistance (ASTM E303): 89.

f. Wet Skid Resistance (ASTM E303): 57.

C. Project Surfacing Colors: as selected by as approved by Owner's Representative.

1. No Premium Colors

2. Composed of two (2) approved colors in addition to black

3. % of each color as approved.

D. Required mix proportions by weight: Extreme-10' poured-in-place playground surfacing system (no substitutions), including the following:

1. Basemat: 16+% urethane (as ratio: 14% urethane divided by 86% rubber). 14% urethane, 86% rubber (based on entire rubber & urethane mix).

2. Top Surface: 22% urethane (ratio: 18% urethane divided by 82% rubber). 18% urethane, 82% rubber (based on entire rubber & urethane mix).

2.2 CRUSHED STONE

A. Crushed Stone for Sub-Base shall be quarried crushed stoneso it compacts to a 95% Standard Proctor Compaction (as per ASTM. Test). The stones should be a homogeneous mixture of the following size stones:

Sieve Size	% Passing by Weight
1"	90 – 100
5/8"	0 – 80
1/4"	30 – 50
#4	15 – 35
#8	10 – 30
#30	3 – 5
#200	0 - 3

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS FOR RESILIENT PLAY SURFACING

A. Comply with the instructions and recommendations of the playground surfacing manufacturer.

3.2 EXAMINATION

A. Substrate preparation must be in accordance with surfacing manufacturer's specification. New asphalt must be fully cured – up to 30 days. New concrete must be fully cured – up to 7 days.

B. Proper drainage is critical to the longevity of the PlayBound Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system in affected areas; and void the warranty.

3.3 PREPARATION

A. Coordinate layout and installation of paving with layout and installation of adjacent paving, curbing, walls and other site improvements to ensure proper alignments.

B. Prepare substrates to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.

C. Make corrections to undisturbed subgrade or compacted gravel provided under Section 31 02 13 – Borrow Materials, to bring to the proper sections and elevations.

D. Compact subgrade to achieve a 95% minimum compaction rate consistent throughout subgrade.

3.4 CRUSHED STONE BASE PREPARATION

A. Completion of the crushed stone base to specification is to be done in advance of specialized crews arriving for installation of the Poured-in-Place System.

B. Depth of the crushed stone base is 9 -1/2". Crushed stone base shall be placed in lifts and compacted using a mechanical compactor and/or roller to achieve the necessary 95% compaction rate throughout the base.

C. The crushed stone base should be sloped 2% to allow run-off of the excess water that doesn't percolate through the crushed stone.

D. The crushed stone base must be thoroughly compacted by using a tamper, roller or combination of both. This is of critical importance so that settling of the crushed stone base does not happen after installation of the poured-in-place material.

E. The crushed stone base must be a level plane that is smooth and comparable in look to the sub-surface of an asphalt road prior to the asphalt paving. This requires significant attention to accomplish. String lines must be used to ensure an even plane is constructed.

3.5 PREPARATION FOR RESILIENT PLAY SURFACING

A. Surface Preparation: Using a brush or short nap roller, apply primer to the substrate perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

3.6 INSTALLATION

A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, playground equipment installation and other relevant work, has been completed.

B. Basemat Installation:

1. Using screeds and hand trowels, install the base mat at a consistent density of 29 pounds, 1 ounce per cubic foot (466 kg/m3) to the specified thickness.

2. Allow base mat to cure for sufficient time so that indentations are not left in the base course from applicator foot traffic or equipment.

3. Do not allow foot traffic or use of the base course surface until it is sufficiently cured.

C. Primer Application: Using a brush or short nap roller, apply primer to the base mat perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

D. Install according to manufacturer's recommendations and at sufficient depth to attenuate shock from the rated fall height of the tallest specified play structure in compliance with the latest edition the Handbook for Public Playground Safety of US Consumer Product Safety Commission and ASTM F 1487 – latest edition, Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

E. Top Surface Installation:

1. Using a hand trowel, install top surface at a consistent density of 58 pounds, 9 ounces per cubic foot (938 kg/m3) to a nominal thickness of 1/2" (12.7 mm).

2. Allow top surface to cure for a minimum of 48 hours.

3. At the end of the minimum curing period, verify that the wearing surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface.

4. Do not allow foot traffic or use of the surface until it is sufficiently cured.

3.7 PROTECTION

A. Protect the installed playground surface from damage resulting from subsequent construction activity on the site.

END OF SECTION

SECTION 02920

LAWNS AND GRASSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Restoration of all vegetated areas disturbed during construction including:

a. Lawn areas

b. Grass surfaces

2. New loam and seed areas

3. Loam, starter fertilizer, lime, lawn seed, and hydric seed

4. Sodding

1.2 SUBMITTALS

A. Lawn seed mixture including percent by weight of each seed type, and manufacturer/Supplier name.

B. Suitable laboratory analysis of the topsoil to determine the quantity of fertilizer and lime to be applied.

C. Lime and starter fertilizer application rates based on laboratory soil tests.

D. A sworn certificate indicating each variety of seed, weed content, germination of seed, net weight, date of shipment and manufacturer's name shall accompany each seed shipment.

E. Sod certification of grass mixture, manufacturer/supplier name, proof that it has been grown on a high sand content field.

1.3 QUALITY ASSURANCE

A. Place seed only between the periods from April 15th to June 1st, and from August 15th to October 1st, unless otherwise approved by the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A. Loam

1. Loam from offsite, as required for Work, shall be taken from a well-drained, arable site, and shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Loam shall also be free of quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Loam shall not be delivered or used for planting while in a frozen or muddy condition. Topsoil as delivered to the Site or stockpiled shall have pH between

6.0 and 7.0 and shall contain not less than 5 percent or more than 8 percent organic matter as determined by loss of ignition of moisture-free Samples dried at 100 degrees Celsius.

2. Onsite loam may be available from stripping of onsite topsoil. Onsite topsoil shall be tested as specified below and shall be amended as necessary to meet Specification requirements for loam.

3. Soil Analysis: The Contractor shall submit representative Samples of loam, which he intends to bring onto the Site, and Samples of loam from onsite sources, to a Soil and Plant Testing Laboratory acceptable to the Engineer. All reports shall be sent to the Engineer for approval. Samples of loam to be brought to the Site must be approved prior to delivery of soil. Deficiencies in the loam shall be corrected by the Contractor, as directed by the Engineer after review of the testing agency report by a soils consultant. Testing reports shall include the following tests and recommendations.

   a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System.

   b. The silt clay content shall be determined by a Hydrometer Test.

   c. Percent of organics shall be determined by an Ash Burn Test or Walkley/Black Test.

   d. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and acidity (pH).

   e. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular lawn and planting objectives noted.

   f. All tests shall be performed in accordance with the current standards of the Association of Official Agriculture Chemists.

4. Loam for General Lawn and Site Restoration Areas: Loam shall conform to the following grain size distribution for material passing the #10 sieve:

	Percent Passing	
U.S. Sieve Size Number	**Minimum**	**Maximum**
10	100	----
18	84	100
35	63	72
140	26	40
270	22	34
0.002 mm	2	5

[1]The ratio of the particle size for 80% passing (D_{80}) to the particle size for 30% passing (D_{30}) shall be 6 or less ($D_{80}/D_{30} < 6$).

[2]Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.

[3]Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

[4]The organic content shall be between 4.0 and 6.0 percent.

B. Typical Sand Amendment

1. Sand to be mixed with topsoil shall meet the following requirements. The material shall be uniformly graded coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock and free from loam or clay, surface coatings, mica, other deleterious materials with the following gradation.

	Percent Passing	
U.S. Sieve Size Number	**Minimum**	**Maximum**
10	100	----
18	60	80
35	35	55
60	8	20
140	0	8
270	0	3
0.002 mm	0	0.3

[1]Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 10% by weight of the total sample.
[2]The ratio of the particle size for 70% passing (D_{70}) to the particle size for 20% passing (D_{30}) shall be 3.0 or less ($D_{70}/D_{20} < 3.0$).
[3]Tests shall be combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

C. Starter Fertilizer

1. Starter fertilizer shall bear the manufacturer's name and guaranteed statement of analysis, and shall be applied in accordance with the manufacturer's directions.

2. Starter fertilizer shall be Scott's Starter Fertilizer, or equal, with timed nitrogen release to prevent burning.

D. Wetting Agent

1. Wetting Agent such as Vikvax Plus soil surfactant should be applied at a rate of 6 lbs/1,000 sf.

E. Seed

1. Seed shall be of the previous year's crop.

2. Required properties:

a. >97% for athletic fields

b. >85% for athletic fields

c. Crop < 0.5%

d. Weed < 0.3%

e. Noxious Weed – 0%

f. Inert < 8%

3. Grass seed shall conform to the following mixtures in proportion by weight and weed content and shall pass the minimum percentages of purity and germination as indicated for same.

General Lawn Area – Three-Way Tall Fescut Mix (Earnst Seeds, Or Approved Equal)	**% Weight**
Tall Fescue, 'FoxHound' (turf type) '	34%
Tall Fescue 'Raptor III' (turf type)	33%
Tall Fescue, "Turismo' (turf type)	33%

4. All seed shall comply with State and Federal seed Laws and Regulations.

F. Sod – (Softball field within Limits of Fence)

1. All sod shall be from the same crop and shall be a Kentucky bluegrass/fescue blend and commercially grown from the same grower. Approved blends shall be:

a. 40 percent Kentucky Bluegrass

b. 30 percent Rye

c. 30 percent Fescue

d. Established height 1-1/2 inches

2. Sod shall be vigorous, well-rooted, free of insects and disease, weeds, stones and burned spots.

3. Notify Engineer of sod grower and grass type prior to delivery date and submit delivery date for viewing and approval of sod delivered.

4. Sod furnished shall be living sod containing at least 70% thickly matted grasses as specified and free from noxious weeds.

5. Sod shall be cut and delivered within 24 hours. It shall be free from noxious weeds and grasses. It shall have a soil layer no less than ½ inch and no more than 1 inch in thickness and shall have enough moisture to allow for proper rolling and handling.

PART 3 EXECUTION

3.1 PREPARATION

A. After rough grading of the subgrade has been completed and approved, the subgrade surface shall be scarified to a depth of four (4) inches. Then furnish and install a layer of loam providing a rolled four (6) inch thickness. Any depressions which may occur during rolling shall be filled with additional loam, regraded and rerolled until the surface is true to the finished lines and grades. All loam necessary to complete the Work under this section shall be supplied by the Contractor.

B. The ground surface shall be fine graded and raked to prepare the surface of the loam for lime, fertilizer and seed.

C. The loam shall be prepared to receive seed by removing stones and grading to eliminate water pockets and irregularities prior to placing seed. Finish grading shall result in straight uniform grades and smooth, even surfaces without irregularities to low points.

D. All stones over one-half (½) inch in diameter remaining on the surface after raking shall be removed.

E. Shape the areas to the lines and grades required. The Contractor's attention is directed to the scheduling of Loaming and Seeding of graded areas to permit sufficient time for the stabilization of these areas.

F. All areas disturbed by construction within the property lines and not covered by structures, pavement, or bark mulch shall be loamed and seeded.

3.2 LOAM AND SEED AREAS

A. The seed mixtures shall be applied at a minimum rate of 200 pounds per acre, or 4.5 pounds per 1,000 square feet.

B. Athletic field seed application rates:

1. Kentucky Bluegrass – 130 pounds per acre

C. Seed shall be sown at the rates indicated above by rotary or drop spreader. Sowing shall be done on a calm, dry day. Immediately before seeding, the soil shall be lightly raked. One half the seed shall be sown in one direction and the other half at right angles to the original direction. It shall be lightly raked into the soil to a depth not over 1/4 inch and rolled with a hand roller weighing not over 100 pounds per linear foot of width.

1. Straw mulch shall be applied immediately after seeding at a rate of 1.5 to 2 tons per acre. Mulch that blows or washes away shall be replaced immediately and anchored using appropriate techniques.

2. The surface shall be watered and kept moist with a fine spray as required, without eroding the soil, until the grass is well established. Any areas, which are not satisfactorily covered with grass, shall be reseeded, and all noxious weeds shall be removed.

D. Unless otherwise approved, seeding shall be done between the periods from April 15th to June 1st, and August 15th to October 1st, when soil conditions and weather are suitable for such Work.

3.3 SOD

A. Sod shall be laid in place expediently after delivery to the Site, but no later than 24 hours after arrival.

B. Sod shall be rolled flat with roller.

C. All sodded areas are to be fertilized following the same Specifications for general seeding areas.

D. During periods of higher than optimal temperature for species being specified and after all unevenness in the soil surface has been corrected, lightly moisten the soil immediately prior to laying the sod.

E. Lay the first row of sod in a straight line with subsequent rows placed parallel to and butted tightly against each other. Stagger lateral joints. Exercise care to ensure that the sod is not stretched or overlapped and that all joints are butted tight to prevent voids.

F. As sodding is completed in any one section, roll the entire section by making four passes with a hand roller weighing not more than 100 lbs/ft of width.

G. Irrigation of Sod

1. Contractor shall be responsible for all pre-plant and post-plant irrigation procedures and practices until the turf is established and accepted by the Engineer.

2. Prior to placement of sod, the soil shall be irrigated and moisture applied to a minimum depth of 1½".

3. Immediately after planting, irrigate plantings sufficiently to seal the soil around them. Keep the seeded areas moist by frequent light applications of irrigation water, at a minimum 4 times daily, and until sufficient rooting has occurred and new leaf tissue sprouting is in evidence.

3.4 MAINTENANCE

A. Maintenance shall include watering, weeding, removal of stones and other foreign objects over one half (½) inch in diameter, cutting the grass until final acceptance. Mow at least weekly, removing no more than 30-40 percent of the leaf tissue using well sharpened blades. Mow grass between one (1) and two (2) inches high in the spring and fall. Mowing heights shall be an additional one-half to an inch in the summer to reduce temperature stress. Leave the clippings in place to help recycle essential plant nutrients needed for growth. All bare or dead spots which become apparent shall be properly prepared, re-loamed, limed, aerated, fertilized, and reseeded as many times as necessary to secure a good growth. The entire area shall be maintained, watered and cut until final acceptance of the lawn installation.

B. The dressed and seeded areas shall be sprinkled with water as necessary from time to time. Signs and barricades should be placed to protect the seeded areas.

C. To be acceptable, seeded areas shall consist of a uniform stand without bare or dead spots of at least 90 percent established permanent grass species, with uniform count of at least 200 plants per square foot.

D. The Engineer shall determine whether maintenance shall continue in any part.

E. After all necessary corrective Work and clean-up has been completed, and maintenance instructions have been received by the Owner, the Engineer will certify in writing the acceptance of the lawns.

F. Athletic fields shall be constructed and ready for acceptance one (1) year prior to Substantial Completion of the Project. The Contractor shall be responsible for maintenance of athletic fields until Substantial Completion.

G. Substantial Completion will not be achieved until the seeded areas have demonstrated a satisfactory stand of growth as determined by the Engineer. Seeded areas not demonstrating satisfactory stands as outlined above, as determined by the Engineer, shall be renovated, reseeded and maintained meeting all requirements as specified herein.

END OF SECTION

SECTION 02795

FLEXIBLE POROUS PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents including the Procurement/ Contracting Requirements, General Requirements and Appendices apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Provide labor, materials, equipment, services and transportation to complete work.

1. Supply and installation of flexible porous paving surface system at designated tree pit areas.

2. Coordination with other trades and General Contractor.

3. Review and approvals and density test reports by Contractor testing agency prior to installation of porous paving surface system.

B. Related Sections include the following:

1. Section 02315 – Excavation, Backfill, Compaction & Dewatering

2. Section 02320 – Borrow Material

3. Section 02870 – Site Furnishings

4. Section 02930 – Planting

5. Section 02932 – Topsoil Placement and Grading

6. Section 02935 – Landscape Maintenance

C. Security for 24-hour curing period related to installation of flexible porous paving.

D. Repairs to flexible porous paving materials damaged by others prior to curing period ending, by accident or by negligence.

1.3 SUBMITTALS

A. Submit a list of materials proposed for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained.

B. Submit certificates, signed by the materials producer and the paving subcontractor, stating that materials meet or exceed the specified requirements.

C. Submit name and contact information of company responsible for performing paving operations as soon as this information becomes available.

D. Material samples (1) 12” x 12” sample for the following:

1. Flexible porous paving

E. Color Samples: submit a brochure with color matrix samples for selection and approval by Owner's Representative.

F. Sample Panel: Construct a 5' x 5' sample of the Flexible Porous Paving material in the selected color matrix or approval. The sample shall show all aspects of finish appearance. The sample, upon approval, shall be maintained as the standard of minimal quality for approval of all proposed surfacing and paving work required for the project.

1.4 QUALITY ASSURANCE

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

B. Codes and Standards

1. All materials, methods of construction and workmanship shall conform to applicable requirements of ASTM Standards unless otherwise specified.

1.5 PROJECT CONDITIONS

A. Protection of Existing Conditions:

1. Protect adjacent work from splashing of paving materials. Remove all stains from exposed surfaces of paving, structures, and grounds. Remove all waste and spillage.

2. Do not damage or disturb existing improvements or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work.

3. Restore damaged improvements, including existing paving on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of the Owner's Representative, and authority having jurisdiction at no additional cost.

B. Safety and Traffic Control:

1. Notify and cooperate with local authorities and other organizations having jurisdiction when construction work will interfere with existing roads and traffic.

2. Provide temporary barriers, signs, warning lights, flaggers, and other protections as required to assure the safety of persons and vehicles around the construction area and to organize the smooth flow of traffic.

C. Weather Limitations:

1. Flexi™-pave shall not be placed when the ambient air temperature at the paving site in the shade away from artificial heat is below 45° F or above 95° F.

2. The Contractor shall not pave on days when rain is forecast for the day, unless a change in the weather results in favorable paving conditions as determined by the Owner's Representative.

1.6 QUALITY ASSURANCE

A. Installers shall be trained, approved, and certified installers of Flexible Porous Paving.

B. All necessary material components and applicable overview required to install the single pass Flexible Porous Paving shall be provided by the certified technicians.

PART 2 PRODUCTS

2.1 MATERIALS

A. Flexible Porous Paving shall be HD2000 Flexi™-pave, as manufactured by K.B. Industries, Inc., 28100 US Hwy 19 North, Suite 410, Clearwater, FL 33761, Telephone (727)-723-3300, Fax (727) 723-3600.

1. Reference manufacturer's information. The certified installer is responsible for supplying and installing a warranted material that meets the following manufacturer's specifications: The material must consist of and utilized recycle tires, aggregate, and binder

2. Color Matrix: as selected and approved by Owner's Representative.

2.2 FILTER FABRIC

A. Filter Fabric: Mirafi 140N, Cevex25, Typar 3351 or approved equal.

2.3 CRUSHED STONE

A. Washed ¾" Crushed Stone: as specified in Section Section 02320 – Borrow MaterialS

PART 3 EXECUTION

3.1 EVALUATION

A. Prior to installation of Flexi™-Pave, certified approved technicians will inspect the substrate visually for performance qualities. If the substrate is found to be unsatisfactory for the Flexi™-Pave, Inc. installation, written and verbal notice will be given to the Owner's Representative. The notice will contain the suspected defects in materials, structural performance or deviation from design specifications of the base materials.

3.2 COMMENCING WORK AFTER REMEDIAL ACTION BY OTHERS

A. Installation will take place only after all known defects in the substrate are repaired, tested and approved by the proper authorities overseeing the project.

B. Prior to the installation of Flexi™-Pave materials the Contractor shall have a qualified Engineering firm determine the structural properties of the proper base material and that it has been placed to a minimum of 95% compaction.

C. Following the signing of a contract with authorized installers, a mutual date will be scheduled for the installation and curing of the Flexi™-Pave system with the Owner's Representative.

3.3 CONDITIONS

A. An ambient temperature of 50 degrees F. or greater with a relative humidity reading of under 75% shall prevail during the installation and for at least 24 hours after the completion time of that day's work to allow for proper curing of the materials.

B. All materials incorporated into the Flexi-Pave system are to be protected before, during and after installation until fully cured.

C. Work will not take place when it is raining, or the humidity is too high to install Flexi-Pave materials.

D. No damages will be assed against the installing crew or KBI, Inc. due to weather conditions that prevent the proper installation of the materials.

3.4 DELIVERY, STORAGE AND HANDLING

A. All rubber and stone materials are to be transported in weather resistant bags protecting against adverse weather conditions.

B. The urethane will be shipped in containers that protect against water intrusion.

C. All materials are to be protected on site against adverse weather conditions. If freezing overnight temperatures are anticipated, heated storage will be provided by the Contractor for proper storage of the urethane binding agent.

3.5 INSTALLATION

A. Technicians performing the KBI-Flexi™-Pave installation will be certified by K.B. Industries, Inc. Details of the certified technicians will be kept at K.B. Industries corporate headquarters.

B. Primer where required by contract will be applied by KBI technicians at a rate of 300 square feet/gallon by the use of a sprayer, roller, brush or mechanical device.

C. Blend only dry stone, dry rubber granules and urethane binder.

D. Trowel, power screed or roll mixture in place following KBI, Inc. approved procedures and details.

E. The layer of KBI-Flexi™-Pave shall be allowed to cure with no foot, machine, load bearing equipment or vehicle traffic for a minimum of 24 hours from the end of the day's work.

3.6 MONITORING AND MAINTENANCE

A. The Flexi™-Pave installer shall be responsible for the entire installation of the contract work. The installer shall monitor the curing of the materials until it has been cured to ensure no damage has occurred prior to acceptance of the work by the Owner's Representative.

B. The Contractor shall protect the new work area from traffic or loads until the product has fully cured.

C. Once Flexi™-Pave is installed and fully cured, cleaning may be accomplished by use of a leaf blower, broom or hose as needed.

1. If Flexi™-Pave is damaged by misuse or negligence that occurs during the warranty period or after, the Contractor will be required to pay for those repairs.

2. All warranty claims must be in writing to the manufacturer, KBI, Inc., to be validated and investigated for proper action.

3.7 ADJUST AND CLEAN

A. Once Flexi-Pave is installed and fully cured, cleaning may be accomplished by use of a leaf blower, broom or hose as needed.

1. If Flexi™-Pave is damaged by misuse or negligence that occurs during the warranty period or after, the Contractor will be required to pay for those repairs.

2. All warranty claims must be in writing to the manufacturer to be validated and investigated for proper action.

END OF SECTION

SECTION 02810

IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS:

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

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

1.02 WORK INCLUDED:

A. The irrigation system shown on the Drawings and described within these Specifications represents a single controller, athletic field and lawn irrigation system supplied from an existing ground water well. The system is designed for 50 gallons per minute. Minimum 70-psi dynamic pressure at full system flow is required from the irrigation contractor's point of connection.

B. Mechanical point of connection for the irrigation system shall be to a groundwater irrigation well, rated at approximately 50 gpm. (Provided by Town of Needham). See well construction completion report for further information on the well. Well pump information is contained herein and is included in the scope of work.

1. Work shall include providing a new pump and control panel for irrigation well.

C. Electrical point of connection for irrigation system controller shall be to a new 120-volt, 1 phase 15-amp electrical circuit within the site electrical distribution panel. See electrical drawings. Irrigation controller shall be mounted inside a stainless steel enclosure.

D. Electrical point of connection for irrigation well pump shall be to a new 240-volt, 1-phase, 60-amp electrical circuit from local electrical distribution panel. See Electrical for power supply information.

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

F. The Drawings and Specifications must be interpreted and are intended to complement each other. The Contractor shall furnish and install all parts, which may be required by the Drawings and omitted by the Specifications, or vice versa, just as though required by both. Should there appear to be discrepancies or question of intent, the Contractor shall refer the matter to the Owner's Representative for decision, and its interpretation shall be final, conclusive and binding.

G. All necessary changes to the Drawings to avoid any obstacles shall be made by the Contractor with the approval of the Owner's Representative.

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

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

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

1.03 RELATED WORK:

A. Grading: Section - 02310

B. Excavating and backfilling for utilities: Section - 02320

C. Planting: Section - 02900

D. Electrical power supply: Division 16.

1.04 REFERENCES:

A. The following standards, latest revision thereof, form a part of this specification as referenced:

American Society for Testing & Materials (ASTM)

ASTM	A536	Ductile Iron Castings
ASTM	D1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
ASTM	D1785	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and Cl200.
ASTM	D2464	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
ASTM	D2466	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
ASTM	D2564	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
ASTM	F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
ASTM	D2737	Polyethylene (PE) Pressure rated tube.

National Plumbing Code (NPC)

National Electric Code (NEC)

National Sanitary Foundation (NSF)

American Society of Agricultural Engineers (ASAE)

Underwriters Laboratories, Inc. (UL)

Occupational Safety and Health Regulations (OSHA)

1.05 ORDINANCES, PERMITS AND FEES:

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

B. The Contractor shall obtain and pay for any and all permits, tests and certifications required for the execution of Work under this Section.

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

D. The Contractor shall include in its bid any charges by the Owner, Utility Company, or other authorities for work done by them and charged to the Contractor.

1.06 EXAMINATION OF CONDITIONS:

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

1.07 CONTRACTOR'S QUALIFICATIONS:

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

B. References: The Contractor must supply three references for work of this type and size with their bid including names and phone numbers of contact person(s).

1.08 TESTS:

A. Observation: The Owner's Representative will be on site at various times to insure the system is being installed according to the Specifications and Drawings.

B. Coverage Test: After completion of the system, test the operation of entire system and adjust sprinklers as required by the Owner's Representative. Demonstrate to the Owner's Representative that all irrigated areas are being adequately covered. Furnish and install materials required to correct inadequacies of coverage due to deviations from the Drawings or where the system has been willfully installed when it is obviously inadequate or inappropriate without bringing it to the attention of the Owner. See Part 3 - Execution).

C. The Owner's Representative shall be notified 48 hours in advance for observations.

D. During final observation, the Contractor shall be responsible for having two-way communication and sufficient personnel to provide instantaneous communication between the observation area and the controller for the system.

1.09 SUBMITTALS: IN ACCORDANCE WITH SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Product specification sheets on all proposed equipment to be installed. Work on the irrigation system may not commence until product sheets are submitted and approved. Submittals shall be marked up to show proper nozzles, sizes, flows, etc. Equipment to be included:

1. Sprinkler and Nozzles
2. Valves: Manual and Automatic
3. Controller
4. Enclosure
5. Valve Boxes

6. Pipe and Fittings
7. Wire and Connectors
8. Quick Coupling Valves
9. Rain Sensor
10. Grounding Equipment
11. Well Pump and Motor
12. Well Pump Control Panel and Accessories
13. Well Pump Wiring
14. Well Pitless Adapter and Cap
15. Electrical Disconnect
16. Bladder Tank
17. Miscellaneous Materials

B. Operation and maintenance manuals: See paragraph 1.13 of this Section of the specifications.

C. Project Record Documents:

1. The Contractor shall provide and keep up-to-date a complete redlined Record Set of Drawings of the system as the project proceeds. Drawings shall be corrected daily, showing every change from the original Drawings and Specifications. Record Drawings shall specify and exactly locate sprinkler type; pop up height and nozzle for each sprinkler installed. Each valve box location to be referenced by distance from a minimum of two permanent locations. Controller, rain sensor, quick coupling valves and all other equipment shall be indicated on the drawings. All wire routing, wire size and splices shall be indicated. Main line pipe and wire route shall have two (2) distinctly different graphic symbols (line types). Prints for this purpose may be obtained from Owner's Representative at cost. This redlined record set of drawings shall be kept at job site and shall be used only as a record set.
2. The redlined set of documents shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. This record set of drawings shall be available at all times for observation and shall be kept in a location designated by Owner's Representative. Should this record set of drawings not be available for review or not be up-to-date at the time of the observation, it will be assumed no work has been completed. Provide copies of the redlined record set of drawings for Owner's Representative review on a monthly basis.
3. Make neat and legible notations on this record set of drawings daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, indicate that equipment in a graphic manner in the location of installation and so as to match the original symbols as indicated in the irrigation legend. Should the equipment be different from that specified, indicate with a new graphic symbol both on the drawings and the irrigation legend. The relocated equipment dimensions and northing and easting coordinates should then be transferred to the appropriate drawing in this record set of drawings at the proper time.
4. On or before the date of final field observation, deliver corrected and completed AutoCAD computer plots of "record drawings" on vellum and AutoCAD electronic files on disk to Owner's Representative as part of contract closeout. Delivery of plots will not relieve Contractor of the responsibility of furnishing required information that may have been omitted from the prints.

D. At the end of each segment of the project the Contractor shall submit the following to the Owner's Representative.

1. Plumbing permits: If none required, so state.
2. Material approvals.
3. Pressure line tests: By whom approved and date.
4. Materials furnished: Recipient and date.

1.10 DELIVERY, STORAGE AND HANDLING:

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

1.11 WARRANTY:

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

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

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

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

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

1.12 COORDINATION:

A. The Contractor shall at all times coordinate his work closely with the Owner’s Representative to avoid misunderstandings and to efficiently bring the project to completion. The Owner’s Representative shall be notified as to the start of work, progression and completion, as well as any changes to the drawings before the change is made. The Contractor shall also coordinate his work with that of his sub-contractors.

B. The Contractor shall be held responsible for and shall pay for all damage to other work caused by his work, workmen or sub-contractors. Repairing of such damage shall be done by the Contractor who installed the work, as required by the Owner’s Representative.

1.13 MAINTENANCE AND OPERATING INSTRUCTIONS:

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

B. Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3) three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE ELIOT ELEMENTARY SCHOOL REC IMPROVEMENTS IRRIGATION SYSTEM, shall be submitted to the Owner’s Representative office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:

1. Table of Contents
2. Written description of Irrigation System.
3. System drawings:
   a. One (1) copy of the original irrigation plan;
   b. One (1) copy of the Record Drawing;

c. One (1) reproducible of the Record Drawing;
d. One (1) copy of the controller valve system wiring diagram

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

1.14 COORDINATION WITH OWNER AND UTILITIES:

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

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

PART 2 - PRODUCTS

2.01 GENERAL:

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

B. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and acceptance from the Owner's Representative.

2.02 PVC IRRIGATION PIPE:

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

B. All pipe in sizes 2-inches and smaller shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241 as manufactured by Certainteed, Cresline, JM or equal.

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

2.03 PVC PIPE SLEEVES:

A. All pipe sleeves beneath non-soil areas shall be PVC, Class 200 water pipe as manufactured by Certainteed, Cresline, JM or equal. Minimum sleeve size to be 3-inch.

2.04 WIRE CONDUIT:

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

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

C. Conduit for above ground wiring to controllers shall be galvanized, rigid metallic conduit.

2.05 PVC IRRIGATION FITTINGS:

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

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

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

D. PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Heavy Duty Cement or equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68 Clear, Oatey Clear Primer for PVC and CPVC, or equal.

E. All nipples to be schedule 80 PVC.

2.06 COPPER PIPE AND FITTINGS

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

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

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

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

2.07 BRASS PIPE AND FITTINGS

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

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

2.08 SPRAY SPRINKLERS

A. Part circle pop up spray sprinklers shall be pressure regulating (30-psi), plastic construction with ratcheting riser, removable nozzle and check valve. Nozzle size shall be as indicated on the drawing and in the legend. Pop-up height shall be 6 inches for lawn.

B. Sprinkler shall carry a minimum 3-year exchange warranty against defects. Sprinklers shall be manufactured by Toro, model 570Z-PRX-COM, Rain Bird, model 1800-SAM-PRS, Hunter Industries, model PRO30-CV or approved equal

2.09 MEDIUM ROTARY SPRINKLERS

A. Small/medium rotary sprinklers shall be gear-driven, rotary type heads, designed for in-ground installation with integral check valves and in-riser flow shut-off capability. Sprinkler shall be capable of covering a 25-44 foot radius and flow range of 0.9-7.0 gpm at 50-55 pounds per square inch of pressure. Sprinklers shall have a one hundred percent warranty for two years minimum against defects in workmanship.

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

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

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

E. Approved Performance Chart (18’ Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 5004-PL-SAM-SS	45psi	90 Deg.	MPR 25Q	1.00	26’
Rain Bird 5004-PL-SAM-SS	45psi	180 Deg.	MPR 25H	1.98	27’
Hunter I20-04-SS	50psi	90 Deg.	.5SR	0.75	18’
Hunter I20-04-SS	50psi	180 Deg.	1.0SR	1.5	18’

F. Approved Performance Chart (25’ Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 5004-PL-SAM	45psi	90 Deg.	MPR 25Q	1.00	26’
Rain Bird 5004-PL-SAM	45psi	180 Deg.	MPR 25H	1.98	27’
Hunter I20-04	45psi	90 Deg.	.75SR	0.75	25’
Hunter I20-04	45psi	180 Deg.	1.5SR	1.5	25’

G. Approved Performance Chart (35’ Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 5004-PL-SAM	55psi	90 Deg.	1.5	1.71	35’
Rain Bird 5004-PL-SAM	55psi	180 Deg.	3.0	3.47	40’
Rain Bird 5004-PL-SAM	55psi	360 Deg.	6.0	6.63	47’
Hunter I20-ADV	50psi	90 Deg.	2.0	2.0	38’
Hunter I20-ADV	50psi	180 Deg.	4.0	4.2	41’
Hunter I20-36V	50psi	360 Deg.	8.0	6.8	44’

2.10 LARGE ROTARY SPRINKLERS:

A. Large rotary sprinklers shall be gear-driven, rotary type with drain check valve and stainless steel riser designed for in-ground installation. The nozzle assembly shall elevate three inches when in operation and retraction shall be achieved by a stainless steel spring. Check valve shall be capable of holding up to 10 feet of elevation. Sprinkler shall be capable of covering a 49-59 foot radius and flow range of to 15.7 gpm at 60 pounds per square inch of pressure.

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

C. Sprinklers shall be manufactured by Hunter Industries model I25-ADS/36S, Rain Bird model 7005-SS or approved equal.

D. Approved Performance Chart (55 Foot Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 7005-SS	60psi	90 Deg.	08	8.4	49’
Rain Bird 7005-SS	60psi	180/360 Deg.	12	12.0	59’
Hunter I25-ADS	60psi	90 Deg.	8	9.2	50’
Hunter I25-ADS	60psi	180/360 Deg.	18	15.7	59’

E. Approved Performance Chart (60’ Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius

Rain Bird 8005-SS	60psi	90 Deg	6	6.1	45’
Rain Bird 8005-SS	60psi	180/360 Deg.	12	12.0	59’
Hunter I25-04-SS	60psi	90 Deg	7	7.5	48
Hunter I25-04-SS	60psi	180/360 Deg.	18	15.7	59’

2.11 ELECTRIC CONTROL VALVES:

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

B. Valves shall be manufactured by Rain Bird model PEB, Hunter Industries model ICV or approved equal.

2.12 VALVE BOXES:

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

B. Valve boxes for single electric valves, isolation valves and quick coupling valves shall be 10-inch round valve boxes with metal detection and bolt down covers.

C. Valve boxes for dual electric valves shall be 12-inch standard valve boxes with metal detection and bolt down covers.

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

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

2.13 AUTOMATIC CONTROLLER:

A. Controller shall be electronic in construction with capability of up to 10 hour run times per zone in increments of 1 or 10 minutes. Controllers to have minimum four independent programs, auto/off switch and be capable of manual, semi-automatic and automatic operation. Controller shall have water budgeting feature, cycle and soak feature, sensor input terminal, locking, weather resistant plastic cabinet and internal transformer. Terminal strip connection shall be easily accessible. The controller shall be U.L. listed, 120 volt, 60 Hertz, A.C. type.

B. Controller shall be as manufactured by Rain Bird model ESP-LXM, Hunter Industries model ACC2 or approved equal.

C. Station quantity shall be minimum of 24.

2.14 CONTROLLER ENCLOSURE

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

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

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

C. Controller enclosure shall be 16 inches wide x 8 inches deep

2.15 QUICK COUPLING VALVES:

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

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

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

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

E. Contractor shall provide two (2) keys for quick couplers and two (2) 1-inch x 3/4-inch swivel hose ells.

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

2.16 WIRE:

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

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

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

2.17 ISOLATION VALVES:

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

2.18 SWING JOINTS:

A. Spray sprinklers and Medium Rotor sprinklers shall be installed on swing pipe assemblies, minimum length 6 inches, maximum 18 inches.

B. Swing pipe operating pressure shall be up to 80 psi with an inside diameter of 0.49 inches, manufactured of low-density polyethylene material meeting ASTM D2104, D2239 and D2737. Swing joint swing pipe and fittings shall be manufactured by Hunter Industries, model FLEXsg, with HSBE-050 and HSBE-075 fittings or approved equal.

C. Large rotary sprinklers shall be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double o-ring seals, minimum 315 psi rating and minimum length of 12-inches.

D. Quick coupling valves to be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double o-ring seals, minimum 315 psi rating and minimum length of 12-inches with brass insert and stabilizer (unless stabilizer is an integral part of the quick coupling valve).

2.19 AUTOMATIC RAIN SENSOR:

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

2.20 CRUSHED STONE:

A. Crushed stone shall be as specified in Section 02300 EARTHWORK. Crushed stone shall be used under valve boxes.

2.21 SAND:

A. Sand used for backfilling of trenches; under, around and over PVC lines shall be as specified in SECTION 02300 EARTHWORK.

2.22 GROUNDING EQUIPMENT:

A. Controller installed inside of a building shall include factory-installed and factory-recommended lightning protection and shall be connected to 5/8-inch diameter x 10-foot long copper clad grounding rods with minimum #6 AWG, solid, bare copper wire and 4-inch x 96-inch x 0.0625-inch copper grounding plates as outlined below. Minimum 20-foot separation between rod and plate. Minimum 12-foot separation between controller and ground rod. All connections to rods shall be with Cadweld connectors as specified. All connections to plates shall be performed by the plate manufacturer (Paige #182199L) with 25-feet of bare copper wire already attached. Each grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover with metal detection and six inches of 4-inch ADS drainage pipe. Plates shall be installed in ground enhancement material. Plates shall be covered with 4-inch plastic grated cover with detection and minimum 36-inches of 4-inch dia. ADS drainage pipe. Ground rods and plates shall be UL listed.

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

2.23 WELL PUMP AND MOTOR

A. New submersible well pump shall be installed in irrigation well. Well pump shall be sized at 7.5 horsepower, providing a flow of approximately 50 gpm, at a minimum total dynamic head of 300 feet. Pump performance shall be verified once well construction and test data is available from the Town.

B. Submersible pump shall be rated for continuous operation as manufactured by Goulds or approved equal, as required for an 8-inch nominal diameter bedrock irrigation well.

C. Submersible pump motor shall be as manufactured by Franklin Electric or approved equal.

D. Pump shall be 230-volt, 3-phase, 3-Wire with ground.

2.24 WELL DISCHARGE PIPE

A. Well pump pull and discharge pipes shall be 2-inch. Pipe shall be stainless steel, SDR 7 HDPE, or galvanized seamless steel pipe, minimum Schedule 40. Use stainless steel reducer bushings as required to connect to submersible pump discharge. Pipe shall have a minimum pressure rating of 300 psi.

B. Well discharge piping near ground surface, downstream of pitless adapter, shall connect to mainline pipe (Class 200 PVC).

C. Steel pipe shall conform to ASTM A-53, A-106, A-120, and API-5L as manufactured by U.S. Steel, or approved equal

2.25 CHECK VALVE

A. Check valve shall be installed on discharge pipe in addition to any check valve installed in the submersible pump itself.

B. Check valve body and spring shall be of 316 stainless steel construction.

C. Sealing surface disc shall have resilient Buna-N-Nitrile.

D. Pressure loss shall not to exceed 3 psi at full discharge capacity.

E. Check valve shall be as manufactured by Flomatic or equal.

2.26 IRRIGATION WELL PUMP WIRE

A. Power wiring from pump control panel to well shall be with copper conductors rated not less than 600 VAC and of proper size to carry full load amperage of motor without exceeding 67% amperage capacity of conductor.

B. Wire size shall be minimum #2 AWG, direct burial cable tray cable, 3-Wire with ground. Grounding cable sized to NEC requirements shall be included in liquid-tight conduit.

C. In-ground wire connections shall be UL- Listed, 3M 82A or approved equal splice kits. All wire splices shall be made in valve boxes or at disconnects.

D. All submersible power conductor wires for well pump shall be PVC twisted submersible pump cable, 3-conductor with ground, minimum #2 AWG, spliced in water-tight, quick disconnects.

E. Pressure transducer wiring shall be 4 individually jacket conductor, #18AWG copper, shielded, rated for direct burial.

F. Wire shall be manufactured by Centri-Line, Paige Electric Corporation, or approved equal.

G. All wire paths from Control Panel to wells shall be in conduit.

2.27 WELL CASING PITLESS ADAPTER

A. Pitless adapter shall be of copper alloy 844 brass casting. Pitless adapter shall have Teflon coated neoprene O-rings, flanged neoprene gasket and contoured brass collar. Pitless adapter shall be tested and certified watertight and shall meet Pitless Adapter Standard # 1 (PAS-1).

B. Pitless adapter shall accommodate pull pipe and power conductors.

C. Pitless adapter shall be 8-inch in size (matching well casing) with a 3-inch outlet, as manufactured by Campbell Manufacturing, Merrill or approved equal.

2.28 SANITARY WELL SEAL

A. Sanitary well seal shall be installed at top of well. Well seal shall utilize two 3/16-inch stainless steel plates with ¾-inch expansion seal.

B. Well seal shall have hole for pump pull pipe and one for electrical wiring.

C. Sanitary seal shall be minimum 8 inches (nominal to match well casing).

2.29 PUMP SYSTEM PRESSURE TRANSDUCER

A. Pressure transducer shall be solid-state bonded strain gage type with accuracy of plus/minus 0.25% and constructed of stainless steel.

B. Pressure transducer shall be rated for pump system discharge pressure, as shown on technical data sheet, and shall provide gauge pressure output, rather than absolute.

C. Pressure transducer shall be 4-20mA analog type with 7-33 VDC supply range.

D. Pressure transducer shall have stainless steel diagram and 200 psi burst pressure rated for wet installation locations. Transducer shall also have built-in surge protection.

E. Pressure transducer shall have ¼-inch NPT welded pressure port adapter for installation into water piping. Transducer shall measure pump discharge pressure and have range of 0-150 psi gauge.

F. Pressure transducer shall be as manufactured by Druck, Telemecanique or approved equal.

2.30 WELL PUMP PRESSURE RELIEF VALVE

A. Pressure relief valve shall be installed downstream of pump discharge and pressure transducer. Valve is to relieve pressure in excess of that which system is designed to maintain safely.

B. Pressure relief valve shall be direct-acting, spring loaded, diaphragm-type valve.

C. Valve shall be normally closed by force of compression spring above diaphragm. Control pressure shall be applied under diaphragm. When controlling pressure exceeds spring setting, disc shall be lifted off its seat, permitting flow through control. When control pressure drops below spring setting, spring forces control back to its normally closed position.

D. Valve pressure adjustment shall be through turning adjusting screw on top of valve.

E. Valve shall be1/2-inch in size and be constructed of cast bronze body and cover.

F. Discharge from relief valve shall be 1 inch Schedule 40 PVC pipe back to well.

G. Relief valve shall be set at 100 psi (at surface).

H. Relief valve shall be as manufactured by Cla-Val, Watts or approved equal.

2.31 VARIABLE FREQUENCY DRIVE CONTROL PANEL

A. A Variable Frequency Drive controller shall be provided for the submersible well pump to maintain constant pressure to the irrigation system while not over-pumping the well. VFD shall be rated for a minimum of 5 hp, to maintain a constant pressure over a range of flow of 0 to 50 gpm. VFD shall be installed in designated space within maintenance building per the direction of the Owner.

B. Power supply for VFD shall be 230V, 1-phase. VFD shall be sized to convert the single phase power supply input to a 3-phase 230-volt output to the submersible pump motor.

C. The variable frequency drive shall be IGBT based with selectable carrier frequency up to 15 KHZ. The VFD shall include terminals for incoming power, motor output power and control terminals.

D. The VFD shall generate a sine-coded, variable voltage/ frequency, three phase output for optimum speed control. The VFD shall incorporate power loss ride-through for a minimum of 2 seconds. VFD protective features shall include current limit, auto restart, short circuit protection, electronic motor overload protection and ground fault protection. The VFD shall have a push button programming display for easy access to operation parameters. The VFD shall be protected on the primary side a breaker of the appropriate amperage. Overload capacity: 120% rated output current for one minute. Voltage Fluctuation: +10%, -15%. Sine wave, PWM, with full range, and automatic torque boost. Frequency Control Range: 0.5 to 500Hz. Frequency Accuracy: Digital, 0.01Hz, Analog, .1%. Motor overload protection, Instantaneous over current of 180% of rated output current. Over voltage at 820VDC if 460V input. Under voltage: user adjustable. Momentary Power Loss: up to 2 second ride through. Electronic Ground Fault. LED capacitor charge indicator. Input Phase loss alarm. Ambient temperature range of 0 to 50 degrees C. Humidity of 95% non-condensing.

E. Automatic Pressure Regulation BASED ON Variable Flow

1. The system controls shall be capable of changing the regulated downstream pressure while in operation, based on discharge flow or discrete input. The system controls shall also be capable of up to six, user adjustable pressure regulation set points based on discharge flow or one additional set point based on a discrete input. In addition to adjustment of downstream pressure, the controls shall be capable of up six pressure regulation algorithms to insure accurate pressure regulation regardless of regulated pressure, discharge flow or connected pump combination.

F. Alarms

1. Controls shall shut down the pump station and/or related components in the event of the following alarm conditions. The controls shall attempt to restart the system after alarm shutdown or loss of power to minimize loss of water. After a user adjustable number of attempts to re-pressurize the system, the controls will go into hard shut down and remain there until manually reset unless otherwise stated in description of operation on drawing.
2. Low discharge pressure cutout. Pressure remains 20 PSI below regulate set point for 240sec (adjustable).
3. High discharge pressure cutout. Pressure remains 11 PSI above regulate set point for 120sec (adjustable).
4. VFD panel shall be able monitor over or under electrical current (resulting from potential well draw down or high torque).
5. Phase Loss

G. VFD shall have a Built-in programmable logic controller (PLC) for integration with other building systems if necessary.

H. VFD shall be as manufactured by Franklin Electric, model Cerus X-Drive or approved equal.

2.32 LOAD/LINE REACTOR

A. A load reactor shall be installed for well pump installed to remove voltage amplitude spikes. Line reactors shall have an inductance tolerance of +/- 10%, a dielectric strength of 4000 Volts RMS, 5600 Volts Peak. The reactors shall have a dv/dt protection of 17,825 volts/microsecond, a maximum switching frequency of 20KHz, Insulation class H, Maximum Ambient Temperature of 45 deg C, Average Temperature rise of 115 deg C and a maximum fundamental frequency without derating of 60 Hz.

B. Reactor to be installed within or adjacent to the VFD control panel.

C. Reactor shall be manufactured by MTE Corporation or approved equal.

2.33 BLADDER TANK

A. Bladder tank shall be provided to supplement irrigation mainline pressure and to reduce pump cycling for zones with low flows or slow leaks in fittings.

B. Bladder tank shall be cylindrical, upright standing, minimum 150 psi rated and 25 gallons in size.

C. Bladder tank shall be as manufactured by Wessels Company, Well-X-Trol (Amtrol) or approved equal.

2.34 PRESSURE GAUGES

A. All pressure gages on system shall be of same size and scale, 0 - 200 psi or as required. Gauges shall be silicone filled with accuracy conforming to ANSI Grade B or greater. Gauge shall be provided on main discharge pipe.

B. System shall include pressure gauges on discharge side of pump station manifold. Gauge shall be silicone filled with accuracy conforming to ANSI Grade B or greater.

2.35 WELL PUMP ELECTRICAL DISCONNECT

A. A three pole, electrical disconnect shall be mounted on the pump enclosure to completely isolate the pump from the incoming power. The disconnect shall LOCKABLE and conform to all NEC requirements and be NEMA 3R. Final location of disconnect shall be per the direction of the Owner's Representative.

B. The switch shall have switch blades which are visible when the switch is OFF and the cover is open.

C. Lugs shall be front removable and UL Listed for aluminum or copper conductors, 60 degree or 75 degree C conductors.

D. All current carrying parts shall be plated to resist corrosion.

E. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.

F. Switches shall have provisions for a field installable electrical interlock.

G. Switch operating mechanism shall be quick-make, quick break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operation handle after the closing or opening action of the contacts has started.

H. The operating handle shall be an integral part of the box, not the cover.

I. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

J. The handle position shall travel at least 90 degrees between OFF and ON positions to clearly distinguish and indicate handle position.

K. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

L. Switch covers shall be top hinged, attached with removable screws and securable in the open position.

M. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvanized steel.

N. The enclosure shall have ON and OFF markings stamped into the cover.

O. The operating handle shall be provided with a dual colored, red/black position indication.

P. All switches shall have provisions to accept up to three 3/8” hasp padlocks to lock the operating handle in the OFF position.

Q. Tangential knockouts shall be provided to facilitate ease of conduit entry.

R. Switch shall be horsepower rated for the final approved pump and be manufactured by Square D Company or equal.

2.36 SPARE PARTS:

A. Contractor shall supply the following tools and equipment to the Owner’s Representative before final observation:

1. Two (2) wrenches for disassembling and adjusting each type of sprinkler head provided.
2. One (1) quick coupler key assembly for every five or fraction thereof of each type of quick coupling valve provided.
3. One (1) of each type of gate valve used in the project.
4. Two (2) of each type sprinkler head and pattern (PC & FC) used in the project.
5. Two (2) of each type nozzle used in the project.

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

PART 3 - EXECUTION

3.01 GENERAL:

A. Before work is commenced, hold a conference with the Owner's Representative to discuss general details of the work.

B. Examine all contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.

C. All work indicated on Drawings shall be provided whether or not specifically mentioned in the Specifications.

D. If there are ambiguities between Drawings and Specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by Owner's Representative, and Contractor shall comply with the decisions. In the event the installation contradicts the directions given, the installation shall be corrected by Contractor at no additional cost to Owner.

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

F. Make all field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the Irrigation Plans, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Owner's Representative prior to proceeding.

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

H. Coordinate installation of all sprinkler materials, including pipe, to avoid conflict with the trees, shrubs, or other plantings.

I. During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Owner's Representative. The superintendent shall not be changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent the Contractor in his absence and all directions given to the superintendent shall be as binding as if given to the Contractor.

J. At all times, protect existing irrigation, landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.

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

3.02 PIPE AND FITTINGS INSTALLATION:

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

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

C. Pipe shall be laid on undisturbed trench bottom provided suitable base is available - no rock larger than 1-inch or sharp edges; if not, excavate to 2-inch below pipe invert and provide and install sand base or crushed stone upon which to lay pipe.

D. Back filling shall be accomplished as follows: the first 10-inches of backfill material shall contain no foreign matter and no rock larger than 1-inch in diameter. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.

E. Do backfilling when pipe is cool. During hot weather cool pipe by operating the system for a short period, or by backfilling in the early part of the morning before the heat of the day.

F. Do not, under any circumstances, use truck wheels for compacting soil.

G. Where feasible, Owner’s Representative may authorize the use of flooding in lieu of tamping.

H. Restore grades and repair damage where settling occurs.

I. Clean bell and spigot ends and make all gasketed joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of lubricant, and wiping off any excess lubricant from each connection. Maximum deflection per joint shall not exceed manufacturer's recommendations.

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

K. Mainline pipe shall have minimum 22-inches of cover (excavate to invert as required by pipe size). Lateral pipe shall have minimum 16-inches of cover for PVC and 12-inches of cover for Polyethylene (excavate to invert as required by pipe size).

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

M. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the piping is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. All piping, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the

lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the piping, no additional piping may be installed or back filled until all water is removed from the trench. Pipe shall not be installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40º F or below. Pipe installed at temperatures below 40º F shall be removed and replaced at no cost to the Owner. PVC pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.

N. In installing irrigation pipe the Contractor shall route the pipe as necessary to prevent damage to tree roots. Where trenching must occur near trees, the Contractor shall provide proper root pruning and sealing methods to all roots 1-inch and larger.

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

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

Q. Exercise care when excavating, trenching and working near existing utilities.

R. Throughout the guarantee period it will be the responsibility of the Contractor to refill any trenches that have settled due to incomplete compaction.

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

3.03 ELECTRICAL WIRE CONDUIT INSTALLATION:

A. Electrical conduit shall be installed in all non-soil areas, as well as for all above ground wiring where wire passes under or through walls, walks and paving to controllers and rain sensor.

B. Conduit shall extend 18-inches beyond edges of walls and pavement.

3.04 PIPE SLEEVING INSTALLATION:

A. Sleeving shall be installed wherever piping is going under a non-soil area, generally where indicated on the Drawings. Minimum cover over all sleeving pipe shall be 24-inches as shown on the drawings.

B. Sleeving shall extend 18-inches beyond edges of walls and pavement.

3.05 ISOLATION VALVE INSTALLATION :

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

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

3.06 VALVE BOX INSTALLATION:

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

B. All valve access boxes shall be installed on a minimum 4-inch crushed stone base. Finish elevation of all boxes shall be at grade. All crushed stone to be supplied by the Contractor and installed before valve box. Crushed stone shall not be poured into previously installed valve boxes.

3.07 24 VOLT CONTROL VALVE INSTALLATION:

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

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

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

3.08 WIRING INSTALLATION:

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

B. All wire shall be laid in trenches and shall be carefully back-filled to avoid any damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 2-inch layer of sand or stone dust on the bottom before the wires are laid into the trench and back-filled. The wires shall have a minimum of 12-inches of cover. Wire not to be installed that day shall not be laid out.

C. An expansion curl shall be provided and installed within 6-inches of each wire connection to a solenoid and at least every 100 feet of wire length on runs more than 100 feet in length. Expansion curls can be formed by wrapping five (5) turns of wire around a 1-inch diameter or larger pipe and then withdrawing the pipe.

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

E. Service wiring in connection with Drawings and local codes for 24-volt service. All in-ground wire connections shall be waterproofed with 3M DBY-6 splice kits. All splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box-valve box shall be used). Splice locations shall be shown on the Record Drawings.

F. Contractor shall provide a complete wiring diagram showing wire routing for the connections between the controller and valves. Include wiring diagram in operation and maintenance manuals per this section of the specifications.

3.09 CONTROLLER INSTALLATION:

A. Contractor to install controller in stainless steel enclosure generally where shown on the drawings. Contractor to wire valves and rain sensor receiver into controller and set proper program.

B. Wire controller to 120-volt electrical supply provided and installed to the controller locations**.**

C. Keys shall be turned over to Owner's Representative.

3.10 GROUNDING INSTALLATION:

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

B. When tested, grounding grid shall have an earth resistance no greater than 5 ohms. If earth resistance is greater than 5 ohms, additional grounding plates and enhancement material shall be added to system until desired test results have been meet.

3.11 RAIN SENSOR INSTALLATION:

A. Install rain sensor on exterior wall of existing shed, generally where indicated on the drawings. Coordinate final location of rain sensor with Owner's Representative. Rain sensor shall be in direct contact with the weather and not in contact with the irrigation spray.

3.12 SPRINKLER INSTALLATION:

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

B. Sprinklers shall not exceed maximum spacing indicated.

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

3.13 QUICK COUPLING VALVE INSTALLATION:

A. Provide and install quick coupling valves where indicated on the Drawings.

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

3.14 WELL PUMP CONTROL PANEL INSTALLATION

A. Contractor shall install pump system control panel on interior wall of maintenance building in a designated area for irrigation equipment as directed by the OWNER, with all necessary conduit penetrations into the panel.

B. Wire panel to 230-volt, 1-phase electrical circuit breaker, and connect to pressure transducer wiring, provided and installed as part of the project.

C. Terminate run relay wiring to pump panel.

D. Key's shall be turned over to the OWNER.

3.15 SUBMERSIBLE WELL PUMP INSTALLATION

A. Submersible well pump shall be installed in new well per AWWA standard. Install downstream control equipment in valve boxes as specified.

B. For bidding purposes, set pump in well at a depth of 300 feet below ground surface as per AWWA standards. Final pump set depth shall be determined after well construction, development and yield testing.

3.16 WELL PUMP SYSTEM START-UP AND TESTING

A. When well pump control panel and electrical connections have been completed for pump system, factory service representative from manufacturer of pump control system shall be on hand at site for period of one (1), four-hour visit. Following services shall be performed by Manufacturer at no further cost to Owner during visit:

1. Start-up pump system and pressurize irrigation system
2. Manufacturer will conduct training (2 hours minimum) to familiarize operator(s) with pump system operation, maintenance and adjustments.
3. Adjust all valves and pump on/off pressures and flows for optimum performance of irrigation system and to prevent frequent on/off cycling of pump.
4. Adjust control panel for optimum pump system performance and efficiency.
5. Adjust high-pressure cut-out so that if pressure of system rises above preset pressure pump system will shut down.
6. Monitor partial cycle of irrigation system if possible and authorized by the Owner's Representative to identify any problems with pump system.

B. SYSTEM TESTING

1. Pump system shall operate throughout range of operating conditions. Pump system shall be given running test of normal start, stop and ramping operations under load. During such tests, pump shall demonstrate its ability to operate and shall demonstrate without question its general fitness for service. All defects shall be corrected and adjustments made without expense to Owner. Tests shall be repeated until satisfactory results are obtained
2. In addition, pump system shall show that safeties incorporated in system are also functioning
3. Manufacturer and Contractor shall notify the Owner's Representative in advance of final test
4. Test all lines in pump system under pressure for leaks
5. Repair all leaks and re-test
6. Furnish all necessary equipment to perform tests
7. Review all Maintenance and Operating Manuals section-by-section with the Owner's Representative and turn them over.

3.17 CHECK/TEST/START-UP/ADJUST

A. Flushing:

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

2. Sprinkler internals, flush caps and nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
3. Flush the entire system after installation is complete and service clogged nozzles for thirty (30) days after substantial completion of this portion of the landscape irrigation system.

B. Testing:

1. Leakage test: test all lines for leaks under operating pressure. Repair all leaks and re-test.
2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Owner's Representative at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate. Readjust sprinklers and/or sprinkler locations as necessary or directed to achieve proper coverage.
3. All testing shall be at no additional expense to the Owner.

3.18 CHECK/TEST/START-UP/ADJUST:

A. Flushing:

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

B. Testing:

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

3.19 CLEANING AND ADJUSTING:

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

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

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

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

3.20 ACCEPTANCE AND OPERATION BY OWNER:

A. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's personnel the operation of the system (provide minimum 48 hours written notice in advance of test). The Contractor shall furnish, in addition to the Record Drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. The Contractor shall guarantee all parts and labor for a minimum period of one (1) year from date of acceptance.

B. Conditions for acceptability of work for start of maintenance by Owner issued by Owner or Owner's Representative shall include but not be limited to:

1. Punch list items complete and approved by Owner or Owner's Representative.
2. Landscape irrigation system complete and in place.
3. Record drawings complete.
4. Maintain installation and watering schedules until all conditions noted above have been completed.

3.21 CLEAN UP:

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

B. Contractor shall remove all debris resulting from work of this section.

C. Contractor shall regrade, lightly compact, and replant around sprinkler heads where necessary to maintain proper vertical positioning in relation to established grade.

D. Contractor shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accordance with Drawings requirements.

END OF SECTION

SECTION 02820

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Work of this Section, as shown or specified shall be in accordance with the requirements of the Contract Documents.

1.2 DESCRIPTION OF WORK

1. Work Included in this Section: Provide includes labor, materials, equipment and services necessary to complete the work as specified herein, as follows: Chain link fence and gates.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 03 3100 – Site - Cast-in-Place Concrete.

1.3 SUBMITTALS

A. Deliver submittals to Engineer and obtain their approval prior to ordering materials, beginning work and as otherwise required. Time delivery to allow reasonable review period and prevent delays.

B. Product Data: For each type of fencing and finish required indicating compliance of materials and required options.

C. Shop Drawings: Include plan with dimensional location and layout with details illustrating height, location and sizes of posts, rails, braces, gates, and anchorage. Provide hardware list and erection procedures.

D. Material Samples: In required finish and color.

1. Fabric, 6” square.

2. End and line posts, 6” lengths.

3. Fittings and accessories, one each.

4. Gate hardware, one each.

E. Installer’s Certification: Indicating furnished and installed materials meet specification requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver chain link fence materials in the manufacturer’s original packaging with tags and labels intact and legible.

B. Handle and store materials in ways that prevent damage and deterioration.

1.5 PROJECT CONDITIONS

A. Coordinate work under this Section closely with work of other trades wherever such work affects and is affected by the work included herein.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fencing system products meeting specified requirement from the following manufacturers are approved for use:

1. Master Halco, Inc. Orange, CA, Ph 888-643-3623, www.masterhalco.com.
2. Eastern Wholesale Fence Co. Inc., Medford, NY, ph. 800-339-3362, www.easternfence.com.
3. Approved equivalent.

2.2 MATERIALS

A. Setting Materials:

1. Concrete for Footings: Provided under Section 03 3100 Site Cast-in-Place Concrete.
2. Anchorage Grout: Factory-prepackaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for site mixing with water to make pourable anchoring site compound. Formulation with high early strength, rapid set, resistance to erosion from water exposure and recommended for exterior use and this purpose by manufacturer. “Euco Rock” by Euclid Chemical Co., Cleveland, OH, Ph 800-321-7628, www.euclidchemical.com or approved equivalent.

B. Chain Link Fabric: Helically wound and woven, diamond mesh, one-piece width for full height indicated on Drawings.
   a. Fabric:
      i Standard: 2” mesh, 9 gauge, 0.148” (3.76mm) steel wire. Breakload 1290 lbf (5740N).
      ii Back stops (Bottom 20’): 2’ mesh, 6 gauge, 0.192” (4.88mm) steel wire. Breaload 2170 lbf (9652N).

2. Finish: ASTM F668, Class 2a (extruded/adhered) or Class 2B (thermally fused), 7 mil (0.18mm) thick, polyvinyl chloride (PVC), plastic resin finish over zinc-coated or zinc-5% aluminum-mischmetal alloy-coated steel core wire with 75,000 psi (517 MPa) tensile strength.
   a. Finish color to be selected from manufacturer’s standard colors: black.

3. Selvages:
   a. Top knuckled and bottom twisted for fabric 72” high and over.
   b. Top and bottom knuckled for fabric 60” high and under.

C. Fence Framing:

1. Round Framing: Type I or Type II steel pipe.

a. Type I: ASTM F1083, standard weight schedule 40; minimum yield strength of 25,000 psi (170 MPa); sizes as indicated. Hot-dipped galvanized with minimum average 1.8 oz/fl2 (550 g/m2) of coated surface area.
b. Type II: Cold formed and welded steel pipe complying with ASTM F1043, Group IC, with minimum yield strength of 50,000 psi (344 MPa), sizes as indicated. Protective coating per ASTM F1043, external coating Type B, zinc with organic overcoat, 0.9 oz/fl2 (275 g/m2) minimum zinc coating with chromate conversion coating and verifiable polymer film. Internal coating Type "B", minimum 0.9 oz/ft2 (275 g/m2) zinc or Type "D", zinc pigmented, 81% nominal coating, minimum 3 mils (0.08mm) thick.

2. Components:
a. Tension Wire (color coated): ASTM F1664, coiled spring steel, metallic coated, 7 gauge core wire, Class 2A PVC, extruded/adhered or Class 2b PVC fused/adhered coating to match framework.

b. Pipe Size Equivalents

Outside Diameter =	Nominal Outside Diameter
1.66"	1-5/8
1.9"	2"
2.375"	2-1/2"
2.875"	3"

c. Terminal, end, corner and pull posts.

Based on Fabric Height	Type I OD x Wall T x Wt in x in x lb/ft (mm x mm x kg/m)	Type II OD x Wall T x Wt in x in x lb/ft (mm x mm x kg/m)
6 ft (1830mm) or less	2.375 x 0.154 x 3.65 (60.3 x 3.91 x 5.4)	2.375 x 0.130 x 3.117 (60.3 x 3.30 x 4.64)
over 6 ft (1830mm) to 12 ft (J3660mm)	2.875 x 0.203 x 9.11 (73.0 x 5.16 x 13.6)	2.873 x 0.160 x 6.57 (73.0 x 4.06 x 9.78)

d. Line Posts :

Based on Fabric Height	Type I OD x Wall T x Wt in x in x lb/ft (mm x mm x kg/m)	Type II OD x Wall T x Wt in x in x lb/ft (mm x mm x kg/m)
6 ft (1830mm) or less	1.900 x 0.145 x 2.72 (48.3 x 3.68 x 3.65)	1.900 x 0.120 x 2.281 (48.3 x 3.05 x 3.30)
over 6 ft (183mm)	2.375 x 0.154 x 3.65	2.375 x 0.130 x 3.117

to 8 ft (2440mm)	(60.3 x 3.91 x 5.4)	(60.3 x 3.30 x 4.64)
over 8 ft. (2440 mm) to 12 ft. (3660mm)	2.875 x 0.203 x 5.79 (73.0 x 5.16 x 8.6)	2.875 x 0.160 x 4.65 (73.0 x 4.06 x 6.91)

e. Rails and Braces:

Type I	Type II
OD x Wall T x Wt	OD x Wall T x Wt
in x in x lb/ft	in x in x lb/ft
(mm x mm x kg/m)	(mm x mm x kg/m)
1.660 x 0.140 x 2.27	1.660 x 0.111 x 1.83
(42.2 x 3.56 x 3.4)	(42.2 x 2.82 x 2.72)

f. Gate Posts for Swing Gates:

Based on Gate Leaf Single Width	Type I Pipe
	OD x Wt
	in x lb/ft
	(mm x kg/m)
6 ft (1829mm) or less	2.875 x 5.79
	(73 x 8.6)
6 ft (1829mm) to 12 ft (3657mm)	4.00 x 9.11 (101.6 x 13.6)
12 ft (3657mm) to 19 ft (5790mm)	6.625 x 18.97 (168.3 x 28.3)
19 ft (5790mm) to 23 ft (7010mm)	8.625 x 28.55 (219.1 x 42.5)

D. Fence Accessories:

1. Provide approved metal accessories required to complete fence system. ASTM F626 except where otherwise indicated herein. Commercial/industrial duty.
2. Finishes: Provide galvanized ferrous accessories. Provide accessories finished to match framework. For vinyl fence accessories provide vinyl fused or powder coated color finish. Provide fasteners for vinyl fences with powder coated color finish or coat them after installation in field with PVC touchup paint.
3. Post Caps: Snug, outside fitting, weather tight closure caps, one for top of each post, secured against removal with 2 set screws each unless other means are approved by Architect. Provide cap styles for posts as follow:
   a. Posts with top rails: Loop caps (no finials).

4. Top rail and brace rail ends.
5. Top rail sleeves: 6 inch (152mm) long, allowing for expansion and contraction and of design secure from slipping along rail.
6. Wire Ties: For attachment of fabric to:
   a. Line Post: 9 gauge, 0.148 in. (3.76mm), galvanized steel wire.
   b. Rails and Braces: double wrap 13 gauge, 0.092 in. (2.324mm)
   c. Tension Wire: 12-1/2 gauge, 0.0985 in. (2.502mm hog rings.
7. Brace and Tension Bands: Beveled.
8. Tension Bars: One piece lengths equal to 2 inches (50mm) less than full height of fabric with minimum cross-section of 3/16" x 3/4" (4.76mm x 19mm) or equivalent fiber glass rod. Provide tension bars at terminal, end, gate, corner and pull posts.
9. Truss Rods: Minimum 5/16 inch (7.9mm), diameter steel, threaded for and fitted with turn buckle and brace rail ends.
10. Fasteners: Stainless steel screws and rivets. Galvanized or stainless steel bolts, nuts and locking washers.

E. Touch-up Paint: Zinc, aluminum or PVC paint recommended by manufacturer and matching adjacent fence finishes.

F. Swing Gates:

1. Provide materials, accessories and fabricate in accordance with ASTM F900 unless otherwise indicated herein. Fabricate and finish gate leaves and attach accessories to extent possible in shop.
2. Use same gauge fabric and base metal type of framing, bracing and accessories in same finishes as specified for adjoining fence.
3. Size gates to fit post to post gate openings and opening heights indicated on Drawings, allowing for hinge, latch and drop rod dimensions without excessive looseness, rubbing or compensation with offset hardware. Provide 2 inch transom clearance. Match bottom clearance specified for fabric of adjoining fence at bottom of gates.
4. Gate Frames:
   a. One-piece frame units with fusion or stainless steel welded connections or assembled panels joined with approved fittings to form rigid panels with no sagging and twisting. Provide assembled panels, 5 feet or wider each with 5/16 inch (7.9mm) minimum diameter, adjustable, diagonal truss rod.
   b. Provide vertical bracing at maximum 8 feet (2440mm) horizontal mid point intervals and horizontal mid-point bracing for gate heights 8 feet (2440mm) and higher. Provide other bracing as necessary to counter sagging of gate panels.
   c. Install fabric with hook bolts and tension bars on 4 sides, attached to gate frames no more than 15 inches (381mm) on center.
5. Gate Frame Finishes: Touch-up finishes damaged by fabrication, cutting and welding with matching rust preventive coating. Provide vinyl coating for

welded unit frames: ASTM 1043, thermally fused, minimum 10 mils (0.254mm) PVC.

6. Gate Hardware: Provide approved metal items and fasteners required to make gates completely operable. Commercial/industrial duty hardware of materials similar to and with finishes matching fence accessories.
   a. Hinges: Offset type allowing clear opening and close fit. Of size, strength and number to support gate without excessive sagging and with no binding on opening and closing. Non-lift off type with 180 degree swing (3.14 rad) either in, out, or in and out as indicated on Drawings.
   b. Latch: Fulcrum fork type with provisions for padlock. Sized and fitted to retain gate in closed position and to open and close smoothly.
   c. Keeper: Provide for gate leaves 5 feet (1524mm) wide and over. Sized and fitted to hold free ends of gate leaves in full open position.
   d. Double Gate Drop Rod: Non removable, pad-lockable in lowered position. Secured in raised and lowered position. Compatible with center stop and latch.
   e. Double Gate Center Stop: Mushroom type, 12” deep for setting in concrete footing.
   f. Gate Stop for One-Way Swing Gate: Plate mounted with bolts on latch side of gate frame to contact latch gate post on closure, preventing over swing and stress on hinges.
   g. Fasteners: Stainless steel screws and rivets. Galvanized bolts, nuts and locking washers. Finish similar to fence fasteners.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that areas to receive fencing are completed to final grades and elevations. Ensure property lines and legal boundaries of work are clearly established. Examine installation conditions. Do not start chain link fence work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Stakeout complete fence line in locations and to dimensions indicated on Drawings.

B. Locate and mark post positions.

   1. Position terminal, end, corner, gate and pull posts. Provide corner posts at any abrupt changes in direction, either horizontally (more than 10 degrees) or vertically (more than 30 degrees). Between end, corner and gate posts spaced more than 100’ apart, install pull posts at equal intervals of 100’ and less.

   2. Space line posts equally between above posts at maximum 10’ on center measured parallel to rake of proposed fence. In straight sections keep posts centered on each other.

C. Review stakeout with Architect or Engineer for their approval. If so directed, make minor adjustments for terrain, vegetation and site improvements.

3.3 INSTALLATION

A. General: Provide rigid, plumb, finished fence structure with fabric tight and in tension and of nominal height indicated on Drawings. Install chain link fence system in accordance with manufacturer's instructions and following ASTM practices unless otherwise indicated on Drawings or herein.

1. Standard Fence: ASTM F567.

B. Post Anchorage: Provide type, size and depth indicated on Drawings.

C. Footings: Installed under Section 03 3100 – Site - Cast-in-Place Concrete.

1. Anchoring Holes and Sleeves
   a. In existing rock and concrete and where its indicated on Drawings for new concrete and stone curbs, walls, and paving ,drill clean, neat vertical setting holes aligned and centered.
   b. Sleeves: Installed by other trades where indicated on Drawings.
   c. Plumb and align post, holding it in position until grout has set.
   d. Half fill setting holes with anchorage grout and force post to bottom of hole. Follow with additional grout worked around post, filling void fully and bringing grout flush and smooth with surface so that hole does not retain water.

D. Swing Gate Hardware Anchorage:

1. Set keepers, stops and sleeves in concrete footings installed to same depth as post footings indicated on Drawings.

2. Center hardware with flanges, edges and bases flush with surface.

3. Excavate holes, cut openings, place and finish concrete similar to post footings.

E. Framing:

1. Bracing: Brace each terminal, gate, corner, end and pull post back to adjacent line post at mid-height for fences 6' (1829mm) and over with horizontal brace rail and diagonal truss rod secured with fittings. Adjust truss rod, ensuring posts remain plumb.

2. Center Rails: Install mid-rails attached with fittings between posts for fences 12' height (3658mm) and over.

3. Top Rails: Install rail continuously through line post tops in minimum 18 feet lengths joined with rail sleeves and attached with fittings at terminal posts.

4. Tension Wire: Provide tension wire at bottom of fabric and at top, if top rail is not specified. Install tension wire before stretching fabric and attach to each post with ties. Attach tension wire to fabric with hog rings 24" (610mm) on center.

F. Fabric:

1. Hang fabric on security side of posts, play side of posts and as determined by Architect.

2. Untwist and weave fabric to form single continuous piece between terminal posts.

3. Stretch fabric between each set of opposing terminal posts and at intervals of no more than 100 feet.

4. Set and maintain clearance of bottom selvage of fabric above finish grade as follows:
   a. Standard Fence: 1-1/2 - 2 inches clearance

5. Pull fabric taut, thread tension bar through fabric and attach to terminal posts with bands or clips at maximum of 15" (381mm) on center. Attach fabric with wire ties to line posts at 15" (381mm) on center and to rails, braces, and tension wire at 24" (600mm) on center.

G. Wire Ties and Fasteners: Bend ends of wire ties to minimize hazard to persons and clothing. Install nuts on side of fence opposite fabric side for added security. If required by Architect vandal proof fasteners in an approved manner.

H. Gates: Install gates plumb, level, closely fitted without binding, centered on gate posts and aligned with adjoining horizontal elements of fence. Adjust and lubricate hardware for smooth operation.

I. Touch-up for Vinyl Coated Fences and Gates: If non-color coated accessories, hardware, ties and fasteners are approved and installed, field coat them. Coat any uncoated moving parts and damaged finishes to match fencing.

3.4 PROTECTION

A. Protect and keep fences in first-class condition until final acceptance.

3.5 CLEANING

A. Clean work area of excess materials, debris and equipment and repair damage caused by installation work.

B. Remove excavated post hole material and dispose of legally off site, unless Architect or Engineer designates on-site location for spoil and approves finish of spoiled material.

C. During installation, prevent concrete and grout droppings on surrounding finish work and remove before staining and set takes place.

END OF SECTION

SECTION 02880

PLAYGROUND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents including the Procurement/ Contracting Requirements, General Requirements and Appendices apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.

1. Free Standing Play Structures, Equipment & Components (Furnished by the Client/ Installed by Contractor).

a. 2- to 5-year-old age group– 2 free standing play structures – Furnished by others and installed by the contractor

b. 5- to 12-year-old age group – 1 free standing play structures – Furnished by others and installed by the contractor

c. Swings Play Equipment & Components – Furnished by others and installed by the contractor

d. Spinner Play Equipment & Components – Furnished by others and installed by the contractor

1.3 RELATED WORK UNDER OTHER SECTIONS

A. Section 03300 – Cast-in-Place Concrete

B. Section 02315 – Excavation, Backfill, Compaction & Dewatering

C. Section 02320 – Borrow Materials

D. Section 02870 – Site Furnishings

E. Section 02790 – Rubber Play Surfacing

1.4 REFERENCES

A. Play equipment must comply with applicable requirements of:

1. Commonwealth of Massachusetts, MassDOT Standard Specifications.

2. Provide labor, materials, equipment and services to comply with requirements.

3. Latest edition the Handbook for Public Playground Safety of US Consumer Product Safety Commission.

4. American Society for Testing and Materials (ASTM F 1487-07ae1) Standard Consumer Safety Performance Specifications for Playground Equipment for Public Use. Certification that all equipment meets the ASTM-F 1487-07ae1 performance specifications are mandatory and required for approval by the Owner's Representative. Playground Equipment Certification submittals to be as follows:

    a. The International Play Equipment Manufacturers Association (IPEMA) third party certification program that certifies manufactures compliance to ASTM F 1487-07ae1.

    b. All individual play components that make up a composite structure must be individually certified by IPEMA.

    c. All individual equipment must be certified by IPEMA.

    d. IPEMA certification is required for Owner's Representative review prior to approval of any play equipment. Submission of detailed drawings with IPEMA Certification Seal and the following stated below the seal is required:

        1) Manufacturers' membership in IPEMA does not constitute equipment certification and approval for use.

    e. Proposed structures, equipment and components must meet the above criteria for review and approval for use.

5. U.S. Consumer Product Safety Commission- Handbook for Public Playground Safety Publication NO. 325

6. The International Organization for Standardization (ISO)

    a. ISO 9001 – Quality Standards certifying manufacturers processes

    b. ISO 14001 - Standards for Environmental Protection and Natural Resource Preservation.

    c. Certification of all ISO Standards are required and must be submitted for review by Owner's Representative.

    d. All Playground equipment provided must be manufactured by companies who are currently ISO certified per the above standards. Both ISO 9001 and 14001 are required.

7. The Americans with Disabilities Act (ADA) – Current Americans with Disabilities Act Architectural Guidelines (ADAAG) as set forth in the Federal Register. All playground equipment, both independent and composite structures, shall meet the current standards as developed by the Federal Access Board. All manufacturers must

provide certification that proposed equipment meets or exceeds the ADAAG guidelines.

8. Recycled and Reclaimed Materials Requirements – Play equipment materials and all components must meet or exceed the following recycled/reclaimed materials contents percentages:

   a. Panel features: recyclable after use; core produced from 100% recycled material.

9. ASTM: American Society for Testing and Materials.

10. AWS: American Welding Society.

1.5 PERMITS AND CODES

A. Conform to Contract Documents and comply with applicable codes and regulations.

B. Obtain permits and licenses required to complete work and pay associated fees.

C. Do not close or obstruct streets, sidewalks, alleys or passageways without prior notification and written permission of Owner's Representative and governing authorities. Minimize interference with use of roads, driveways, alleys, sidewalks, or other facilities.

1.6 SUBMITTALS

A. Submittals: in accordance with Section 00700 – General Conditions.

B. Product Data

1. Submit product data, manufacturer's literature and instructions for:

   a. Play structures, swings and spinner equipment and components

      1) Current Material Safety Data Sheets (MSDS).

2. Manufacturers statement that proposed equipment conforms to the ADA Accessibility Guidelines (ADAAG)

3. Submit breakdown of playground components certifying compliance to the ADAAG guidelines as follows:

   a. Play structures, equipment and components

   b. Swings Play Equipment & Components

   c. Spinner Play Equipment & Components

4. Submit written certification as to the recycled/reclaimed materials contents percentages compliance requirements listed above.

C. Shop drawings

1. Submit complete shop drawings for:

a. Play structures, equipment and components

b. Swings Play Equipment & Components

c. Spinner Play Equipment & Components

2. Shop drawings must include the following items to be considered complete:

a. Large-scale drawings showing play structures, equipment and components including colors, their attachment to each other and the associated use zones. Submit all components, colors and footing design in the shop drawing review. All colors shall be approved by the Owner's Representative.

b. Manufacturer's specifications for play structures, equipment and components

c. Manufacturer's recommended installation, including mounting details for equipment attached to concrete surfaces.

d. Evidence of compliance with IPEMA certification (ASTM F 1487-95) "Standard Consumer Safety Performance Specification for Playground Equipment for Public Use."

e. Supply documentation stating the system installer is a manufacturer's certified installer.

D. Samples

1. Provide color samples of the following for final selection and approval by Owner's Representative:

a. Play structures, equipment and components

b. Swings Play Equipment & Components

c. Spinner Play Equipment & Components

E. Do not order materials until approval has been obtained by Owner's Representative. Delivered materials shall closely match the approved samples.

F. Approved equals must be determined by Owner's Representative.

G. Proposed alternate manufacturers of play equipment submitted after bid that are found not equal shall not be considered grounds for amendment to contract price.

1.7 DELIVERY, STORAGE AND HANDLING

A. Handle, transport and store materials to prevent damage. Damaged materials shall be rejected and replaced.

B. Check materials upon delivery to ensure proper materials have been received.

C. Installation Documentation:

1. Shipments shall include a notebook or packet of order-specific, step-by-step instructions for assembly of each component, including equipment assembly diagrams, estimated hours for assembly, footing dimensions, concrete quantity for direct bury components, fall height information, area required information and detailed material specifications.

D. Packing List:

1. Shipments shall include a packing list for each skid/container, specifying the part numbers and quantities on each skid or within each container.

E. Packaging:

1. Posts shall be individually packaged in sturdy, water-resistant, mar-resistant cardboard boxes. Other components shall be individually wrapped or bulk wrapped to provide protection during shipment. Small parts and hardware packages will be placed in crates for shipment. The components and crates are then shrink-wrapped to skids (pallets) to ensure secure shipping. It will be unacceptable for parts and pieces to come loose.

F. Shipping:

1. Equipment shall be delivered on a flat-bed truck directly from factory to site to best allow ease of offloading and to best prevent multiple unloading and loading of equipment at various terminals.

G. Maintenance Kit:

1. An order-specific maintenance kit shall be provided for each structure order. The kit shall include the following:

a. A notebook or packet with a second set of installation documents

b. Order-specific maintenance documentation with recommendations on how often to inspect, what to look for and what to do to keep the equipment in like-new condition.

c. Touch-up primer

d. Appropriate color touch-up paint

e. Sandpaper

f. Appropriate color touch-up PVC

g. Graffiti remover

h. Additional installation tools for the tamperproof fasteners.

H. Prevent mud, wet cement, and materials which can affix themselves from contacting materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's Representative's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

B. Landscape Structures Inc. ("Manufacturer") warrants that all play structures and/ or equipment sold will conform in kind and in quality to the specifications manual for the products identified in the Acknowledgment of Order and will be free of defects in manufacturing and material. Manufacturer further warrants:

C. 100-YEAR LIMITED WARRANTY On all PlayBooster® and PlayShaper® aluminum posts, stainless steel fasteners, clamps, beams and caps against structural failure due to corrosion/natural deterioration or manufacturing defects, and on PlayBooster steel posts against structural failure due to material or manufacturing defects.

D. 15-YEAR LIMITED WARRANTY On all Evos® and Weevos® steel arches, all plastic components (including TuffTimbers™ edging), all aluminum and steel components not covered above, Mobius® climbers, Rhapsody® Outdoor Musical Instruments, decks and TenderTuff™ coatings (except Wiggle Ladders, Chain Ladders and Swing Chain) against structural failure due to corrosion/natural deterioration or material or manufacturing defects.

E. 10-YEAR LIMITED WARRANTY On concrete products against structural failure due to natural deterioration or manufacturing defects. Does not cover minor chips, hairline cracks or efflorescence. On stainless-steel fasteners, aluminum post, clamps, beams and caps, against structural failure due to corrosion/natural deterioration or manufacturing defects.

F. 8-YEAR LIMITED WARRANTY On Aeronet® climbers and climbing cables against defects in materials or manufacturing defects.

G. 5-YEAR LIMITED WARRANTY On Rhapsody® cables and mallets against defects in materials or manufacturing defects, on polycarbonate panels against defects in materials or manufacturing defects, and on bamboo panels against delamination due to defects in materials or manufacturing defects. Does not cover damage which may be associated with the natural characteristics of bamboo aging, including but not limited to discoloration, splitting, cracking, warping or twisting, nor the formation of algae, mold and other forms of fungal-type bodies on bamboo.

H. 3-YEAR LIMITED WARRANTY On all other parts, i.e.: Pulse® products, all swing seats and hangers, Mobius climber handholds, Wiggle Ladders, Chain Ladders and ProGuard™ Swing Chain, Track Ride trolleys and bumpers, all rocking equipment including Sway Fun®

gliders, belting material, HealthBeat® resistance mechanism, Seesaws, etc., against failure due to corrosion/ natural deterioration or manufacturing defects.

I. 1-YEAR LIMITED WARRANTY On all moving parts, swing seats and swing hangers bumpers and other equipment not included above against failure due to corrosion, deterioration, or workmanship.

J. The environment near the saltwater coast can be extremely corrosive. Some corrosion and/or deterioration is considered “normal wear” in this environment. Product installed within 500 yards (457 meters) of a saltwater shoreline will only be covered for half the period of the standard product warranty, up to a maximum of five years, for defects caused by corrosion. Products installed in direct contact with saltwater or that are subjected to salt spray are not covered by the standard warranty for any defects caused by corrosion.

K. These warranties do not include any cosmetic issues or wear and tear from normal use of the product, or misuse or abuse of the product. It is valid only if the play structures and/or equipment are erected to conform with Landscape Structures’ installation instructions and maintained according to the maintenance procedures furnished by Landscape Structures Inc.

1.9 EXAMINATION OF SITE AND DOCUMENTS

A. Carefully examine site and conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions, except those described in General Conditions.

B. Plans, surveys, measurements, and dimensions are believed to be correct, No additional compensation for errors or inaccuracies.

1.10 QUALITY ASSURANCE

A. The playground installation contractor shall provide written certification by a Certified Playground Safety Inspector (CPSI) that the installed equipment conforms to all applicable safety and accessibility standards including, but not limited to ASTM, CPSC, ADA, and MAAB. The Owner reserves the right to retain an independent CPSI to inspect the playground equipment and surfacing after reinstallation. The Contractor will be responsible for correcting any deficiencies at their own expense to the satisfaction of the Landscape Architect.

B. Equipment Installer Qualifications: An experienced and certified installer who has completed work with similar equipment, materials, and design, and to the extent similar with this project and whose work has resulted in construction with a record of successful performance in a minimum of 10 installations over 5 years. Contractor to provide their subcontractor’s appropriate qualifications including references and experience. Installer shall follow manufacturer’s instructions and installation documentation for all equipment.

PART 2 PRODUCTS

2.1 GENERAL

A. MANUFACTURER: Landscape Structures and supplied by O'Brien & Sons Inc., 17 Trotter Drive, Medway, Massachusetts 02053; Phone: 508-359-4200; Fax: 508-533-6342, meghan@obrienandsons.com., or approved equal.

2.2 FREESTANDING PLAY STRUCTURE MATERIAL SPECIFICATIONS

A. Material: Materials shall be structurally sound and suitable for safe play. Durability shall be ensured on all steel parts by the use of time-tested coatings such as zinc plating, galvanizing, ProShield® finish, TenderTuff coating, etc. Colors shall be approved by the Owner's Representative.

B. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications). All primary fasteners shall include a locking patch type material that will meet the minimum torque requirements of IFI-125. Manufacturer to provide special tools for pinned tamperproof fasteners.

C. TenderTuff Coating: Metal components to be TenderTuffcoated shall be thoroughly cleaned in a hot phospatising wash system, then primed with a water-based thermosetting solution. Primed parts shall be preheated prior to dipping in UV stabilized, liquid polyvinyl chloride (PVC), then salt cured at approximately 400 degrees. The finished coating shall be approximately .080" thick at an 85 durometer with a minimum tensile strength of 1700 psi an.

D. ProShield Finish:

1. Metal components with ProShield finish shall be thoroughly cleaned and pretreated through a multi-stage wash system. Parts are then thoroughly dried, preheated and processed through a set of powder spray guns where a minimum of .002" of epoxy primer is applied. A minimum .004" of architectural-grade Super Durable polyester TGIC powder is applied. The average ProShield film thickness is .006". ProShield is formulated and tested per the following ASTM standards. Each color must meet or exceed the ratings listed below:

    a. Hardness (D3363) rating 2H

    b. Flexibility (D522) pass 1/8" mandrel

    c. Impact (D2794) rating minimum 80 inch-pounds

    d. Salt Fog Resistance (B117 and D1654) 4,000 hours and rating 6 or greater

    e. UV Exposure (G154, 340 bulb) 3,000 hours, rating delta E of 2, and 90 percent gloss retention*

    f. Adhesion (D3359, Method B) rating 5B

2. The Paint Line shall employ a "checkered" adhesion test daily.

3. Standard colors are available.

E. Decks: Decks shall be of modular design and have 5/16" diameter holes on the standing surface. There shall be a minimum of (4) slots in each face to accommodate face mounting of components. Decks shall be manufactured from a single piece of low carbon 12 GA (.105") sheet steel conforming to ASTM specification A-1011. The sheet shall be perforated with a return flange on the perimeter to provide the reinforcement necessary to ensure structural integrity. There shall be no unsupported area larger than 3.5 square feet. The unit shall then be TenderTuff-coated brown or gray only. Decks shall be designed so that all sides are flush with the outside edge of the supporting posts.

F. Rotationally Molded Polyethylene Parts: These parts shall be molded using prime natural linear low-density polyethylene having a tensile strength of 2400 psi per ASTM D638. Rotational molding resin is compounded with color and UV-stabilizing additives with a nominal wall thickness typically 1/4" with some variation depending upon product type. Standard colors are available.

G. Recycled Permalene Parts: These parts shall be manufactured from 3/4" high-density polyethylene that has been specially formulated for optimum UV stability and color retention. Products shall meet or exceed density of .960 G/cc per ASTM D1505, tensile strength of 2400 PSI per ASTM D638. Available in a three-layer product with (2) .100" thick colored exterior layers over a .550" thick recycled Black interior core. Standard colors are available.

H. Footings: Unless otherwise specified, bottom of footings shall be a minimum of 48" below Finished Grade (FG) on all in-ground play events/posts. Other types of anchoring are available upon request.

I. Hardware Packages: All shipments shall include individual component-specific hardware packages. Each hardware package shall be labeled with the part number, description, a component diagram showing the appropriate component, package weight, a bar code linking the hardware package to the job number, assembler's name, date and time the package was assembled, work center number and work order number.

J. Play Equipment Re-Painting

1. Existing play equipment to remain shall be protected by the contractor at the start of construction. The contractor shall thoroughly clean all components of the existing play equipment. Remove any flaking paint prior to repainting the play equipment.

2. All play equipment shall be primed and painted with the following Diamond Vogel Paint Coatings, or approved equal (both primer and paint shall be a compatible system from a single manufacturer):

   a. Primer: "CoteAll Multi-Purpose Alkyd Primer". (One Coat)

   b. Paint: "OEM Touch-Up Air Dry Enamel". (Two coats minimum)

   c. Colors shall match the standard LSI colors. Coordinate with the Town Representative.

2.3 FREE STANDING PLAY STRUCTURE FOR 2 TO 5 & 5 TO 12 YEAR AGE GROUPS

A. Free Standing Play Structures for 2 to 5 age group and 5 to 12 year age group as manufactured by Landscape Structures and supplied by O'Brien & Sons Inc., 17 Trotter Drive, Medway, Massachusetts 02053; Phone: 508-359-4200; Fax: 508-533-6342, meghan@obrienandsons.com.

1. ADA Compliant

2. Footings: Direct bury

B. SwiggleKnots Bridge w/o Deck Connections DB Only - #193171C

1. Footer (DB): Weldment comprised of 1.660" (42,16 mm) O.D. RS20 (.085"-.095") (2,16 mm-2,41 mm) galvanized steel tubing and 3/16" (4,75 mm) HRPO sheet steel. Finish: ProShield, color specified.

2. Ball Knot: Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified.

3. Beam: Weldment comprised of 2.375" (60,33 mm) O.D. RS20 (.095"-.105") (2,41 mm-2,67 mm) wall galvanized steel tubing, 3/8" (9,53 mm) thick stainless steel plate, and 1/4" (6,35 mm) HRPO flat steel. Finish: ProShield, color specified.

4. Grab Bar: Weldment comprised of formed 7/8" (22,23 mm) O.D. x 11 GA (.120") (3,04 mm) and 1/4" x 1 3/4" (6,35 mm x (44,45 mm) stainless steel half clamps. Finish: TenderTuff, color specified.

5. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

6. Cable Assy.: (Cable) Made of tightly woven polyester-wrapped, six-stranded galvanized-steel cable with a polypropylene core. (Cable Connectors) 6063-T6 aluminum.

7. E-Pod: Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified.

8. Pod Bolt Plate: Weldment consists of 3/16" (4,75 mm) HRPO steel plate and 3/8" (9,53 mm) thick HRPO steel plate. Finish: ProShield, color specified.

9. Chain: Steel 1/4" (6,35 mm) straight link chain, 3,150 lb (1428,82 kilograms). working load limit. Finish: ProGuard.

10. Clamps: Cast aluminum. Finish: ProShield, color specified.

C. TightRope Bridge w/o Deck Connections - #193173C

1. Net Clamp: Weldment comprised of 1/4" x 1 3/4" (6,35 mm x 44,45 mm) HRPO flat steel and .375" (9,53 mm) stainless steel sheet. Finish: ProShield, color specified.

2. Beam: Fabricated from 2.375" (60,33 mm) O.D. RS40 (.130"-.140") (3,30 mm-3,55 mm) wall galvanized steel tubing. Finish: ProShield®, color specified.

3. Cable Ball Knot: Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified.

4. TightRope Clamp: Weldment comprised of 2" (50,8 mm) O.D. 11 GA. (.120") (3,05 mm) wall HRPO galvanized steel tube and 1/4" HRPO flat steel. Finish: ProShield, color specified.

5. Handle: Solid color Permalene, black in color.

6. Spacers: Solid color Permalene®, black in color.

7. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

8. Cable Assy.: (Cable) Made of tightly woven polyester-wrapped, six-stranded galvanized-steel cable with a polypropylene core. (Cable Connectors) 6063-T6 aluminum.

9. Clamps: Cast aluminum. Finish: ProShield, color specified.

D. Wood Plank Wiggle Ladder 32"Deck w/Recycled Wood-Grain Handholds DB - # 169318A

1. Handhold Frame: Weldment comprised of 1.125" (28,58 mm)O.D. 11 GA. (.120") (3,04 mm) steel tubing with 203 or 303 stainless steel inserts, with 5/8" (15,88 mm) internal threads and 1/4" (6,35 mm) HRPO steel plate. Finish: ProShield, tan in color.

2. Chain/ProGuard: Steel 3/16" (4,75 mm) straight link chain, 800 lb. (362,87 kilograms) working load limit. Finish: ProGuard.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

4. Poly Board: Recycled high-density polyethylene.

5. Support (DB): Fabricated from 1.315" (33,40 mm) O.D. RS20 (.080"-.090") (2,03 mm - 2,28 mm) galvanized steel tubing.

6. Clamps: Cast aluminum. Finish: ProShield, color specified.

E. Conical Climber 72"Dk DB - #143199A

1. Spacer Tube: Made from 6061-T6 aluminum 7/8" (22,23 mm) O.D. x 1 11/16" (42,85 mm). Finish: ProShield, color specified.

2. Handhold Panel: Recycled Permalene, color specified.

3. Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield, color specified.

4. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

5. Belt: PVC belting, 5/16" (7,92 mm) thick, 300 PIW tension rating.

6. Center Loop: Weldment comprised of 1.315" (33,40 mm) O.D. RS-20 (.080" - .090") (2,03 mm-2,28 mm) galvanized steel tubing, 1/4" x 1 1/4" (6,35 mm x 31,75 mm) HR flat steel and 1/4" x 2 3/4" (6,35 mm x 69,85 mm) HR flat steel. Finish: ProShield, color specified.

7. Footer: Fabricated from 1.125" (28,58 mm) O.D. x 11 GA (.120") (3,04 mm) galvanized steel tubing. Finish: ProShield, color specified.

8. Hand Grip: Made from Polyester Resin. Hand Grips measure 5 3/4" (146,05 mm) long x 2 1/2" (63,5 mm) wide x 1 3/4" (44,45 mm) high.

9. Mounting Plate: Fabricated from 1/8" (3,17 mm) HR flat steel. Finish: ProShield, green in color.

10. Rails: Weldment comprised of 1.315" (33,40 mm) O.D. RS-20 (.080" - .090") (2,03 mm-2,28 mm) galvanized steel tubing, and 1/4" x 1 1/4" (6,35 mm x 31,75 mm) HR flat steel. Finish: ProShield, color specified.

F. Pod Climber No Handsupports 32"Dk DB - 345313A

1. Spacer Tube: Made from 6061-T6 aluminum 7/8" (22,23 mm) O.D. x 1 11/16" (42,85 mm). Finish: ProShield, color specified.

2. Disc: Rotationally molded from U.V. stabilized linear low-density polyethylene, disc measures 14" (356 mm) in diameter x 7" (178 mm) high, color specified.

3. Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield, color specified.

4. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

5. Handhold Panel: Recycled Permalene, color specified.

6. Support: Weldment comprised of 1.900" (48,26 mm) O.D. RS-20 (.090" - .100") (2,28 mm-2,54 mm), 1.315" (33,40 mm) O.D. RS-20 (.080" - .090") (2,03 mm-2,28 mm) and 3/16" x 5" (4,75 mm x 127 mm) diameter plate. Finish: ProShield, color specified.

7. Handloop: Weldment comprised of 1.125" (28,58 mm) O.D. x 11 GA (.120") (3,04 mm) steel tubing with 203 or 303 stainless steel inserts, with 3/8" (9,53 mm) internal thread. Finish: TenderTuff, color specified.

8. Handrail: Weldment comprised of 1.125" (28,58 mm) O.D. x 11 GA (.120") (3,04 mm) steel tubing with 203 or 303 stainless steel welded inserts with 3/8" (9,53 mm) internal threads. Finish: TenderTuff, color specified.

G. Square Loop Incline Climber w/Permalene Handholds 72" Deck DB - #345332A

1. Angled Loop Climber: Weldment comprised of 2.375" (60,32 mm) O.D. x .095" - .105" (2,41 mm-2,66 mm) wall RS20 galvanized steel tube, 1.315" (33,40 mm) O.D. x .080" - .090" (2,03 mm-2,28 mm) wall RS20 galvanized steel tube, and 1/4" (6,35 mm) thick HRPO steel sheet. Finish: ProShield, color specified.

2. Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield, color specified.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

4. Handhold Panel: Recycled Permalene, color specified.

5. Clamps: Cast aluminum. Finish: ProShield, color specified.

H. Driver Panel Above Deck - #345280A

1. Spacer Tube: Made from 6061-T6 aluminum 7/8" (22,23 mm) O.D. x 1 11/16" (42,85 mm). Finish: ProShield, color specified.

2. Window: Made from .25" (6,35 mm) clear polycarbonate.

3. Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield, color specified.

4. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

5. Angled Panel Bracket: Weldment comprised of .190" (4,83 mm) thick 5052 aluminum formed angle with (2) 6005-T5 aluminum threaded tubes 1 1/8" (28,58 mm) O.D. x 1 1/2" (38,1 mm) long. Finish: ProShield, color specified.

6. Permalene Panels: Recycled Permalene, color specified.

7. Wheel: 12" (305 mm) diameter cast A319.1 aluminum alloy. Shaft-303 stainless steel. Finish: TenderTuff, color specified.

8. Wheel Bracket: Weldment comprised of formed 3/16" (4,75 mm) plate and 5/8" (15,88 mm) O.D. stainelss steel shaft. Finish: ProShield, Black in color.

I. Pipe Barrier Above Deck - #116244A

1. 90o Bracket: Formed from 1/4" x 1 1/4" (6,35 mm x 31,75 mm) HRPO flat steel. Finish: ProShield, color specified.

2. Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield, color specified.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

4. Pipe Barrier: Weldment comprised of 5/8" (15,88 mm) solid steel vertical rails, 1 1/8" (28,58 mm) O.D. x 11 GA (.120") (3,04 mm) steel horizontal rails with 203 or 303 stainless steel welded inserts with 5/8" (15,88 mm) internal threads, 1 1/2" x 1 1/2" x 29 1/2" (38,1 mm x 38,1 mm x 749,3 mm) angle iron. Barrier measures 33 7/8" (860,43 mm) wide x 39 13/16" (1011,22 mm) high. Finish: TenderTuff, color specified.

J. Skyport Climber for 7-Post Mainstructure DB Only - #193175A

1. Net Mat: .315" (8,00 mm) Thick mini rough top rubber belting with polyester fabric plys, black in color.

2. Clamp: 369.1 Aluminum. Finish: ProShield®, color specified.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

4. Tunnel Net Footer: Weldment conprised of 1.315" (33,40 mm) O.D. RS20 (.080"-.090") (2,03 mm-2,29 mm) wall galvanized steel tube, 7 GA. (.179") (4,54 mm) HRPO steel plate,12 GA. (.105") (2,67 mm) sheet HRPO steel and .375" (9,53 mm) stainless steel plate. Finish: ProShield, black in color.

5. Cable Assy.: (Cable) Made of tightly woven polyester-wrapped, six-stranded galvanized-steel cable with a polypropylene core. (Cable Connectors) 6063-T6 aluminum.

6. Casting Plate: Weldment comprised of 3/8" (9,53 mm) HRPO steel plate and 1/4" (6,35 mm) HRPO steel plate. Finish: ProShield®, color specified.

K. Zenith Climber for 7 Post Netplex - #272371A

1. Net: Made of tightly woven, polyester-wrapped, six stranded galvanized-steel cable with a PVC wrapped steel core. 20 mm, steel-core interior rope and 20 mm, steel-core perimeter rope.

2. Net Clamp: Weldment comprised of 1/4" x 1 3/4" (6,35 mm x 44,45 mm) HRPO flat steel and .375" (9,53 mm) stainless steel sheet. Finish: ProShield, color specified.

3. Turnbuckle: Clevis to Clevis Turnbuckle 3/4-10unc threads with 6" max adjustment. Finish: Forged Galvanized Steel Body.

4. Eye Bolt Separator: Weldment comprised of 1/4" SST plate, 1/2" SST plate, Eye Bolt Galvanized Steel and 3/4-10 thread SST hex Nut.

5. Anchor Assembly: Weldment comprised of 1/4" HRPO steel plate and 1/2" HRPO steel plate. Finish: Hot Dip Galvanized

6. Casting cover: Cast Aluminum. Finish: ProShield, color specified.

7. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product

installation/specifications).

8. Belt: .315" (8,00 mm) Thick mini rough top rubber belting with polyester fabric plys, black in color.

9. Clamps: Cast aluminum. Finish: ProShield, color specified.

L. E-Pod Seat - #166809A

1. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

2. E-Pod: Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified.

3. Pod Casting: Fabricated from sand cast alloy 356 in accordance with ASTM B26. Finish: ProShield, color specified.

M. LolliLadder w/2 E-Pods - #193170A

1. Rung Cap: EPDM, black in color.

2. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

3. E-Pod: Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified.

4. Pod Casting: Fabricated from sand cast alloy 356 in accordance with ASTM B26. Finish: ProShield, color specified.

5. Clamps: Cast aluminum. Finish: ProShield, color specified.

6. LolliLadder: Weldment comprised of 1/4" (6,35 mm) HRPO flat steel, 2.375" (60,33 mm) O.D. RS40 (.130"-.140") (3,30 mm-3,55 mm) wall galvanized steel tubing, and 1.315" (33,40 mm) O.D. RS20 (.080"-.090") (2,03 mm-2,29 mm) wall galvanized tubing. Finish: ProShield®, color specified. Finish: ProShield, color specified.

N. 116"Alum Post DB - #111404E

1. Post: See PlayBooster (PB) General Specifications.

O. 132"Alum Post DB - #111404C

1. Post: See PlayBooster (PB) General Specifications.

P. Footprint Balance Beam DB - #307436A

1. Support: Weldment comprised of 1.900" (48,26 mm) O.D. RS-20 (.090" - .100") (2,28 mm-2,54 mm) 1.315" (33,40 mm) O.D. RS-20 (.080" - 090") (2,03 mm-2,28 mm) and 3/16" x 5" (4,75 mm x 127 mm) diameter plate. Finish: ProShield, color

specified.

2. Boards: Recycled high-density polyethylene. Cedar and mink in color.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Q. Footprint Stepper 16" DB - #307433A

1. Boards: Recycled high-density polyethylene. Cedar and mink in color.

2. Support: Weldment comprised of 1.900" (48,26 mm) O.D. RS-20 (.090" - .100") (2,28 mm-2,54 mm) 1.315" (33,40 mm) O.D. RS-20 (.080" - 090") (2,03 mm-2,28 mm) and 3/16" x 5" (4,75 mm x 127 mm) diameter plate. Finish: ProShield, color specified.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

R. Footprint Stepper 24" DB - #307434A

1. Footprint Stepper 24" DB

2. Boards: Recycled high-density polyethylene. Cedar and mink in color.

3. Support: Weldment comprised of 1.900" (48,26 mm) O.D. RS-20 (.090" - .100") (2,28 mm-2,54 mm) 1.315" (33,40 mm) O.D. RS-20 (.080" - 090") (2,03 mm-2,28 mm) and 3/16" x 5" (4,75 mm x 127 mm) diameter plate. Finish: ProShield, color specified.

4. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

S. Footprint Stepper 8" DB - #307432A

1. Boards: Recycled high-density polyethylene. Cedar and mink in color.

2. Support: Weldment comprised of 1.900" (48,26 mm) O.D. RS-20 (.090" - .100") (2,28 mm-2,54 mm) 1.315" (33,40 mm) O.D. RS-20 (.080" - 090") (2,03 mm-2,28 mm) and 3/16" x 5" (4,75 mm x 127 mm) diameter plate. Finish: ProShield, color specified.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

T. Pod Climber 24" DB - #120712A

1. Support: Weldment comprised of 1.900" (48,26 mm) O.D. RS-20 (.090" - .100")

(2,28 mm-2,54 mm) 1.315" (33,40 mm) O.D. RS-20 (.080" - 090") (2,03 mm-2,28 mm) and 3/16" x 5" (4,75 mm x 127 mm) diameter plate. Finish: ProShield, color specified.

2. Disc: Rotationally molded from U.V. stabilized linear low-density polyethylene, disc measures 14" (356 mm) in diameter x 7" (178 mm) high, color specified.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

U. Chill Spinner DB - #247189A

1. Belt Seat: Made from .315" (8,00 mm) thick mini rough top 3-ply rubber belting with polyester fabric plys, black in color.

2. Belt: Made from .315" (8,00 mm) thick mini rough top 3-ply rubber belting with polyester fabric plys, black in color.

3. Bearing: 2" (50 mm) Deep groove stainless steel.

4. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

5. Bumper: Molded from U.V. stabilized black EPDM rubber.

6. Seat Frame: Weldment comprised of 1.66" (42,1 mm) O.D. RS40 (.130"-.140") (3,30 mm-3,56 mm) wall galvanized steel tubing, 1/4" (6,35 mm) thick HRPO steel sheet and 3.500" (88,9 mm) O.D. steel pipe. Finish: ProShield, color specified.

7. Seat Post: Weldment comprised of 3.500" (88,9 mm) O.D. (8 GA) (.165") wall galvanized steel tubing. Finish: ProShield®, color specified.

V. Global Motion DB Only - #218915A

1. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

2. Belt Platform: Made from .315" (8,00 mm) thick mini rough top 3-ply rubber belting with polyester fabric plys, 58" (1473 mm) diameter, black in color.

3. Belt Plate: 7GA. (.179")(4,54 mm) Thick HRPO steel plate. Finish: ProShield, black in color.

4. Brake Cover: Recycled Permalene, black in color.

5. Bottom Mount: Weldment comprised of 7.000" (177 mm) O.D. x .188" (4,77 mm) wall stainless steel tube and 1/4" (6,35 mm) thick HRPO steel plate. Finish: ProShield, black in color.

6. Base Bushing: Oil-Filled UHMW PE.

7. Bottom Rib: 7GA. (.179")(4,54 mm) Thick HRPO steel plate. Finish: ProShield, black in color.

8. Center Post: 6.000" (152 mm) O.D. (.250")(6,35 mm) wall HR Black D.O.M. Steel Tube. Finish: ProShield®, color specified.

9. Shock: 70 Series.

10. GripX Platform: 3/4" (19,05 mm) Thick recycled Permalene®, black in color.

11. Hand Grip: Weldment comprised of 1.125" (28,57 mm) O.D. x 11 GA. (.120")(3,05 mm) wall steel tube and 7 GA. (.179")(4,54 mm) thick HRPO steel sheet. Finish: TenderTuff™ coated, gray in color.

12. Mounting Hub Assembly:Comprised of 1/2" (12,7 mm) thick stainless steel plate, 11 Ga. (.120")(3,05 mm) stainless steel sheet, steel bearing shaft, bronze bearings,oilite bearings and stainless steel fasteners.

13. Hub Clamp: 12 GA. (.109")(2,76 mm) Thick stainless steel.

14. Net: (Cable) Made of tightly woven polyester-wrapped, six-stranded galvanized-steel cable with a polypropylene core, red or black in color. (Cable Connectors) 6063-T6 aluminum.

15. Trim Ring & Trim Spacer: Recycled Permalene, black in color.

16. Rib: Weldment comprised of 1.5" (38,1 mm) x 3.0" (76,2 mm) x .180" (4,57 mm) wall HRPO steel tube, 3/8" (9,52 mm) thick stainless steel tab, 3/8" (9,52 mm) O.D. stainless steel pin, 3/8" (9,52 mm) thick HRPO steel plate and 1/4" (6,35 mm) thick HRPO steel plate. Finish: ProShield®, color specified.

17. Rope Casting: Cast Aluminum. Finish: ProShield, black in color.

18. Spinner Top/Bottom: Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified.

19. Top, Middle & Bottom Pipe: Weldment comprised of 2.375" (60,32 mm) O.D. RS20 (.095" -.105")(2,41 mm-2,66 mm) galvanized steel tube, 1/4" (6,35 mm) thick HRPO steel plate and 3/8" (9,52 mm) thick stainless steel tab. Finish: ProShield, color specified.

W. We-Go-Round w/Perf Panels - 2 seats DB Only - #248819A

1. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

2. Brake Cover: Recycled Permalene, black in color.

3. Bottom Mount: Weldment comprised of 7.000" (177 mm) O.D. x .188" (4,77 mm)

wall stainless steel tube and 1/4" (6,35 mm) thick HRPO steel plate. Finish: ProShield, black in color.

4. Base Bushing: Oil-Filled UHMW PE.

5. Center Post: 6.000" (152 mm) O.D. (.250")(6,35 mm) wall HR Black D.O.M. Steel Tube. Finish: ProShield®, color specified.

6. Shock: 70 Series.

7. Rib: Weldment comprised of 1.5" (38,1 mm) x 3.0" (76,2 mm) x .180" (4,57 mm) wall HRPO steel tube, 3/8" (9,52 mm) thick stainless steel tab, 3/8" (9,52 mm) O.D. stainless steel pin, 3/8" (9,52 mm) thick HRPO steel plate and 1/4" (6,35 mm) thick HRPO steel plate. Finish: ProShield®, color specified.

8. Bottom Rib: 7GA. (.179") (4,54 mm) thick HRPO steel sheet. Finish: ProShield, Black in color.

9. GripX Tread: 3/4" (19,05 mm) Thick Permalene®, black in color.

10. Drain Pipe: Comprised of 4" x 25' polypropylene perforated pipe.

11. Weldment comprised of 2.375" (60,32 mm) O.D. RS20 (.095" - .105") (2,41 mm-2,66 mm) wall galvanized steel tubing, 1/4" (6,35 mm) thick HRPO steel plate and 3/8" (9,52 mm) stainless steel tab. Finish: ProShield, color specified.

12. Mounting Hub Assembly: Comprised of 1/2" (12,7 mm) thick stainless steel plate, 11 GA (.120") (3,05 mm) stainless steel sheet, steel bearing shaft.

13. Seat Frame: Comprised of 7GA (.179") (4,54 mm) thick HRPO steel plate. Fisnish: ProShield, specify color

14. Seat Permalene Panel: 3/4" thick Recycled Permalene®, color specified.

15. Spinner Top: Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified.

X. Tendertuff Picnic Table 72"Table 72"Seat Permanent - #141684B

1. Bench Legs: Weldment comprised of formed 2.375" (60,33 mm) O.D. RS-40 (.130" - .140") (3,30 mm-3,56 mm) galvanized steel tubing and 3/8" x 4" x 10" (9,53 mm x 102 mm x 254 mm) HRPO steel. Finish: ProShield, color specified.

2. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

3. Seat Planks: Fabricated from formed 11 GA (.120") (3,04 mm) HRPO sheet steel perforated, planks measure 10 3/4" (273,05 mm) wide x 72" (1829 mm) long and 10 3/4" (273,05 mm) wide x 92" 2337 mm) long with 5/16" (7,92 mm) diameter holes on surface. Finish: TenderTuff, color specified.

4. Table Legs: Weldment comprised of formed 2.375" (60,33 mm) O.D. RS-40 (.130" - .140") (3,30 mm-3,56 mm) galvanized steel tubing and 3" x 2" x 3/16" (76 mm x 51 mm x 4,75 mm) HRS angle top mounts. Finish: ProShield, color specified.

5. Table Tops: Fabricated from formed 11 GA (.120") (3,04 mm) HRPO sheet steel perforated, table tops measure 29" (737 mm) wide x 72" (1829 mm) long and 29" (737 mm) wide x 92" (2337 mm) long with 5/16" (7,92 mm) diameter holes on surface. Finish: TenderTuff, color specified.

Y. Tendertuff Picnic Table 92"Table 72"Seat Permanent - #141684F

1. Bench Legs: Weldment comprised of formed 2.375" (60,33 mm) O.D. RS-40 (.130" - .140") (3,30 mm-3,56 mm) galvanized steel tubing and 3/8" x 4" x 10" (9,53 mm x 102 mm x 254 mm) HRPO steel. Finish: ProShield, color specified.

2. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

3. Seat Planks: Fabricated from formed 11 GA (.120") (3,04 mm) HRPO sheet steel perforated, planks measure 10 3/4" (273,05 mm) wide x 72" (1829 mm) long and 10 3/4" (273,05 mm) wide x 92" 2337 mm) long with 5/16" (7,92 mm) diameter holes on surface. Finish: TenderTuff, color specified.

4. Table Legs: Weldment comprised of formed 2.375" (60,33 mm) O.D. RS-40 (.130" - .140") (3,30 mm-3,56 mm) galvanized steel tubing and 3" x 2" x 3/16" (76 mm x 51 mm x 4,75 mm) HRS angle top mounts. Finish: ProShield, color specified.

5. Table Tops: Fabricated from formed 11 GA (.120") (3,04 mm) HRPO sheet steel perforated, table tops measure 29" (737 mm) wide x 72" (1829 mm) long and 29" (737 mm) wide x 92" (2337 mm) long with 5/16" (7,92 mm) diameter holes on surface. Finish: TenderTuff, color specified.

Z. DTR IND Crab Trap w/Alpine Slide and Transfer - # CP021046

1. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

2. Cable Net Assemblies: (Cable) Made of tightly woven polyes ter-wrapped, six-stranded galvanized-steel cable with a polypropylene core. (Cable Con nectors) 6063-T6 aluminum.

3. Belting: .315" (8,00 mm) Thick mini rough top rubber belting with polyester fabric plys, black in color. DTR

4. Slides/Hoods/O-Zone/Ball Knots/Pods: Rotationally molded from U.V. stabilized linear low density polyethylene, color specified.

5. Chain: Steel 1 /4" (6,35 mm) straight link chain, 3,150 lbs. (1428,82 ki lograms) working load limit. Finish: ProGuard.

6. Pod Bolt Plate: Weldment consists of 3 /16" (4,75 mm) HRPO steel plate and 3 /8" (9,53 mm) thick SST plate. Finish: Pro Shield®, color specified.

7. Swiggle Knot Footers: Formed from hot dipped galvanized HRPO steel plate 0.250" thick.

8. Bell Striker/Sliders/Accents: Two color Permalene, color specified.

9. "Supports: Fabricated from 2.375" (60,33 mm) O.D. RS20 (.095"- .105") (2,41 mm-2,67 mm) wall galvanized steel tubing. Finish: ProShield, color specified."

10. I beams: Rolled I-Beams, W6-9 in thickness. Proshield, Color specified"

11. Plastic lumber Recycled high-density polyethylene, color specified

12. "Windows: Weldment comprised of 1.660" (42,16 mm) O.D. RS20 (.120" - .130") (3,05 mm-3,30 mm) wall galvanized steel tubing and 3/16" (4,75 mm) HRPO sheet steel. ProShield, color specified"

13. GripX Tread: 3 /4" (19,05 mm) Thick Permalene®, black in color

AA. Flexx Swing w/5" Arch Frame Additional Bay DB Only - #352216A

1. Hanger Assembly: Machined from 303 stainless steel, with oil impregnated bronze bearings.

2. Arch Posts: See PlayBooster (PB) General Specifications.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

4. Bumper: Molded from U.V. stabilized black EPDM rubber.

5. Swing Beam: Weldment comprised of tee clamps and 5" (127 mm) O.D. extruded 6005-T5 aluminum alloy tube with a .125" (3,17 mm) W. Finish: ProShield, color specified.

6. LSI Flexx: 6.6 mm cable comprised of braided polyester strands reinforced with a 2.5 mm galvanized steel cable for strength and vandal resistance. The cable has a minimum breaking load of 771.6 lbs.

7. Clamps: Cast aluminum. Finish: ProShield, color specified.

8. Flexx Tube: Extruded from 6005A-T61 aluminum. Finish: ProShield, color specified.

BB. Molded Bucket Seat (5-12 yrs) w/Harness ProGuard Chains for 8' Beam Height - #177351A

1. Chain/ProGuard: Steel 3/16" (4,75 mm) straight link chain, 800 lb. (362,87 kilograms) working load limit. Finish: ProGuard.

2. Dbl. Pivot Block: Fabricated from 6061-T6 Aluminum with bronze oil impregnated bearing.

3. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

4. Bucket Seat Assy: (Bucket Seat & Yoke) Rotationally molded from U.V. stabilized linear low-density polyethylene, color specified. (Pipebolt) Made from 1.125" (28,58 mm) O.D. 6005-T5 threaded annodized aluminum tube. (Bearings) UHMW PE lubricated. (Brackets) Made from 356-T6 aluminum.

5. Bumper: Molded from U.V. stabilized black EPDM rubber.

6. Mounting Bracket: Cast from 535 aluminum magnesium.

2.4 PORTLAND CEMENT CONCRETE MATERIALS AND PRODUCTS

A. As specified in Section 02320 – Borrow Materials. Portland cement concrete materials and products: as specified in Section 03300 –Cast-in- Place Concrete

2.5 DENSE GRADED CRUSHED STONE AND GRAVEL BASE

A. As specified in Section 02320 – Borrow Materials.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate with Town to review Playground Equipment furnished by Town at Town Storage location prior to delivering to the site to confirm it is consistent with the construction documents and to prepare for delivery to site.

B. Coordinate with Town and then protect, load,

C. deliver and offload Playground Equipment from Town storage location to the site and protect in place prior to installation.

3.2 PLAY STRUCTURES, SWINGS, SPINNER AND COMPONENTS

A. The Contractor shall coordinate with the playground manufacturer's representative to ensure the timely completion of tasks necessary to install the equipment.

B. Install as per drawings and according to manufacturer's recommendations. All work shall be done so that no hazardous projections shall be left on the finished work.

C. An authorized representative of the play equipment manufacturer must inspect and approve the completed installation. The play equipment will not be accepted by the play equipment manufacturer or the Owner until they are satisfied with the installation. No additional compensation will be given for any necessary corrective work. Contractor shall submit written certification from Manufacturer's Representative that all play equipment has been installed in accordance with manufacturer's prescribed standards.

3.3 CLEAN UP

A. All site improvements and features shall be kept clean and free of splashed or over-sprayed materials

B. In the event of damage by defacement, splashing, overspray, soiling, or any other means Contractor shall remedy the damage at no additional cost to Owner.

1. Site shall be left in a clean, neat and orderly condition.

3.4 PLAYGROUND SAFETY AUDIT

A. Contractor is responsible for performing a Low Frequency Audit at the end of construction to be performed by a 3rd party CPSI. All costs of the audit shall be borne by the contractor.

END OF SECTION

SECTION 03100

CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Wood Form Material
2. Prefabricated Forms
3. Formwork Accessories

B. Related Sections

1. Section 03300 - Cast-in-Place Concrete

1.2 REFERENCES

A. American Concrete Institute (ACI)

1. ACI 301 - Specifications for Structural Concrete for Buildings
2. ACI 318 - Building Code Requirements for Reinforced Concrete
3. ACI 347 - Guide to Formwork for Concrete

B. American Society for Testing and Materials (ASTM)

1. D4 - Standard Test Method for Bitumen Content
2. D6 - Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds
3. D71 - Standard Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method)
4. D217 - Standard Test Method for Cone Penetration of Lubricating Grease
5. D1056 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
6. D1751 - Standard Specifications for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
7. D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
8. D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

C. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing

D. National Institute of Standards and Technology (NIST)

1. Voluntary Product Standard PS 1-95 - Construction and Industrial Plywood

1.3 SUBMITTALS

A. Product Data on form release agent, permanent formwork and inserts.

1.4 DESIGN REQUIREMENTS

A. Design formwork and shoring at the Contractor's expense by a Professional Engineer registered in the State where the work will be performed to conform to all design and code requirements in ACI 301, ACI 318 and ACI 347 and other applicable regulations and codes. The design shall consider any special requirements that may result due to the use of super plasticized and/or retarded set concrete.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: Class I High Density Overlay plyform, exterior grade, not less than 5 ply nor less than 5/8 inches thick conforming to Voluntary Product Standard PS 1-95

B. Lumber: Douglas Fir species, No. 1 grade S4S with grade stamp clearly visible

2.2 PREFABRICATED FORMS

A. Manufacturers:

1. Symons Corporation, DesPlains, Illinois

2. HICO Corporation, Bronx, NY

3. Or equal

B. Preformed Steel Forms: Minimum 16 gage (1.5 mm), tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearances of finished concrete surfaces; with clean, warp free, undented, ungouged, undamaged surfaces

C. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearances of finished concrete surfaces

2.3 FORMWORK ACCESSORIES

A. Form Ties:

1. Ties for foundation walls shall be metal and designed with removable setback cones so that after removal of the projecting part, no metal shall remain within 1½ inches of the face of the concrete.

2. Form ties for tanks, wet wells, pump chambers, below grade structures and other water retaining structures shall have a neoprene waterstop washer placed on each form tie, or on the inside tie rods for systems which use she bolts, and shall have setback cones.

3. Flat bar snap ties for panel forms shall have plastic or rubber inserts with 1½ inch minimum depth to allow patching of tie hole after removal.

4. Setback cones shall be wood or plastic tapered cones 1 inch diameter and 1½ inches deep to allow filling and patching of the concrete surface after removal.

5. Common wire ties shall not be used.

B. Form Release Agent:

1. Non-staining and non-emulsifiable type which will not stain concrete or absorb moisture nor interfere with adherence of any material to be applied to concrete surfaces.

C. Corners:

1. Chamfered No. 1 Poplar wood strips; ¾ inch by ¾ inch; maximum possible lengths

D. Dovetail Anchor Slot:

1. Galvanized steel 22 gage thick; non-filled, release tape sealed slots for securing to concrete formwork

E. Flashing Reglets:

1. Galvanized steel 26 gage thick, longest possible lengths, with alignment splines for joints, release tape sealed slots for securing to concrete formwork

F. Compressible Filler:

1. Closed cell expanded neoprene, ASTM D1056, Grade No. 2C1, ozone and weather resistant

G. Premolded Joint Filler:

1. Buildings and Structures: Self-expanding cork, ASTM D1752, Type III; and Federal Specification HH-F-341-F, Type II, Class C; capable of one directional swelling up to 140% of its original thickness

2. Sidewalks: Asphalt impregnated, ASTM D1751, ¾ inch thick unless otherwise shown on the Drawings

PART 3 EXECUTION

3.1 GENERAL

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

B. Review all work prepared by others to receive work of this Section and correct any defects affecting installation. Commencement of work by the Contractor will be construed as complete acceptance of preparatory work by others.

C. Handle and store materials separately in such manner as to prevent intrusion of foreign matter, segregation, or deterioration. Do not use foreign materials or those containing frozen material. Remove improper and rejected materials immediately from point of use. Cover materials and accessories during construction period.

3.2 EARTH FORMS

A. Earth forms are not permitted.

3.3 FORM PREPARATION

A. Coat contact surfaces of forms with a form release agent prior to form installation.

B. Thoroughly clean steel forms between uses using high pressure water or jet or sand blasting to remove all mill scale, concrete laitance or other ferrous deposits from the contact surfaces of the forms.

C. Before re-use of wood forms, thoroughly clean form contact surfaces, repair damaged areas and remove projecting nails. A partial or complete steel lining on wood sheathing or plywood will not be allowed.

3.4 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements of ACI 301 and the following additional requirements:

1. Variation in cross-sectional dimensions of columns and beams and in thickness of slabs and walls:

a. Minus $^{1}/_{8}$ inch

b. Plus ¼ inch

3.5 JOINTS

A. Construction and expansion joints indicated on the Drawings are mandatory and shall not be omitted.

B. Use premolded joint filler at expansion joints unless otherwise noted.

C. Where joints other than those shown are required, obtain approval prior to installation.

D. For slab-on-grade construction (welded wire fabric reinforcement only) with large floor areas where construction joints are not shown, the maximum area per section is approximately 600 square feet, but will not limit the number of sections which may be placed at one time. For structural slabs reinforced with deformed bars where construction joints are not shown on the Drawings, the maximum area will be approximately 900 square feet. Slab dimensions between construction joints for floor areas shall be as "square" as possible, but the length shall not exceed 1.5 times the width under any circumstances.

E. Joints not indicated or specified shall be placed to least impair strength of structure and shall be subject to approval of the Engineer.

3.6 FORM REMOVAL

A. The Contractor shall be responsible for damage resulting from form removal. Forms and shoring for structural slabs or beams shall remain in place in accordance with requirements in ACI 301. Form removal shall also conform to the requirements specified in Section 03300.

3.7 INSPECTION

A. The Engineer shall be notified when the forms are complete and ready for inspection at least thirty-six hours prior to the proposed concrete placement.

B. Failure of the forms to comply with the requirements specified herein, or to produce concrete complying with requirements of these Specifications, shall be grounds for rejection of that portion of the concrete work. Rejected work shall be repaired or replaced at no additional cost to the Owner. Such repair or replacement shall be subject to the requirements of these Specifications and approval of the Engineer.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Reinforcing Steel Bars
2. Welded Wire Fabric
3. Reinforcing Accessories

B. Related Sections

1. Section 03100 - Concrete Forms and Accessories
2. Section 03300 - Cast-in-Place Concrete

1.2 REFERENCES

A. The Massachusetts State Building Code, latest edition.

B. American Concrete Institute (ACI)

1. ACI 117 - Standard Tolerance for Concrete Construction and Materials
2. ACI 301 - Specifications for Structural Concrete for Buildings
3. ACI 315 - Details and Detailing of Concrete Reinforcement
4. ACI 318 - Building Code Requirements for Reinforced Concrete, American Concrete Institute
5. ACI 350R - Environmental Engineering Concrete Structures
6. ACI SP-66 - Detailing Manual

C. American Society for Testing and Materials (ASTM)

1. A185 - Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
2. A615 - Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
3. A675 - Specifications for Steel Bars, Carbon, Hot Wrought, Special Quality, Mechanical Properties

D. American Welding Society (AWS)

1. D1.4 Structural Welding Code - Reinforcing Steel

E. Concrete Reinforcing Steel Institute (CRSI)

1. CRSI 63 - Recommended Practice for Placing Reinforcing Bars

2. CRSI 65 - Recommended Practice for Placing Bar Supports, specifications and nomenclature

1.3 SUBMITTALS

A. Provide shop drawings in accordance with the recommendations of ACI 315, "Details and Detailing of Concrete Reinforcement" and show the following: elevations, dimensions of concrete work with specified reinforcement clearances; ledges, brackets, openings, sleeves or other items furnished by other Sections, where interference with reinforcement may occur; bending diagrams; assembly diagrams; splices and laps of reinforcement; temperature and shrinkage reinforcement; construction joint reinforcement and shape; dimensions, grade designations, and details of reinforcement and accessories. Show dowels with concrete work to be placed first. Shop drawings shall be drawn to scale.

B. Bar Bending Details - The bars shall be referenced to the same identification marks shown on the placement drawings. Bars to have special coatings and/or to be of special steel or special yield strength are to be clearly identified.

C. Prior to delivery of reinforcing steel or concrete to job site, submit certified mill test reports of reinforcing steel and cement (including names and locations of mills and shops, and analyses of chemical and physical properties), properly correlated to concrete to be used in this project.

1.4 DELIVERY, HANDLING AND STORAGE

A. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.

B. Reinforcing steel shall be covered and stored off the ground, protected from moisture, and kept free from dirt, oil, or other foreign matter.

PART 2 PRODUCTS

2.1 REINFORCING STEEL BARS

A. Reinforcing steel bars shall be newly rolled billet steel conforming to ASTM A615, Grade 60.

B. Minimum yield strength shall be 60,000 psi.

C. Where reinforcing steel bars are called for to be grouted into existing concrete, the anchorage shall develop an allowable bond strength equal to 24,000 psi times the cross section area of the bar, or an ultimate strength equal to the tensile strength of the bar.

1. For installations in non-submerged concrete with an ambient temperature greater than or equal to 40 degrees Fahrenheit, the epoxy adhesive shall be, Hilti HIT_HY 200, Simpson SET-XP, Powers PE 1000+ or approved equal.

2. For installation in wet or submerged concrete with an ambient temperature greater than or equal to 40 degrees Fahrenheit, the epoxy adhesive shall be Hilti HIT RE-500SD, Simpson ET-HP, Powers Pure 110+ or approved equal.

3. For installation in concrete below 45 degrees Fahrenheit the epoxy adhesive shall be Hilti HIT ICE, Simpson AT-XP or equal.

2.2 WELDED WIRE FABRIC

A. Welded wire fabric shall conform to ASTM A185

2.3 REINFORCEMENT ACCESSORIES

A. Reinforcement accessories shall conform to Product Standard PS7-766, National Bureau of Standards, Department of commerce, Class C, as produced by Dayton Superior Corporation; R.K.L. Building Specialties Co., Inc. or equal approved by the Engineer.

B. Reinforcement accessories shall include spacers, chair ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing, spacing, supporting, and fastening reinforcement.

C. Tie wire shall be of sufficient strength for all intended purpose, but not less than No. 18 gauge. Metal supports shall be of such type as not to penetrate surface of formwork and show through surface of concrete.

D. Accessories touching interior formed surfaces exposed to view shall have not less than 1/8 inch of plastic between metal and concrete surface. Plastic tips shall extend not less than 1/2 inch up on metal legs.

E. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.

F. Expansion Joint Dowels

1. Dowels shall conform to ASTM A675.

2. Expansion dowel caps shall be No. 87 dowel caps as manufactured by Heck Building Products, Inc., Type F-46 dowel caps as manufactured by the Dayton Sure-Grip and Shore Company, or equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Review all work prepared by others to receive work of this Section. Commencement of work will be construed as complete acceptance of preparatory work by others.

3.2 PREPARATION

A. Notify the Engineer prior to the start of any phase of the reinforcing work so as to provide the opportunity to inspect the work. Such notification shall be made at least 24 hours in advance of reinforcement placements and at least 36 hours in advance of other inspections (forms, etc.).

3.3 REINFORCING BAR FABRICATION

A. Fabrication of reinforcement shall be in accordance with the recommendations of CRSI.

B. Reinforcing bars shall be cold bent and shall not be straightened or re-bent. Bars shall not be field bent unless approved by the Engineer.

C. Reinforcing bars shall be bent around a revolving collar having a diameter of not less than that recommended by the CRSI.

D. Reinforcing bar ends that are to be butt spliced or threaded, shall have the applicable end saw-cut. Such ends shall terminate in flat surfaces at a right angle to the axis of the bar.

E. Where reinforcing bars are called for to be welded, the welding shall conform to AWS D1.4 Structural Welding Code - Reinforcing Steel.

3.4 INSTALLATION

A. Reinforcement shall be placed in accordance with requirements of CRSI -63 - "Recommended Practice for Placing Reinforcing Bars" and CRSI 65, "Recommended Practice for Placing Bar Supports" and with further requirements below.

B. Reinforcement shall be accurately placed in accordance with Contract Documents and shall be firmly secured in position by wire ties, chairs, spacers, and hangers, each of type approved by the Engineer. For slabs, grade beams, etc. where concrete is poured on grade, use additional setup bars and concrete brick to provide required cover over reinforcement.

C. Bending, welding or cutting reinforcement in field in any manner other than as shown on Drawings, is prohibited, unless specific approval for each case is given by the Engineer.

D. Reinforcement shall be continuous through construction joints unless otherwise indicated on Drawings.

E. Reinforcement shall be spliced only in accordance with requirements of Contract Documents or as otherwise specifically approved. Splices of reinforcement at points of maximum stress shall generally be avoided.

F. Welded wire fabric shall lap 6 inches or one space plus 2 inches whichever is larger, and shall be wired together. Provide No. 4 set up bars spaced 30 inches on center for slabs-on-grade or elevated slabs with composite decks.

G. Proceed with installation of embedded items, and reinforcement, but do not place concrete into or around such items until the Engineer has approved work.

3.5 FIELD QUALITY CONTROL

A. The Engineer shall have the right to postpone or stop concrete operations when in his judgment, reinforcement and embedded item installation has not been properly completed or the quality of construction will impair strength and durability or desired finished product. Costs arising from delays due to noncompliance will not be considered.

B. Any material or workmanship that is rejected, either at the batch plant or at the site, shall be replaced promptly at no additional cost to the Owner.

C. Before concrete is placed, reinforcement shall be free of excessive rust, dirt, oil, scale or other foreign matter that will destroy or reduce bond requirements. Reinforcement expected to be exposed to weather for a considerable length of time shall be painted with a heavy coat of cement grout. Protect stored materials so as not to bend or distort bars in any way. Bars that become damaged will be rejected.

D. Before concrete is placed, check all installed reinforcement to ensure that it conforms to Contract Documents and approved Shop Drawings. Such checking shall be done

only by qualified experienced personnel. In addition, the Engineer shall be notified at least 36 hours prior to concrete placement and given opportunity to inspect completed reinforcement. Prior approval of Shop Drawings shall in no way limit the Engineer's right to require modifications or additions to reinforcement or accessories.

E. Expansion joint dowels must be straight and clean, free of loose flaky rust and loose scale. Dowels may be sheared to length provided deformation from true shape caused by shearing does not exceed 0.04 inches on the diameter of the dowel and extends no more than 0.04 inches from the end. Bars shall be coated with a bond breaker on the expansion end of the dowel. Expansion caps shall be provided on the expansion end.

3.6 ADJUSTING

A. Carry out corrections without delay as directed by the Engineer when construction operations indicate that requirements of Contract Documents or prudent construction practices are being or are about to be violated.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Concrete Materials
2. Admixtures
3. Concrete Mix
4. Miscellaneous Concrete Materials

B. RELATED SECTIONS

1. Section 03100 - Concrete Forms and Accessories

1.2 REFERENCES

A. The Massachusetts State Building Code, latest edition

B. American Concrete Institute (ACI)

1. ACI 301-95 - Specifications for Structural Concrete for Buildings, (included as part of this specification)
2. ACI 305 - Hot Weather Concreting
3. ACI 306.1-90 - Standard Specifications for Cold Weather Concreting
4. ACI 318-19 - Building Code Requirements for Reinforced Concrete", American Concrete Institute

C. American Society for Testing and Materials (ASTM)

1. C33 – Standard Specification for Concrete Aggregates
2. C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
3. C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
4. C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
5. C87 - Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
6. C94 - Standard Specification for Ready-Mixed Concrete

7. C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
8. C150 – Standard Specification for Portland Cement
9. C260 - Standard Specification for Air-Entraining Admixtures for Concrete
10. C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
11. C494 - Standard Specification for Chemical Admixtures for Concrete
12. C535 - Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
13. C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
14. C685 – Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
15. C881 – Standard Specification for Epoxy-Resin Base Bonding Systems for Concrete
16. C989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
17. C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete

1.3 SUBMITTALS

A. Submit concrete mix proposed for use, indicating design strength, supplier, batch quantities, and constituents. Provide test report copies indicating prior satisfactory performance in accordance with ACI 301.

B. Submit data and descriptive literature for concrete constituents including admixtures, aggregate tests, bond breaker, bonding agent, and repair grout.

C. Submit detailed methods proposed for curing and protection of concrete. This submittal shall be made not less than 10 days prior to the placement of any concrete.

D. Submit a truck load ticket for every concrete delivery. Ticket information shall include batch time and date, weights of all constituents, quantity of admixtures, water added at the batch plant and moisture content of coarse and fine aggregates.

E. Maintain an accurate daily record of the locations and quantity of concrete placed.

1.4 QUALITY ASSURANCE

A. Provide inspection of cast-in-place concrete work, and testing, including slump tests, air content, and standard compression testing. Materials and workmanship shall be subjected to inspection and testing in mill, shop and/or field by the Engineer. Such inspection and testing shall not relieve Contractor of their responsibility to provide their own inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of this Section.

B. Provide notification prior to the start of any phase of concrete placement work so as to provide the opportunity to inspect the work. Such notification shall be made at least 24 hours in advance of concrete placements and at least 36 hours in advance of other inspections (forms, rebar, etc.).

C. Facilitate observation by the Engineer as well as inspection and testing by the concrete testing agency, and furnish the following:

1. Safe access to the work at all times to allow proper inspection of the work

2. Full and ample means and assistance for sampling and testing materials and proper facilities for inspection of work in plant and at project site

3. Covered box large enough to contain twenty-four standard concrete cylinders. At temperatures below 60°F, box shall be electrically heated and thermostatically controlled to maintain inside temperature of 60° to 80°F. Cylinders shall be placed in box immediately after molding and shall be covered with moist burlap until delivery to laboratory, 24 to 72 hours after molding.

4. Access by the Engineer or his representative to the batch plant supplying the concrete at any time.

D. Compression tests shall consist of one set of 4 cylinders for each test made, cured, and tested by testing laboratories during progress of job. 6 cylinders shall be required for each test made with concrete mix containing fly ash or ground granulated blast furnace slag. One set of cylinders shall be taken for every 100 cubic yards of concrete or fraction thereof placed in any one day.

1. 1 cylinder of each set shall be tested for 7-day compressive strength; 2 cylinders shall be tested for 28-day compressive strength. The remaining cylinder shall be tested for 56-day compressive strength if either one of the 28-day tests are below the specified strength, otherwise the 56-day test will be eliminated.

2. For modified mix with fly ash or ground granulated blast furnace slag, 1 cylinder of each set shall be tested for 7-day compressive strength, 2 cylinders shall be tested for 28-day compressive strength and 2 cylinders shall be tested for 56-days compressive strength. The remaining cylinder shall be tested for 84-day compressive strength if either one of the 56-day tests are below the specified strength, otherwise the 84-day test will be eliminated.

3. The Owner will provide and pay for the services of an approved testing laboratory to test the cylinders. The Contractor shall coordinate and schedule all concrete testing performed by approved agency.

4. Compression strength test of cylinders shall conform to ASTM C39, latest revision. The testing laboratory will submit certified copies of the test results directly to the Engineer and the Owner within 24 hours after tests are made.

5. Sampling, molding, curing and testing of cylinders shall conform to ASTM requirements. Specimens shall be cured under laboratory conditions. The Engineer may require additional cylinders to be cured under field conditions when unusual conditions may tend to reduce concrete strength.

6. Report of tests shall include: name of project, date and location of concrete placement, design strength of concrete, mix data, slump, air content (if tested), compressive strength, age and condition of test cylinder, type of fracture, and type of curing.

E. Slump test, to check consistency, shall be made from the sample used to mold cylinders. Additional slump tests may be taken of every batch delivered to job site.

F. Tests for determination of air content shall be made as required to verify conformance with the specifications.

G. The strength level of the concrete mix shall be considered satisfactory if both of the following criteria are satisfied:

1. Every arithmetic average of any three consecutive strength tests equals or exceeds the specified design strength.

2. No individual strength test (average of two cylinders from the same test group) falls below the specified design strength by more than 500 psi when the specified design strength is 5000 psi or less or by more that 10 percent of the specified design strength when the design strength is more than 5000 psi.

H. When tests of control specimens fall below these requirements, the Engineer will require 56 day or 84 day cylinder tests or core specimens taken from concrete in question and tested in accordance with ASTM C42. If these specimens do not meet strength requirements, the Engineer has the right to require additional curing, load tests, strengthening or removal and replacement of those parts of the structure which are unacceptable, and in addition, removal of such sound portions of structure as necessary to ensure safety, appearance, and durability of structure. Additional testing, load tests, strengthening or removal and replacement of parts or structure and any costs associated with delay of project shall be at no additional cost to the Owner.

I. Any material or workmanship which is rejected, either at the batch plant or at the site, shall be replaced promptly at no additional cost to the Owner.

J. If arrangements for corrections and/or replacements are not made within seven days after notice of rejection, the Owner has the right to have corrections and/or replacement made and charge cost thereof and any costs associated with delay of project against balance of monies withheld.

K. Acceptance of work and admixtures at the batch plant shall not prevent final rejection at job site upon arrival or after it has been installed, if work is found to be defective.

L. Portions of a structure which do not meet the requirements of the Contract Documents based on appearance or for any other aesthetic reason, shall be corrected or removed and replaced at no additional cost to the Owner.

M. Work on new concrete structures shall conform to the requirements of ACI 306.1, Standard Specifications for Cold Weather Concreting, except as modified herein.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: shall be American-made Portland Cement, free from water soluble salts or alkalies which will cause efflorescence on exposed surfaces. Portland Cement shall be Type II, ASTM C150. Air entraining cements are prohibited.

B. Pozzolans and Blast Furnace Slag

1. Fly Ash: Class F conforming to the requirements of ASTM C618.

2. Ground Granulated Iron Blast-Furnace Slag: Conforming to ASTM C989.

C. Normal weight Fine Aggregate

1. Washed, inert, natural sand conforming to ASTM C33 and the following additional requirements.

a. Fineness Modulus 2.75 (plus/minus 0.25)

b. Clay lumps and friable particles – 3.0 percent maximum

c. Coal and lignite – 0.5 percent maximum

d. Organic Impurities (ASTM C40) – Organic Plate No. 2

e. Strength of Mortar (ASTM C87) – not less than 95 percent at 7 days

f. Soundness (AASHTO T-104) - 10 percent maximum loss (magnesium sulfate solution, five cycles)

D. Normal weight Coarse Aggregate

1. Well graded crushed stone or washed gravel conforming to ASTM C33 and the following additional requirements:

a. Material finer than No. 200 sieve – 1.0 percent maximum

b. Clay lumps and friable particles – 2.0 percent maximum

c. Chert (less than 2.40 specific gravity, saturated surface dry) – 3.0 percent maximum by weight.

d. Sum of clay lumps, friable particles, and chert (less than 2.40 specific gravity, saturated surface dry) – 3.0 percent maximum by weight. This limitation only applies to aggregates in which chert appears as an impurity.

e. Coal and lignite – 0.5 percent maximum

f. Soundness - 18 percent maximum loss (magnesium sulfate solution, five cycles)

g. Soundness - 10 percent maximum loss (sodium sulfate solution, five cycles)

2. Coarse aggregates shall not exceed 35% by weight "percentage of wear" as determined by the Los Angeles Abrasion and Impact Tests in ASTM C131 and C535.

E. Water shall be from approved source, potable, clean and free from oils, acids, alkali, organic matter and other deleterious material.

2.2 ADMIXTURES

A. Water-reducing agent:

1. Water-reducing agent shall be by same manufacturer as air-entraining agent.
2. Daracem - 55 W.R. Grace & Co.
3. Pozzolith 220N – BASF Admixtures, Inc.
4. Eucon MR - Euclid Chemical Co.
5. Or equal conforming to ASTM C494 Type A.

B. Air-entraining agent:

1. DAREX AEA - W.R. Grace & Co.
2. MB-VR or MB-AE90 - BASF Admixtures, Inc.
3. Air-Mix - Euclid Chemical Co.
4. Or equal conforming to ASTM C260.

C. Admixtures which retard setting of cement in concrete shall not be used without written approval of the Engineer. Admixtures causing accelerated setting of cement in concrete shall not be used.

2.3 CONCRETE MIX

A. Select proportions of ingredients to meet the design strength and materials limits specified and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportioning shall also conform to the requirements in ACI 301 and ACI 318.

B. The concrete mix design shall be a 4000 psi compressive strength concrete using ¾ inch aggregate. The design mix shall be selected based on previous test records for a mix with essentially the same proportions, and shall meet the following limiting values in Table A:

TABLE A
Maximum Allowable Water/Cement Ratios

Minimum Allowable 28 day Compressive Strength (psi)	Maximum Allowable Water/Cement Ratio	Total Cementitious Material (Pounds)	
		Min	Max
4,000	0.45	611	635
4,500	0.45	635	658

C. If sufficient test records are not available, (at least 30 consecutive strength tests or two groups of tests totaling at least 30 within the past 12 months), the design mix shall be developed using laboratory trial mixtures in accordance with ACI 301.

D. All concrete is normal weight with air-dry weight not to exceed 150 lbs. per cubic foot.

E. Fly ash may be substituted for up to 20 percent by weight of the total cementitious material. Ground granulated iron blast-furnace slag may be substituted for up to 40 percent by weight of the total cementitious material.

F. For concrete flatwork with a steel trowel finish, fly ash may be substituted for up to 10 percent by weight and ground granulated iron blast-furnace slag may be substituted for up to 25 percent by weight of the total cementitious material.

G. All concrete shall contain the approved air-entraining admixture as per manufacturer's written instructions to provide entrained air by volume in the cured concrete between 4.5 and 7.5%.

H. The design mix shall meet the following slump limiting values in Table B:

TABLE B
Concrete Slump[1]

Portion of Structure	Recommended (inches)	Maximum Range (inches)
Slabs	3	2-4

[1]After addition of high range water reducer

I. The approved water-reducing admixture shall be used in all concrete, in accordance with manufacturer's written instructions.

2.4 MISCELLANEOUS MATERIALS

A. Grout shall be a ready-to-use, non-metallic, non-shrink aggregate product requiring only the addition of water at the job site. Grout shall be as manufactured by Five Star Products, Inc.; Euclid Chemical Company; Master Builders; or equal. Grout shall be easily workable and shall have no drying shrinkage at any age. Compressive strength of grout (2 inch by 2 inch cubes) shall not be less than 5000 psi at 7 days, and 7500 psi at 28 days.

B. Floor Hardener, Sealer, and Waterproofing Treatment:

1. Concrete floor surfaces not covered with resilient flooring or carpet shall receive a surface treatment after steel trowel finishing.

2. Product and Manufacturer:

a. Ashford Formula hardener and sealer as manufactured by Concrete Chemical Company, Inc., Springville, Utah

b. Seal Hard concrete sealer as manufactured by L&M Construction Chemicals, Inc., Omaha, Nebraska

c. Approved equal

C. Concrete Construction Joint Roughener:

1. Provide a water soluble non-flammable, surface-retardant roughener.

2. Product and Manufacturer:

   a. Rugasol-S by Sika Corporation for horizontal joints only

   b. MasterFinish QD 200 by BASF Corporation for vertical joints

   c. Approval equal

D. Bond Breaker:

1. Provide an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint.

2. Bond breaker for concrete other than where tape is specifically called for shall be either bond breaker tape or an ASTM C309 non-staining type bond prevention coating such as Masterkure 100WB by Degussa Construction Chemicals, Dayton Superior Sure Lift J6WB, StarSeal Clean Lift by Vexcon Chemicals or equal.

E. Bonding Agent:

1. Provide a two-component, 100% solids, moisture –tolerant structural epoxy adhesive conforming to ASTM C881, Type II. The bonding agent shall be Sikadur 32 Hi-Mod by Sika Corporation of Lyndhurst, NJ, Concresive Liquid (LPL) by Degussa Admixtures, Inc. of Cleveland, OH or equal.

2. Latex bonding agent shall be a non-remulsifiable acrylic-polymer latex conforming to ASTM C1059 Type II.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify cover requirements over all reinforcement.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

C. Verify site conditions to ensure that full access is available for placement of concrete.

3.2 JOINTS

A. Construction and expansion joints indicated on Drawings are mandatory and shall not be omitted. Construction joints shall conform to the requirements of Section 03100 and the following:

1. Before placing new concrete against concrete already in place and hardened, the surface shall again be cleaned with a jet where practical. The exposed aggregate shall then be mopped with a mortar composed of the same proportions of sand and placed and mopped in place immediately prior to the placing of concrete and shall not have set up or hardened prior to the placing of concrete.

2. Where joints other than those shown are required, they shall be made at such locations as the Engineer may allow, and shall in no case impair the structural strength of the structure.

B. Joints not indicated or specified shall be placed to least impair strength of structure and shall be subject to approval of the Engineer.

C. Saw-cut joints shall be installed in the locations shown on the Drawings. Saw-cut joints shall not be substituted for formed construction joints unless approved by the Engineer. Saw-cut joints shall conform to the following requirements:

1. The depth of the saw cut shall be at least ¼ of the slab thickness or a minimum depth of one inch unless otherwise shown on the Drawings.

2. Do not saw cut through slab reinforcing steel unless directed to do so in writing by the Engineer.

3. Joints produced using conventional wet-cut process shall be completed within 4 to 12 hours after the slab has been finished - 4 hours in hot weather conditions and 12 hours in cold weather conditions.

4. Joints produced using the early-entry dry cut process shall be formed using diamond-impregnated blades and shall be completed within 1 to 4 hours after the slab has been finished – 1 hour in hot weather conditions and 4 hours in cold weather conditions. The maximum depth of joints produced by the dry cut process shall not exceed 1-1/4 inches. Care should be taken to make sure that the saw does not ride up over large or hard coarse aggregates.

5. Regardless of the saw cutting process chosen, the saw cutting must be performed before the concrete starts to cool, as soon as the concrete surface is firm enough not to be torn or damaged by the cutting blade, and before random-drying-shrinkage cracks can form in the concrete slab.

3.3 MIXING, CONSISTENCY, AND DELIVERY OF CONCRETE

A. Concrete shall be ready-mixed, produced by a central batch plant. Hand or site mixing shall not be allowed. Constituents, including admixtures, shall be batched at the central batch plant. Admixtures shall be premixed in solution form and dispensed as recommended by the manufacturer.

B. Central plant and rolling stock equipment and methods shall conform to Truck Mixer and Agitator Standard of Truck Mixer Manufacturer's National Ready-Mixed Concrete Association, ASTM C94, ASTM C685, and Contract Documents. Consistency of concrete at time of placement shall be at a 3 inch slump, +/- 1 inch.

C. Ready mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities. Discharge at site shall be within one and one-half hours after cement is first introduced into the aggregates. Concrete with a temperature greater than 90°F. shall be rejected and removed from the site.

D. During any of the following conditions: high ambient temperature, high concrete temperature, low relative humidity, increased wind velocity, high solar radiation, when the temperature of the concrete is 85°F or above, the time between the introduction of cement to the aggregates and discharge shall not exceed one hour. In

addition, when the rate of evaporation on the surface of the concrete is expected to approach 0.2 lb/ft^2/hr. (see chart in ACI 305R) special precautions shall be taken against the formation of plastic shrinkage cracking on the surface of the concrete after placement.

E. During any period when for more than three successive days the average daily outdoor temperature drops below 40°F, the concrete temperature at the time of placement shall be as specified in Table C below.

TABLE C
Concrete Temperature During Cold Weather

Least dimension of section, inches.	**Minimum temperature of concrete as placed and maintained during the protection period, °F**	**Maximum gradual decrease in surface temperature during any 24 hours after end of protection, °F**
Less than 12	55	50
12 to less than 36	50	40

F. Central mixed concrete shall be plant mixed a minimum of five minutes. Agitation shall begin immediately after premixed concrete is placed in truck and shall continue without interruption until discharged. Transit mixed concrete shall be mixed at mixing speed for at least ten minutes immediately after charging truck followed by agitation without interruption until discharged.

G. Retempering of concrete which has partially hardened by mixing with or without additional cement, aggregates, or water shall not be permitted.

3.4 PLACING CONCRETE

A. Remove excess water and foreign matter from forms and excavations. Do not place concrete on frozen soil. Provide adequate protection against frost action during freezing weather.

B. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of ingredients and displacement of reinforcements, and which avoid re-handling. Do not deposit partially hardened concrete. When concrete is conveyed by chutes, equipment shall be of such size and shape to ensure continuous flow in chute. Flat (coal) chutes shall not be used. Chutes shall be of metal or metal lined and uniformly sloped. Slope shall not be less than 25° nor more than 45° from horizontal. Concrete shall be lowered and maintained as near to the surface of deposit as practicable. The chute shall be thoroughly cleaned before and after each use and debris and any water shall be discharged outside of the forms. Concrete shall not be allowed to flow horizontally over distances exceeding 10 feet or dropped vertically over 6 feet.

C. Place concrete in such a manner as to prevent segregation and accumulations of hardened concrete on forms or reinforcement above the grade of concrete being placed. Suitable hoppers and spouts with restricted outlets and tremies shall be used as required.

D. Thoroughly consolidate each layer of concrete by rodding and vibrating using internal type mechanical vibrator. Vibration shall be done by experienced operators under close supervision and shall be carried on only enough to produce homogeneity and optimum consolidation without permitting segregation of constituents or "pumping" of air. Vibrators used for normal weight concrete shall operate at speeds of not less than 7,000 vpm and be of suitable capacity. Do not use vibrators to move concrete. Vibration shall be supplemented by spading to remove bubbles and honeycombs adjacent to visible surfaces. At least one vibrator shall be on hand for every 10 cubic yards of concrete placed per hour, plus one spare. Vibrators shall be operable and on site prior to starting concrete placement.

E. Deposit concrete continuously, and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within the section. If a section cannot be placed continuously between planned construction joints, as specified, field joints and additional reinforcement shall be introduced at the Contractor's expense to preserve structural continuity.

F. Cold joints, particularly in exposed concrete, including "honeycombs", are unacceptable. If they occur in concrete surfaces exposed to view, the Engineer will require that entire section in which blemish occurs be removed and replaced with new materials at the Contractor's expense.

3.5 CURING AND PROTECTION

A. When concrete is placed at or below an ambient air temperature of 40°F. or whenever this temperature or lower values are likely to occur within 48 hours after placement of concrete, cold weather concreting procedures, according to ACI 306.1 and as specified herein, shall be followed. The entire area affected shall be protected by adequate housing or covering, and heating. No salt, chemicals or other foreign materials shall be used in the mix to lower the freezing point of concrete. No oil or kerosene heaters shall be utilized. Vent flue gases from combustion heating units to the outside of the enclosure.

B. No frozen materials shall be used in batching concrete and any ice shall be removed from coming into contact with the concrete.

C. Protect concrete work against injury from heat, cold, and defacement of any nature during construction operations.

D. Concrete shall be treated and protected immediately after concreting or cement finishing is completed, to provide continuous moist curing above 50°F. for at least 7 days, regardless of ambient air temperatures.

E. All concrete shall be cured immediately after finishing in accordance with the following requirements:

1. Curing shall be accomplished by a continuous soaking process such as the use of soaker hose or sprinklers, or by use of plastic roll materials to cover the concrete, which shall be thoroughly wetted at least once a day or more often as required in very hot weather. Such plastic shall be placed as soon as possible after finishing of concrete so that scarring of the surface will not occur. Plastic shall be held in place on the surface of the concrete in such a manner and means

as will not allow it to be blown off or otherwise dislodged from the concrete surface. Curing procedures shall be maintained continuously for a period of at least 7 days.

2. All methods of curing shall be subject to approval of the Engineer, and each method employed shall be practical and adequate for the curing required. Curing compounds in lieu of wet curing will not be allowed.

F. Keep permanent temperature records showing date and outside temperature during concreting operations. Thermometer readings shall be taken at start of work in morning, at noon, and again late in afternoon. Locations of concrete placed during such periods shall likewise be recorded in such manner as to show any effect temperatures may have had on construction.

3.6 REMOVAL OF FORMWORK

A. Forms shall not be removed until concrete has attained sufficient strength to support its own weight, construction loads to be placed thereon and lateral loads, without damage to structure or excessive deflection.

B. With the exception of construction joint bulkheads and keyways, forms and supports shall remain in place for not less than the minimum time periods noted below.

C. Unless specifically authorized by the Engineer, forms for vertical surfaces shall not be removed before the concrete has attained a strength of not less than 30 percent of the minimum allowable prescribed compressive strength nor not less than the minimum time period specified in Table D.

D. Unless specifically authorized by the Engineer, forms for horizontal surfaces shall not be removed before the concrete has attained a strength of not less than 60 percent of the minimum allowable prescribed compressive strength nor not less than the minimum time period specified in Table D.

TABLE D
Minimum Degree Day Requirement for Form Removal

Form Use	Degree-Days
Walls and Vertical Surfaces	200
Elevated Slabs	400
Beams and Girders	600

E. Definition of degree-days - Total number of days times mean daily air temperature at the surface of the concrete. For example, 5 days at temperature of 60°F. equals 300 degree-days. Days or fractions of days in which temperature is below 50°F. shall not be included in calculation of degree-days except where modified by Table C above.

F. Forms for construction joint bulkheads and keyways may be removed the following day, after the concrete pour. Extreme caution must be used to avoid damage to the concrete surface and keyway.

G. Any test cylinders required to verify the specified minimum strengths for form removal shall be field cured under the same conditions as the concrete they represent. Such cylinders and testing shall be at the Contractor's expense.

3.7 FINISHING OF CAST-IN-PLACE CONCRETE

A. Upper Horizontal Surfaces

1. Horizontal surfaces not subjected to wear, such as tops of parapets, copings, walls, etc., shall be formed by placing an excess of material in the forms and removing or striking off such excess with a template, forcing the coarse aggregate below the surface of the mortar.

2. Horizontal surfaces shall be attained by striking off excess concrete and in no case shall concrete be added to the tops of walls, etc., once initial set has taken place.

3. The top of such surfaces shall be finished in a manner as required and dictated by the necessary appearance of the part being finished. For covered surfaces, a wood float finish will in most cases be sufficient. Steel troweling may be necessary where concrete is exposed to view and adjacent surfaces have a steel trowel finish. In other cases, a "broom" finish may be required.

B. Slab Surfaces

1. Interior traffic bearing surfaces shall have a steel trowel finish and exterior slabs shall have a wood or magnesium trowel non-slip finish. The finish shall be accomplished by a procedure as follows, but shall be the Contractor's responsibility to produce a good and proper finish on all parts of the work:

a. "Wood Float Finish" - The surface shall be screeded, given a minimum of one steel troweling and shall then be finished with a wood, cork or other float as required to produce the desired finish. In cases where a rough wood float finish is sufficient, the above procedure may be executed, omitting the steel troweling. A wood float finish shall be used only when allowed in writing by the Engineer.

b. "Broom Finish" - On exterior work such as sidewalks and where else called for, a broom finish shall be used. The finishing shall be accomplished in the following manner. Screeding shall be done and the surface worked up with a wood float. At a proper time thereafter, the surface shall be steel troweled at least once and more if so directed. Upon completion of troweling, a sufficiently stiff bristled broom shall be drawn lightly across the surface to produce a slightly striated finish. The brooming shall in general be perpendicular to the main traffic route. Coordinate required finish with the Engineer before application.

2. For all of the finishing procedures described, the time element is important and something that must be determined during the progress of the work as conditions warrant. Normally, free water on the surface of concrete should not occur. Allow the concrete surface to dry before starting finishing operations. Do not, under any circumstance, add dry cement to wet areas in order to

accelerate drying. Finishing and rubbing required for all parts of the work shall be done only by competent "Cement Finishers" trained for the work.

C. Formed Surfaces

1. Immediately after the end of the wet cure period, remove form ties and patch all tie-holes, rat holes, and other surface voids with a non-metallic, non-shrink grout, which most nearly matches the color and texture of the concrete surface. All protrusions shall be ground smooth with an approved mechanical grinder.

3.8 REPAIRING OF HARDENED CONCRETE SURFACES

A. Defective concrete and honeycombed areas shall not be patched unless examined and approval is given by the Engineer. After approval, areas involved shall be cut back to a minimum depth of 1 inch from the finished surface, or as otherwise directed, whichever is greater. Edges of areas to be repaired shall be cut square to a minimum depth of 3/4 inch. Feathered edges will not be allowed. Any voids or honeycomb around reinforcing steel shall be chipped away to provide at least 3/4 inch clearance all around to permit proper placement of repair concrete around the steel to the parent, sound concrete.

B. Exposed surfaces shall be thoroughly cleaned of all mud, paint, grime, scum, laitance, organic matter, detritus, calcareous growth and other foreign matter by sand and water blasting or other acceptable means. Immediately after cleaning, the surface shall be checked by the Engineer for proper surface preparation, including fractured concrete or loose aggregate. Any such material shall be removed using pneumatic or hand tools. The final surfaces shall be thoroughly rinsed with clean water to remove remaining dirt and dust.

C. Premoisten the prepared surface for at least 2 hours to reduce the absorption of water by the parent concrete and to provide a reservoir for moist curing at the interface of the repair. The substrate should be saturated surface dry with no standing water. While the concrete surface is still damp, apply a thin 1/16 inch coat of neat cement slurry (mixed to the consistency of a heavy paste) with a bristle brush to provide a bond coat throughout the entire cavity of the repair. Before the slurry has dried or changed color, promptly install the repair concrete or dry-pack, as may be required or selected.

D. For relatively small areas, ram repair concrete into this portion of the formed void. This concrete shall comprise a crumbly-dry 1-1-1.5 mixture of cement, concrete sand and pea gravel (or 3/4 inch gravel) mixed slightly damp to the touch (just short of "balling"). The "dry-pack" consistency of the concrete shall be zero slumps, but moist enough so that when it is rodded and tamped until dense, an excess of paste will appear on the surface in the form of a spider web. In cases of unformed voids of thinner section, do not build-up repair in excess of a depth which will sag with the weight of the fresh mortar or concrete. Trowel smooth with heavy pressure.

E. The concrete shall be of the driest possible consistency and mix composition so that it can be worked into the corners and angles of forms and around the reinforcement, without permitting the materials to segregate or free water to collect on the surface, due consideration being given to the methods of placing and compacting. Source and mixture of concrete shall be submitted for approval.

F. Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. Concrete shall be thoroughly consolidated and trowelled dense, smooth and plane. Avoid premature and excessive trowelling which could cause sagging.

G. Repair areas and adjacent parent concrete surfaces shall be continuously moist cured immediately after finishing for at least 7 days. Surfaces shall be covered with damp burlap and sealed with taped polyethylene. Membrane curing compounds shall not be used.

H. Leave finished work and adjacent concrete surfaces in a neat, clean condition with no evidence of spillovers or staining.

3.9 CLEANING

A. Concrete surfaces shall be cleaned of objectionable stains as determined by the Engineer. Materials containing acid in any form or methods which will damage the "skin" of concrete surfaces shall not be employed, except where otherwise specified.

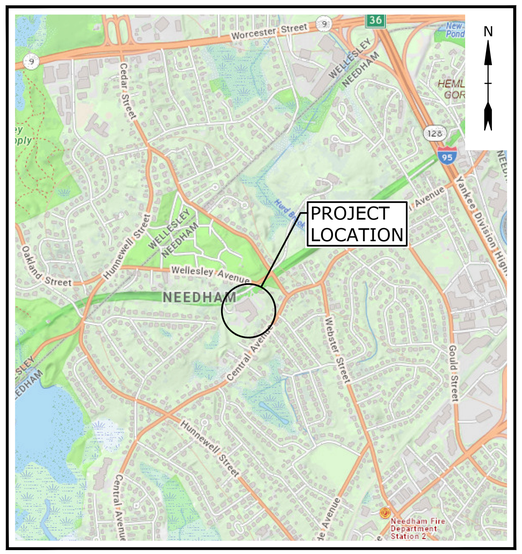
END OF SECTION

ELIOT ELEMENTARY
SCHOOL REC IMPROVEMENTS
PHASE 1

135 WELLESLEY AVE, NEEDHAM, MA 02494

ISSUED FOR BIDDING
JUNE 2026

LIST OF DRAWINGS		
SHEET NO.	DRAWING NO.	DRAWING TITLE
-	-	COVER SHEET
2	L000	GENERAL NOTES, LEGEND, AND ABBREVIATIONS
3	L100	EXISTING CONDITIONS
4	L101	SITE PREPARATION PLAN
5	L201	SITE MATERIAL AND LAYOUT PLAN
6	L202	GRADING & DRAINAGE PLAN
7	L401	SITE DETAILS - 1
8	L402	SITE DETAILS - 2
9	L403	SITE DETAILS - 3



LOCATION MAP
SCALE: 1" =1000'

PREPARED BY:

Tighe & Bond
53 Southampton Road
Westfield, MA 01085
T 413.562.1600

JOSEPH VIAMARI, PE, LEED AP

RICHARD HOUGHTON, PE

PREPARED FOR:

TOWN OF NEEDHAM
500 DEDHAM AVENUE
NEEDHAM, MA 02492

COMPLETE SET 9 SHEETS

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LEGEND

DESCRIPTION	EXISTING	PROPOSED
PROPERTY LINE		
PROPERTY LINE ADJACENT		
APPROXIMATE LIMITS OF WORK		
INTERMEDIATE CONTOURS		
INDEX CONTOURS	25	25
SPOT GRADE	X 141.2	141.2
MAGNITUDE & DIRECTION OF SLOPE		
STORM DRAIN	SD SD	
PERFORATED STORM DRAIN		
STORM UNDERDRAIN		UD
SANITARY SEWER	SS SS	
WATER SERVICE	W W	
UNDERGROUND ELECTRIC	E E	
CURB		
EDGE OF PAVEMENT		
FENCE (CHAIN LINK)		
FENCE (WOOD)		
FENCE (METAL)		
STORM DRAIN STRUCTURES	MANHOLE (D) CATCH BASIN	MANHOLE (D)
WATER SERVICE STRUCTURES	VALVE	
GAS SERVICE STRUCTURES	VALVE GG	
ELECTRIC SERVICE STRUCTURES	UTILITY CO. POLE LIGHT	
TREELINE		
TREE	PINE MAPLE/OAK	

ABBREVIATIONS

ABDN('D)	ABANDON(ED)
APPROX.	APPROXIMATE
BC	BOTTOM OF CURB ELEVATION
BIT. CONC.	BITUMINOUS CONCRETE
BR	BOTTOM OF RAMP ELEVATION
BS	BOTTOM OF STEP ELEVATION
BW	BOTTOM OF WALL ELEVATION
CL	CENTERLINE
CLF	CHAIN LINK FENCE
CLSTR	CLUSTERING TREE
CONC	CONCRETE
CY	CUBIC YARD
DIA	DIAMETER
DMH	DRAIN MANHOLE
E	EAST
EG	EXISTING GRADE
EL/ELEV	ELEVATION
ELEC	ELECTRIC
EOP	EDGE OF PAVEMENT
EXIST	EXISTING
FFE	FINISHED FLOOR ELEVATION
HMA	HOT MIX ASPHALT
HP	HIGH POINT
HYD	HYDRANT
ICV	IRRIGATION CONTROL VALVE
IN	INCHES
INV	INVERT
LT	LEFT
MAP	MAPLE
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
N	NORTH
N/F	NOW OR FORMERLY
NTS	NOT TO SCALE
OC	ON CENTER
PERF	PERFORATED
PG	PAGE
PI	POINT OF INTERSECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
R	RADIUS
RD	ROAD
RCP	REINFORCED CONCRETE PIPE
REC	RECORD
REV	REVISION
RT	RIGHT
R&D	REMOVE AND DISPOSE
S	SOUTH
SCH	SCHEDULE
SF	SQUARE FOOT
STA	STATION
STRM	STORM
T	TANGENT LENGTH
TBM	TEMPORARY BENCH MARK
TC	TOP OF CURB
TR	TOP OF RAMP ELEVATION
TS	TOP OF STEP ELEVATION
TW	TOP OF WALL ELEVATION
TYP	TYPICAL
UP	UTILITY POLE
W	WATER
WV	WATER VALVE

BASE PLAN NOTES

1. THE EXISTING CONDITIONS INFORMATION SHOWN ON THE DRAWINGS IS BASED ON THE FOLLOWING:
   - SURVEY DRAWINGS PROVIDED BY SHERMAN AND FRYDRYK TITLED "EXISTING CONDITIONS PLAN" AND DATED NOVEMBER 10, 2025.
   - CCTV DRAINAGE INVESTIGATIONS PERFORMED BY EST ASSOCIATES, INC AND OBSERVED BY TIGHE & BOND ON SEPTEMBER 27, 2025
2. THE ACCURACY AND COMPLETENESS OF SUBSURFACE INFORMATION (E.G., EXISTING UTILITIES) SHOWN ON THESE DRAWINGS IS NOT GUARANTEED AND SOME SUBSURFACE INFORMATION MAY NOT BE SHOWN. DETERMINE THE LOCATIONS AND ELEVATIONS OF ALL SUBSURFACE FEATURES WHICH MAY AFFECT CONSTRUCTION OPERATIONS BY TEST PIT OR OTHER METHODS, AS NECESSARY TO PREVENT DAMAGE TO UTILITIES AND OTHER SUBSURFACE FEATURES, AND/OR INTERRUPTIONS IN UTILITY SERVICE. PROVIDE DATA COLLECTED THROUGH THESE INVESTIGATIONS TO THE ENGINEER PRIOR TO CONSTRUCTING THE PROPOSED IMPROVEMENTS.
3. THE DRAWINGS ARE BASED ON THE FOLLOWING DATUMS: HORIZONTAL NAD83 ; VERTICAL NAVD88.
4. THE EXISTING CONDITIONS SHOWN ARE APPROXIMATE. FIELD VERIFY EXISTING CONDITIONS.
5. THE PROPERTY LINES SHOWN ON THE DRAWINGS ARE APPROXIMATE AND ARE NOT BASED ON DEED OR PLAN RESEARCH.

GENERAL NOTES

1. NOTIFY DIGSAFE AT 1-888-344-7233 AND OTHER UTILITY OWNERS IN THE AREA NOT ON THE DIGSAFE LIST AT LEAST 72 HOURS PRIOR TO ANY DIGGING, TRENCHING, ROCK REMOVAL, DEMOLITION, BORING, BACKFILLING, GRADING, LANDSCAPING, OR ANY OTHER EARTH MOVING OPERATIONS.
2. THE CONTRACTOR IS RESPONSIBLE FOR SUPPORT OF EXISTING UTILITIES AND REPAIR OR REPLACEMENT COSTS OF UTILITIES DAMAGED DURING CONSTRUCTION, WHETHER ABOVE OR BELOW GRADE. REPLACE DAMAGED UTILITIES IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER AND AT NO COST TO THE PROPERTY OWNER
3. BOLD TEXT AND LINES INDICATE PROPOSED WORK. LIGHT TEXT AND LINES INDICATE APPROXIMATE EXISTING CONDITIONS.
4. TIGHE & BOND ASSUMES NO RESPONSIBILITY FOR ANY ISSUES, LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM TIGHE & BOND.
5. EXCAVATE ADDITIONAL TEST PITS TO LOCATE EXISTING UTILITIES AS DIRECTED OR APPROVED BY THE ENGINEER.
6. NOTIFY THE ENGINEER OF ANY UTILITIES IDENTIFIED DURING CONSTRUCTION THAT ARE NOT SHOWN ON THE DRAWINGS OR THAT DIFFER IN SIZE OR MATERIAL.
7. THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY; COORDINATION WITH THE OWNER, ALL SUBCONTRACTORS, AND WITH OTHER CONTRACTORS WORKING WITHIN THE LIMITS OF WORK, THE MEANS AND METHODS OF CONSTRUCTING THE PROPOSED WORK.
8. OBTAIN, PAY FOR AND COMPLY WITH PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK. ARRANGE AND PAY FOR NECESSARY INSPECTIONS AND APPROVALS FROM THE JURISDICTIONAL AUTHORITIES.
9. SHORE UTILITY TRENCHES WHERE FIELD CONDITIONS DICTATE AND/OR WHERE REQUIRED BY LOCAL, STATE AND FEDERAL HEALTH AND SAFETY CODES.
10. FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION. IF FIELD CONDITIONS ARE OBSERVED THAT VARY SIGNIFICANTLY FROM THOSE SHOWN ON THE DRAWINGS, IMMEDIATELY NOTIFY THE ENGINEER IN WRITING FOR RESOLUTION OF THE CONFLICTING INFORMATION.
11. PROTECT AND MAINTAIN ALL UTILITIES IN THE AREAS UNDER CONSTRUCTION DURING THE WORK. LEAVE ALL PIPES AND STRUCTURES WITHIN THE LIMITS OF THE CONTRACT IN A CLEAN AND OPERABLE CONDITION AT THE COMPLETION OF THE WORK. TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SAND AND SILT FROM DISTURBED AREAS FROM ENTERING THE DRAINAGE SYSTEM.
12. NOTIFY THE ENGINEER IN WRITING OF ANY CONFLICT, ERROR, AMBIGUITY, OR DISCREPANCY WITH THE PLANS OR BETWEEN THE PLANS AND ANY APPLICABLE LAW, REGULATION, CODE, STANDARD SPECIFICATION, OR MANUFACTURER'S INSTRUCTIONS.
13. EXCAVATE WITH EQUIPMENT SELECTED TO MINIMIZE DAMAGE TO EXISTING UTILITIES OR OTHER FACILITIES. HAND EXCAVATE AS NECESSARY TO LOCATE UTILITIES AND AVOID DAMAGE.
14. TAKE NECESSARY MEASURES AND PROVIDE CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE, AND STRENGTH TO PREVENT ACCESS TO ALL WORK AND STAGING AREAS AT THE COMPLETION OF EACH DAYS WORK.
15. NO OPEN TRENCHES WILL BE ALLOWED OVER NIGHT.
16. MAINTAIN EMERGENCY ACCESS TO ALL PROPERTIES WITHIN THE PROJECT AREA AT ALL TIMES DURING CONSTRUCTION.
17. REMOVE AND DISPOSE OF ALL CONSTRUCTION-RELATED WASTE MATERIALS AND DEBRIS IN STRICT ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS.
18. THE TERM "DEMOLISH" USED ON THE DRAWINGS MEANS TO REMOVE AND DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS.
19. THE TERM "ABANDON" USED ON THE DRAWINGS MEANS TO LEAVE IN PLACE AND TAKE APPROPRIATE MEASURES TO DECOMMISSION AS SPECIFIED OR NOTED ON THE DRAWINGS.
20. ALL PROPOSED WORK MAY BE ADJUSTED IN THE FIELD BY THE OWNER'S PROJECT REPRESENTATIVE TO MEET EXISTING CONDITIONS.

SURFACE RESTORATION NOTES

1. ALL PAVEMENT DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
2. PROVIDE SITE GRADING AT ACCESSIBLE SIDEWALK RAMPS, SIDEWALKS, AND BUILDING ENTRANCES THAT IS CONSISTENT WITH THE RELEVANT ACCESS REQUIREMENTS OF THE ARCHITECTURAL BARRIERS ACT (ABA), THE AMERICANS WITH DISABILITIES ACT (ADA), AND MA ARCHITECTURAL ACCESS BOARD REQUIREMENTS (AAB). SMALL CHANGES IN GRADE OVER RELATIVELY SHORT DISTANCES (E.G. AT PARKING SPACES, ACCESSIBLE ROUTES, AND RAMPS) MIGHT NOT BE CLEARLY DEPICTED WITHIN THE CONTOUR INTERVAL SHOWN. COMPLY WITH THE CRITERIA IN THESE STANDARDS. SELECT MAXIMUM SLOPE CRITERIA ARE REPRODUCED BELOW:
   - LONGITUDINAL SLOPE ALONG ACCESSIBLE ROUTES < 5.0%
   - CROSS SLOPE ALONG ACCESSIBLE ROUTES < 2.0%
3. PROTECT PROJECT FEATURES (E.G., WALLS, FENCES, MAIL BOXES, SIGNS, SIDEWALKS, CURBING, STAIRS, WALKWAYS, TREES, ETC.) FROM DAMAGE DURING CONSTRUCTION, INCLUDING PROVIDING TEMPORARY SUPPORTS, WHEN APPROPRIATE.
4. IF REMOVAL OF PROJECT FEATURES IS REQUIRED IN ORDER TO PERFORM THE PROPOSED WORK, REMOVE THOSE SITE FEATURES ONLY UPON APPROVAL OF ENGINEER. REPLACE ALL REMOVED PROJECT FEATURES; NEW ITEMS SHALL BE EQUAL OR BETTER IN QUALITY AND CONDITION TO THE ITEMS REMOVED.
5. EXISTING SURVEY MONUMENTS DISTURBED BY THE CONTRACTOR SHALL BE REPLACED BY A LAND SURVEYOR LICENSED IN THE STATE IN WHICH THE WORK IS PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
6. COORDINATE THE ADJUSTMENT OF EXISTING UTILITY STRUCTURES WITH EACH RESPONSIBLE UTILITY OWNER PRIOR TO RECONSTRUCTION AND/OR PAVING OPERATIONS. RAISE ALL STRUCTURES TO FINISHED GRADES PRIOR TO THE END OF THE CONSTRUCTION SEASON AND PRIOR TO FINISHED PAVING.
7. REPAIR DISTURBED PAVED SURFACES AT THE END OF EACH WORK WEEK, UNLESS OTHERWISE APPROVED/REQUIRED BY THE OWNER.
8. TRANSFER ALL TEMPORARY BENCHMARKS, AS NECESSARY.
9. RESTORE ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE PAYLINE LIMITS TO ORIGINAL CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
10. REGRADE ALL UNPAVED AREAS DISTURBED BY THE WORK AS REQUIRED. REPAIR/REPLACE PAVED SURFACES DISTURBED BY THE WORK IN-KIND, UNLESS OTHERWISE NOTED. RESTORE SURFACES TO EXISTING OR PROPOSED CONDITIONS AS INDICATED ON THE DRAWINGS.
11. PROVIDE A SMOOTH, FLUSH TRANSITION BETWEEN ALL NEW AND EXISTING PAVEMENTS AND WALKING SURFACES.

EROSION CONTROL AND RESOURCE AREA PROTECTION NOTES

1. PROVIDE ALL EROSION CONTROL MEASURES SHOWN, SPECIFIED, REQUIRED BY PERMIT, AND/OR REQUIRED BY THE ENGINEER PRIOR TO ANY CONSTRUCTION OR IMMEDIATELY UPON REQUEST. MAINTAIN SUCH CONTROL MEASURES UNTIL FINAL SURFACE TREATMENTS ARE IN PLACE AND/OR UNTIL PERMANENT VEGETATION IS ESTABLISHED. INSPECT AFTER EACH RAINSTORM AND DURING MAJOR STORM EVENTS TO CONFIRM THAT ALL SEDIMENTATION AND EROSION CONTROL MEASURES REQUIRED ARE IN PLACE AND EFFECTIVE.
2. PRIOR TO STARTING WORK, CLEARLY STAKE WORK LIMITS. DO NOT DISTURB VEGETATION AND TOPSOIL BEYOND THE PROPOSED LIMITS. COORDINATE WITH THE ENGINEER FOR LOCATIONS OF TEMPORARY STOCKPILING OF TOPSOIL DURING CONSTRUCTION.
3. COMPACT, STABILIZE, AND LOAM AND SEED SIDE SLOPES, SHOULDER AREAS AND DISTURBED VEGETATED AREAS IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND AS REQUIRED BY PERMITS. GRADE SIDE SLOPES, SHOULDER AREAS AND DISTURBED VEGETATED AREAS TO A MAXIMUM SLOPE OF 3 HORIZONTAL TO 1 VERTICAL (3H:1V), WHERE POSSIBLE. PROVIDE BIODEGRADABLE EROSION CONTROL BLANKETS TO PREVENT EROSION WHERE SLOPES ARE STEEPER THAN 3H:1V.
4. SWEEP, COLLECT, REMOVE AND DISPOSE OF ANY SEDIMENT TRACKED ONTO PUBLIC RIGHT-OF-WAYS AT THE END OF EACH DAY.
5. LOAM AND SEED ALL DISTURBED VEGETATED AREAS TO ESTABLISH COVER AND STABILIZATION AS SOON AS POSSIBLE FOLLOWING DISTURBANCE.
6. MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES ON-SITE FOR EMERGENCY REPAIRS.
7. STORE FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE TO A SECURE LOCKED AND COVERED AREA DURING NON-WORK HOURS.
8. PROVIDE A SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS SUCH AS BOOMS, BLANKETS, AND OIL ABSORBENT MATERIALS AT THE CONSTRUCTION SITE AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS. IMMEDIATELY REPORT SPILLS OF HAZARDOUS MATERIALS TO THE STATE ENVIRONMENTAL AGENCY AND THE MUNICIPALITY WHERE THE WORK IS OCCURRING.

Tighe & Bond
53 Southampton Road
Westfield, MA 01085
T 413.562.1600

ISSUED FOR BID

Eliot Elementary School Rec Improvements

Town of Needham

Needham, Massachusetts

MARK	DATE	DESCRIPTION

PROJECT NO:	N5001-014
DATE:	05/18/2026
FILE:	N5001-014 Issued For Bidding.dwg
DRAWN BY:	M. MARTIN
DESIGNED BY:	E. GJERTSEN
CHECKED BY:	R. MORRISON
APPROVED BY:	J. VIAMARI / R. HOUGHTON

GENERAL NOTES, LEGEND AND ABBREVIATIONS

SCALE: AS SHOWN

L000

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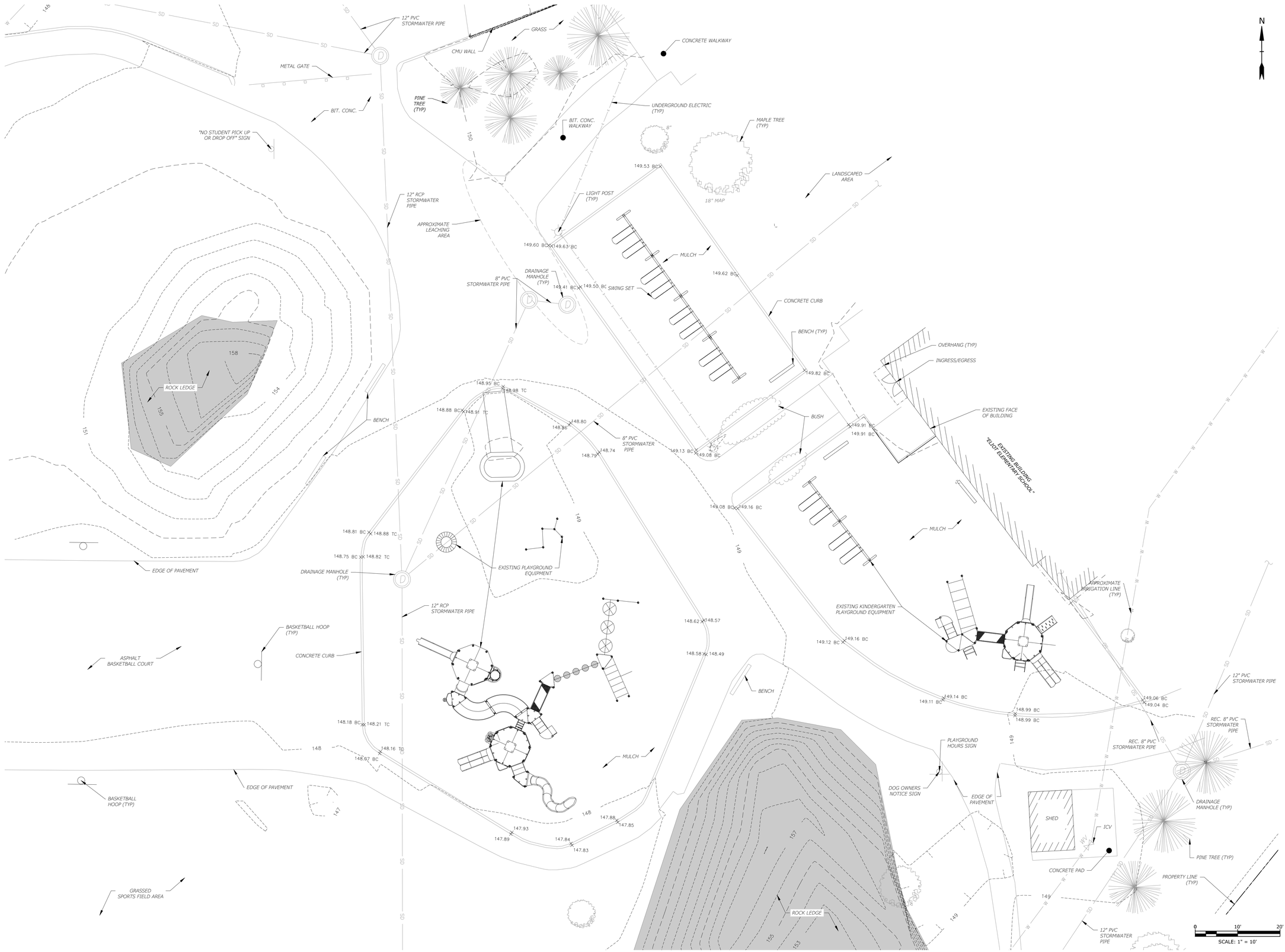

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EXISTING CONDITIONS PLAN

SCALE: AS SHOWN

L100

Last Saved: 6/9/2026
Plotted On:Jun 09, 2026-1:39pm By: EGjertsen
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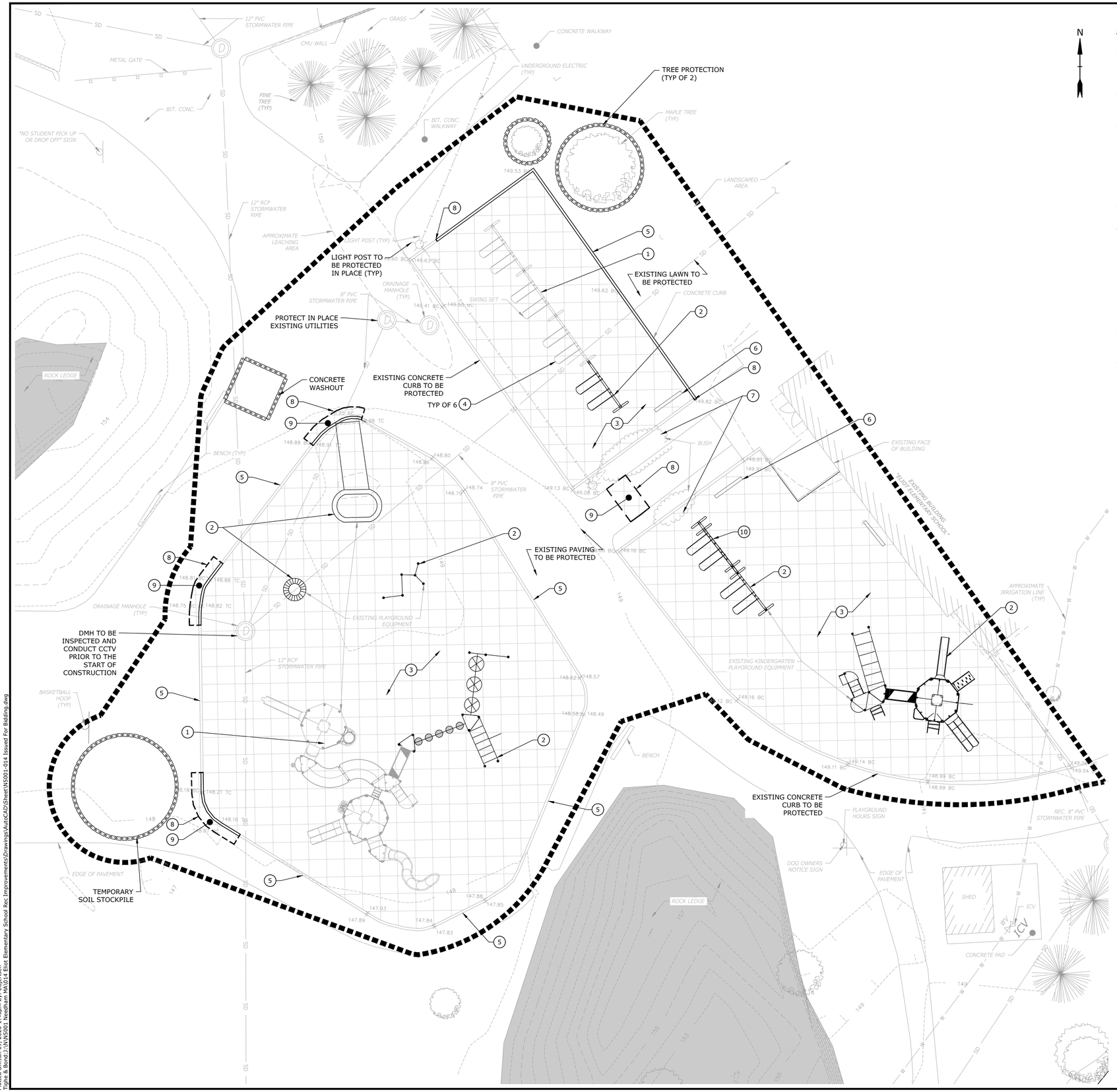

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SITE PREPARATION & DEMOLITION NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR A THOROUGH SITE EXAMINATION TO DETERMINE THE EXTENT OF DEMOLITION NECESSARY TO PREPARE THE SITE FOR CONSTRUCTION AND SHALL VERIFY ITEMS TO BE DEMOLISHED, SALVAGED, OR PROTECTED WITH THE OWNER OR OWNERS REP PRIOR TO BEGINNING WORK.
2. CARE SHALL BE TAKEN NOT TO DAMAGE ITEMS DESIGNATED TO REMAIN OR DESIGNATED TO BE SALVAGED; REPAIR OR REPLACEMENT OF DAMAGED TO REMAIN THEREBY DESIGNATED SHALL BE AT THE CONTRACTOR'S EXPENSE.
3. DISPOSAL OF ITEMS DESIGNATED TO BE REMOVED SHALL CONFORM TO APPLICABLE LAWS AND REGULATIONS. SALVAGEABLE MATERIAL SHALL BE DELIVERED BY THE CONTRACTOR TO CITY OWNED STORAGE AREAS WITHIN CITY LIMITS AS DESIGNATED BY THE OWNER. A PLAN INDICATING AREAS FOR STOCKPILING MATERIALS SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL PRIOR TO BEGINNING WORK.
4. VERIFY ALL UTILITY LOCATIONS PRIOR TO EXCAVATION. REPORT DISCREPANCIES OR CONFLICTS IN WRITING TO THE OWNER'S REPRESENTATIVE AND RECEIVE INSTRUCTIONS PRIOR TO PROCEEDING.
5. CONTRACTOR RESPONSIBLE TO REPAIR DAMAGE DUE TO CONSTRUCTION OPERATIONS INSIDE AND OUTSIDE THE LIMIT OF WORK LINE.
6. ERECT AND MAINTAIN CONSTRUCTION FENCING SURROUNDING PARK LIMIT OF WORK FOR DURATION OF CONSTRUCTION OPERATIONS. CONSTRUCTION FENCING SHALL BE CHAINLINK WITH DUST SCREENING SET WITH TEMPORARY BASES WITH GATES. CONTRACTOR SHALL MAINTAIN FENCING THROUGHOUT CONSTRUCTION IN PLUMB CONDITION. ANY DAMAGED FENCING OR SCREENING SHALL BE REPLACED IMMEDIATELY BY CONTRACTOR.
7. ERECT AND MAINTAIN CONSTRUCTION FENCING AT SIDEWALK LIMITS AS CONSTRUCTION PHASING REQUIRES. SCHEDULE AND COORDINATE UTILITY, SIDEWALK, ROADWAY, AND STREETSCAPE WORK IN PUBLIC WAY TO MINIMIZE IMPACTS TO PUBLIC ACCESS AND PROTECT NEW WORK. PROVIDE PEDESTRIAN AND VEHICULAR ACCESS PLANS TO OWNERS REPRESENTATIVE FOR REVIEW AND APPROVAL PRIOR TO PERFORMING WORK IN PUBLIC WAY OR ERECTING/RELOCATING CONSTRUCTION FENCES.
8. EXCESS SOILS TO BE LEGALLY DISPOSED OF OFF SITE BY CONTRACTOR. DETERMINE VOLUME OF SOILS FOR EXPORT AND IMPORT TO MEET DESIGN INTENT AND DETAILING. CONTRACTOR TO PROVIDE ALL IMPORT SOIL PER PROJECT REQUIREMENTS.
9. ALL EXISTING SITE ITEMS WITHIN THE LIMIT OF WORK, NOT LIMITED TO GRANITE WALLS, GRANITE CURBS, TREES, SITE FURNISHINGS, ETC. ARE TO REMAIN AND BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.

SITE PREPARATION LEGEND:

TAG	DESCRIPTION
1	PROTECT EXISTING PLAYGROUND EQUIPMENT
2	DEMOLISH PLAYGROUND EQUIPMENT
3	DEMOLISH APPROX. 18" EXISTING MULCH MATERIAL
4	REMOVE AND STORE BELT SEAT W/ PROGUARD
5	PROTECT OR DEMOLISH CONCRETE CURB DEPENDENT ON CURB CONDITION COORDINATE WITH TOWN REPRESENTATIVE
6	DEMOLISH BENCH AND FOOTING
7	DEMOLISH BUSH AS NECESSARY COORDINATE WITH OWNER FOR APPROVAL
8	SAWCUT BIT. CONC./CONCRETE CURB
9	DEMOLISH BIT. CONC.
10	RELOCATE PLAYGROUND EQUIPMENT TO LOCATIONS IDENTIFIED ON PLANS

LEGEND

APPROXIMATE LIMITS OF WORK
EROSION & SEDIMENT CONTROL
SAWCUT
SURFACE DEMOLITION

0 10' 20'
SCALE: 1" = 10'

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SITE PREPARATION PLAN

SCALE: AS SHOWN

L101

Last Saved: 6/9/2026
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MATERIALS LEGEND:

TAG	DESCRIPTION	LEGEND	DETAIL
	SURFACING/CURBING		
A1	REDUCED REPLACEMENT OF CONCRETE CURB REPLACE EXISTING CURB IN KIND. CONTRACTOR TO ASSUME A TOTAL OF 150 LF OF CURB REPLACEMENT		1/L201
A2	POURED-IN PLACE PLAYGROUND SURFACING		2/L201
A3	ENGINEERED WOOD FIBER SURFACE		1/L201 2/L201
A4	BIT. CONC. SURFACE		3/L201
A5	POURED-IN-PLACE PLAYGROUND SURFACING TERMINATION		4/L201
A6	EXISTING POSTS TO BE REPAINTED		
	EXISTING SITE FURNISHINGS		
B1	GRID WALK W/ GUARDRAILS		
B2	BRIDGE/RAMP TRANSITION BRKT.		
B3	RIGHT TRANSFER MODULE		
B4	PLAYODYSSEY DECK WITH ROOF DIRECT BURY ONLY		
B5	SLIDEWINDER 2 DB ONLY		
B6	DECK TO DECK STEPS (2)		
B7	FIRE POLE		
B8	DOUBLE SWOOSH SLIDE		
B9	SUMMIT CLIMBER PLAYODYSSEY		
B10	BRIDGE/RAMP TRANSITION BRKT.		
B11	90* CURVED BRIDGE		
B12	CHIMNEY CLIMBER		
B13	CORKSCREW		
B14	PLAYODYSSEY DECK WITH ROOF DIRECT BURY ONLY		
B15	SINGLE WAVE SLIDE		
B16	5" ARCH SWING (TYP OF 4)		
B17	RELOCATED 5" ARCH SWING		
B18	BELT SEAT W/ PROGUARD CHAINS 8' BEAM HEIGHT (TYP OF 7)		
	SITE FURNISHINGS		
C1	CHILL SPINNER - 247189		
C2	GLOBAL MOTION - 218915		
C3	72" (3) OR 92" (4) TENDERTUFF PICNIC TABLE W/2 72" SEATS PERMANENT - DB ONLY (TYP OF 7) - 141684		
C4	SKYWAYS 16' X 16' CANTILEVER SINGLE POST PYRAMID W/ RAPID RELEASE W/ 12' ENTRANCE - 237675		
C5	WE-G-ROUND PERF PANELS 2 SEATS DB ONLY - 248819		
C6	ALPINE SLIDE - *CP021046		
C7	O-ZONE CLIMBER - *CP021046		
C8	NET CLIMBER - *CP021046		
C9	DTR IND CRAB TRAP W/ALPINE SLIDE & TRANSFER - *CP021046		
C10	FOOTPRINT BALANCE BEAM - 307436		
C11	WOOD PLANKING WIGGLE LADDER - 169318		
C12	ZENITH CLIMBER FOR 7 POST NETFLEX - 272371		
C13	SKYPORT CLIMBER 7 POST - 193175		
C14	LOLLILADDER W/ (2) E-PODS - 193170		
C15	TIGHTROPE NO DECKS - 193173		
C16	SWIGGLE KNOTS NO DECKS - 193171		
C17	FOOTPRINT STEPPER (TYP OF 4) - 307434		
C18	PIPE BARRIER - 116244		
C19	CONICAL CLIMBER - 143199		
C20	SQUARE LOOP INCLINE CLIMBER - 345332		
C21	DRIVER PANEL - 345280		
C22	FLEXX SWING 5" ARCH FRAME ADDITONAL BAY - 352216		
C23	MOLDED SEAT/HARNESS W/ PROGUARD CHAINS 8' BEAM HEIGHT - 177351		
C24	SKYWAYS 30' X 30' HIP W/ RAPID REALEASE 8' ENTRANCE - 227371		
C25	WELCOME SIGN - 182504		

PLAYGROUND EQUIPMENT NOTES:

1. FALL ZONE AREAS SHOWN FOR REFERENCE ONLY. CONTRACTOR TO ENSURE ALL FALL ZONE REQUIREMENTS ARE BEING MET PRIOR TO INSTALLATION OF EQUIPMENT

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ISSUED FOR BID

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Needham, Massachusetts

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FILE:	N5001-014 Issued For Bidding.dwg
DRAWN BY:	M. MARTIN
DESIGNED BY:	E. GJERTSEN
CHECKED BY:	R. MORRISON
APPROVED BY:	J. VIAMARI / R. HOUGHTON

SITE MATERIAL AND LAYOUT PLAN

SCALE: AS SHOWN

L201

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GRADING NOTES

1. REVIEW DRAWINGS TO DETERMINE THE TOTAL SCOPE AND COORDINATION OF WORK. EMPLOY A LICENSED SURVEYOR OR REGISTERED CIVIL ENGINEER TO VERIFY AND LAYOUT GRADES, LINES AND DIMENSIONS SHOWN ON DRAWINGS. VERIFY EXISTING GRADES AND ELEVATIONS OF ADJACENT SITE CONDITIONS WITH ELEVATIONS ON DRAWINGS PRIOR TO BEGINNING WORK. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REPORT DISCREPANCIES TO THE OWNER'S REPRESENTATIVE IMMEDIATELY AND RECEIVE WRITTEN INSTRUCTIONS PRIOR TO PROCEEDING WITH CONSTRUCTION.
2. USE ONE SINGLE BENCHMARK FOR WORK.
3. GRADE EVENLY BETWEEN SPOT GRADES AS NOTED.
4. THE CONTRACTOR SHALL VERIFY EXISTING UTILITY LOCATIONS PRIOR TO EXCAVATION OF ANY TYPE.
5. EXCAVATE BY HAND IN CLOSE PROXIMITY TO EXISTING UTILITIES, STRUCTURES AND ITEMS TO REMAIN, INCLUDING TREES.
6. RIM ELEVATIONS OF ANY NEW / EXISTING DRAINAGE AND UTILITY STRUCTURES OUTSIDE OF THE POURED-IN-PLACE PLAYGROUND SURFACING AND WOOD FIBER SURFACING SHALL BE FLUSH WITH FINAL SURROUNDING GRADES SO NOT TO CAUSE A TRIP EDGE.
7. FINAL SHAPING OF EARTHWORK SHALL BE APPROVED IN THE FIELD BY THE LANDSCAPE ARCHITECT AND OWNER. LANDSCAPE ARCHITECT TO REVIEW AND APPROVE ROUGH GRADING BEFORE THE CONTRACTOR COMMENCES FINE GRADING AND LAYING OF TOPSOIL.
8. PITCH PAVEMENT TO PROVIDE POSITIVE DRAINAGE.
9. PAVEMENT CROSS PITCH SHALL NOT BE GREATER THAN 1.9% OR LESS THAN 0.50%.

CLEAN OUT 2
RIM: 149.6'
OUTLET INVERT: 145.6'

149.6 TC/BC

CO

15.00' (TYP)

40LF 6" PERF HDPE PIPE @ 1% SLOPE

SUBGRADE TO DRAIN SLOPE 1% MIN

DRAINAGE MANHOLE 2
RIM: 149.0'
INLET INVERT (W): 145.20'
INLET INVERT (E): 145.20'
OUTLET INVERT (S): 145.18'
APPROX
VERIFY IN FIELD

149.8 TC/BC

MATCH EXISTING GRADES AND MEET FLUSH WITH ADJACENT PAVING

82LF 6" HDPE PIPE @ 1% SLOPE
PIPE TO BE PERF IN PLAYGROUND AREA
OTHERWISE PIPE IS SOLID WALL

72.25 LF 8" HDPE PERF PIPE @ 0.75% SLOPE

DRAINAGE MANHOLE 1
RM: 148.49
OUTLET INVERT: 144.99

EXISTING DRAINAGE MANHOLE
RIM: 148.4' APPROX
INLET (E): 144.45'
OUTLET(S): 144.4' APPROX
VERIFY IN FIELD

CLEAN OUT 1
RIM: 148.1
OUTLET INVERT: 146.02

UNDERDRAIN (TYP)

COORDINATE FOOTING DETAIL WITH LSI PRIOR TO INSTALLATION TO AVOID EXISTING 8" PIPE

CONTRACTOR TO MATCH TC AND BC WHERE NEW CURBING MEETS EXISTING (TYP)

APPRX. IRRIGATION LINE (PVC)

ROCK LEDGE

EXISTING BUILDING "ELIOT ELEMENTARY SCHOOL"

0 10' 20'
SCALE: 1" = 10'

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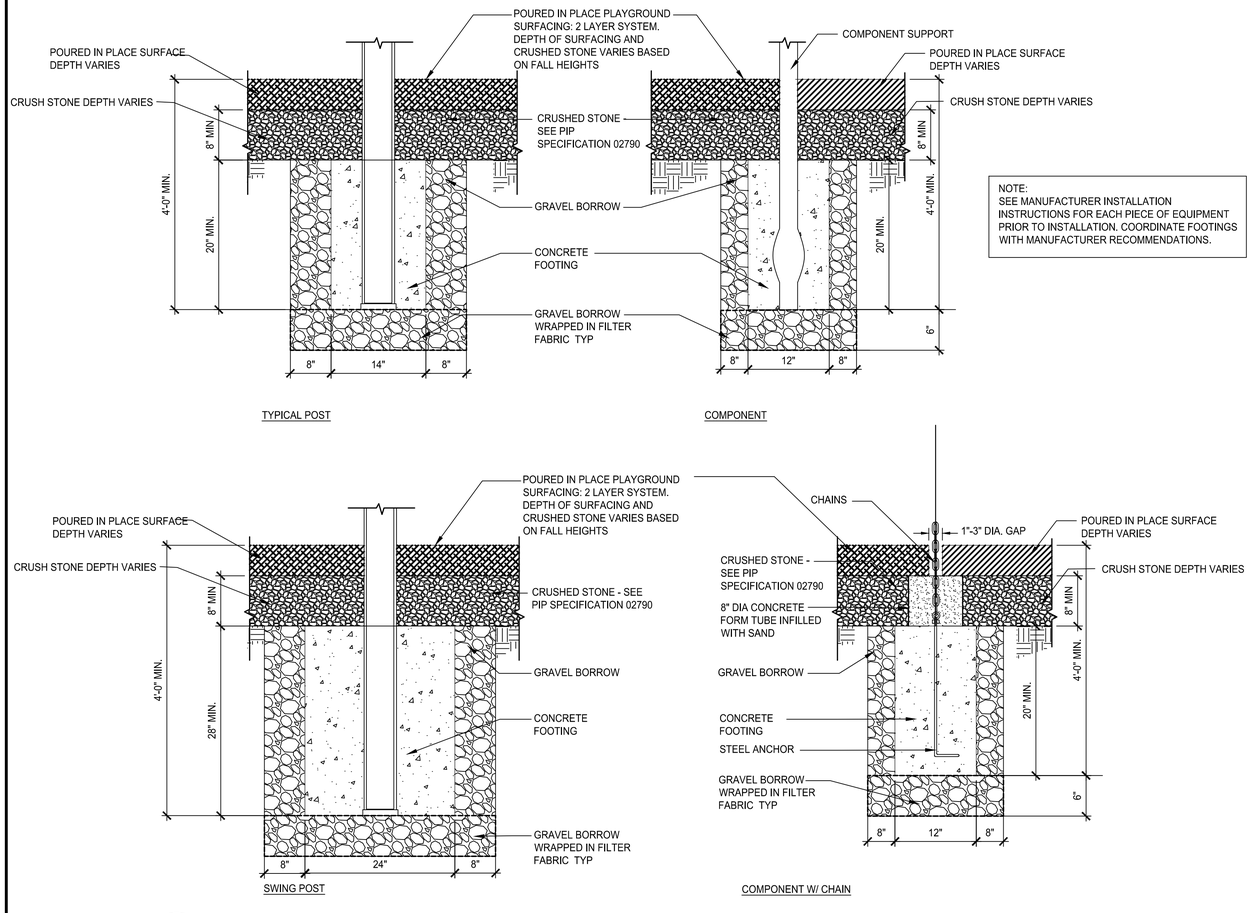
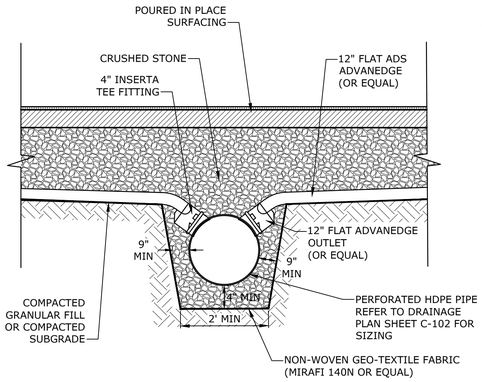
GRADING & DRAINAGE PLAN

SCALE: AS SHOWN

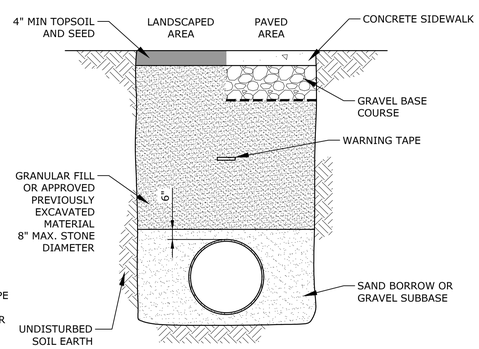
L202



1 PLAYGROUND EQUIPMENT FOOTINGS
Scale: NTS

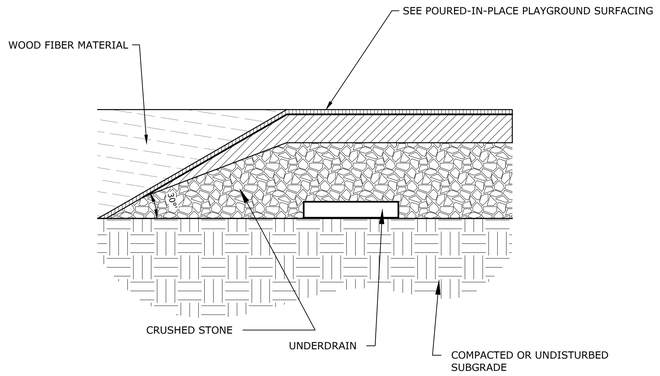


2 PLAYGROUND PERFORATED UNDERDRAIN SYSTEM
NTS

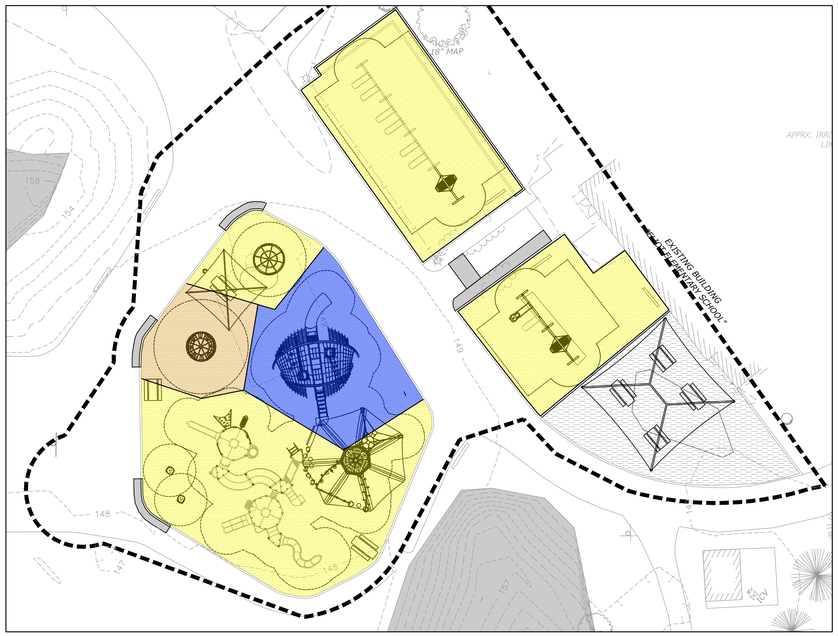


3 PLAYGROUND DRAINAGE PIPING
NTS

4 POURED-IN-PLACE PLAYGROUND SURFACING
NTS



5 POURED-IN-PLACE PLAYGROUND SURFACING TERMINATION
NTS



LEGEND

10 FT CFH - 4.5 INCH	1700 SF	
9 FT CFH - 4 INCH	825 SF	
8 FT CFH - 3.5 INCH	7167 SF	

NOTES:
1. CFH = CRITICAL FALL HEIGHT
2. PROVIDE POURED-IN-PLACE SURFACING THICKNESS TO EXTENTS OF FALL ZONES AND AS REQUIRED COORDINATE WITH PLAYGROUND MANUFACTURER.

6 POURED-IN-PLACE SURFACING THICKNESS
NTS

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SITE DETAILS - 1

SCALE: AS SHOWN

L401

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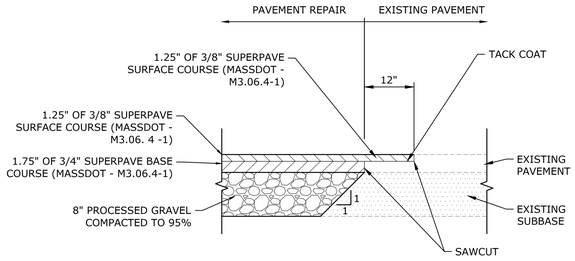
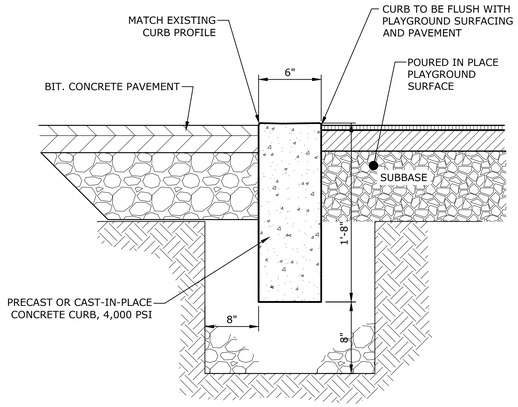


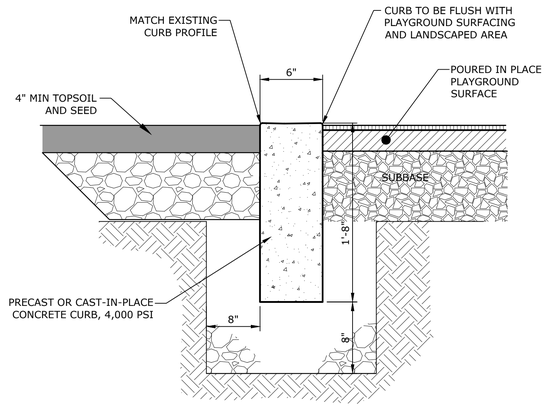
NOTES

1. TAMP EDGES WHERE PAVING ABUTS LOAM AND SEED AREAS
2. APPLY BITUMINOUS SEALANT ALONG ALL PAVEMENT SAWCUT LINES AND BUILDING INTERFACE
3. SEE SITE MATERIAL AND LAYOUT PLAN FOR SIDEWALK WIDTH AND LOCATIONS

1 BIT. CONCRETE PAVEMENT REPAIR
NTS



CONCRETE CURB ADJACENT TO BIT. CONC.

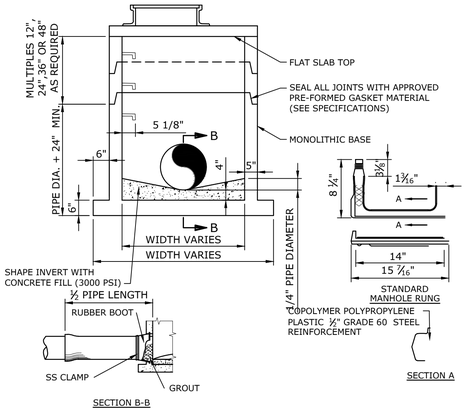


CONCRETE CURB ADJACENT TO GRASSED AREA

NOTES

1. CONSTRUCT CURBING IN SECTIONS NOT TO EXCEED 10 FEET IN LENGTH, SUCH THAT THE CURBING JOINTS ALIGN WITH JOINTS IN THE CONCRETE PAVEMENT SLAB. NO SECTION SHALL BE LESS THAN 6 FEET IN LENGTH.
2. PROVIDE EXPANSION JOINTS - 20' MAX.
3. APPLY (2) COATS OF APPROVED SEALER TO FRONT, TOP, AND BACK EDGES OF CONCRETE CURB.

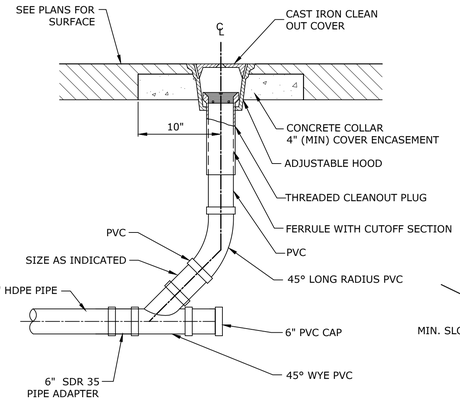
2 CONCRETE CURB
NTS



NOTES

1. CONCRETE MANHOLE TO BE SET ON 12" OF PROCESSED GRAVEL COMPACTED TO 95%

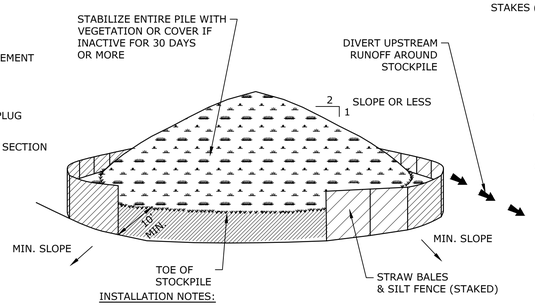
3 PRECAST DRAIN MANHOLE
NTS



NOTES

1. CLEAN OUT SERIES 8310 MADE BY JOSAM MANUE CO. (OR APPROVED EQUAL) WITH SCORIATED COVER & BRASS INTERNAL PLUG, TYPE 8316 (FOR 6" PIPE).

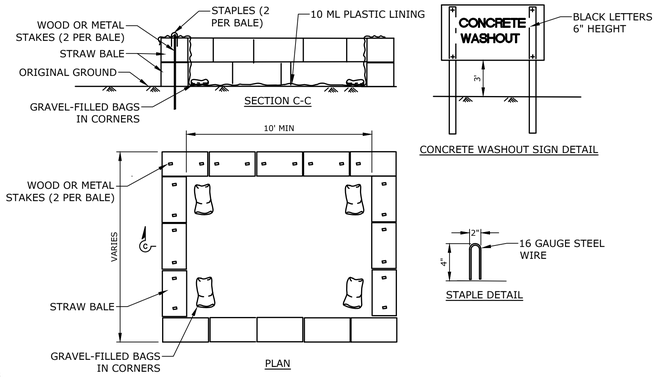
4 CLEAN OUT
NTS



INSTALLATION NOTES:

1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 2H:1V.
3. IF INACTIVE FOR 30 DAYS OR MORE, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING OR STRAW BALES, THEN STABILIZED WITH VEGETATION OR COVERED WITH TARP.

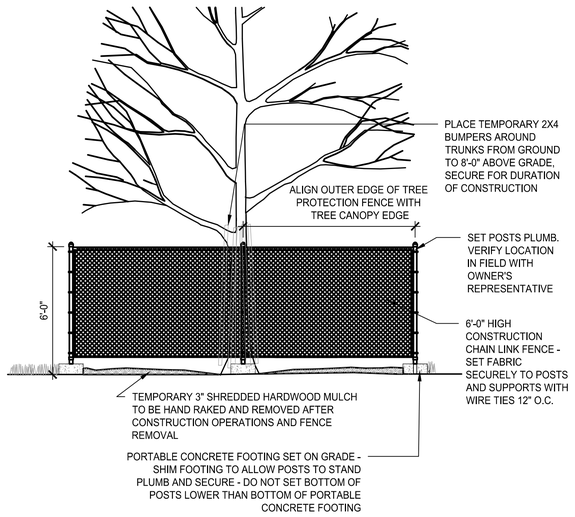
5 TEMPORARY SOIL STOCKPILING
NTS



NOTES

1. TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE LOCATED A MINIMUM OF 50 FEET FROM STORM DRAIN INLETS, OPEN DRAINAGE FACILITIES, AND WATER COURSES. EACH FACILITY SHOULD BE LOCATED AWAY FROM CONSTRUCTION TRAFFIC OR ACCESS AREAS TO PREVENT DISTURBANCE OR TRACKING.
2. A SIGN SHOULD BE INSTALLED ADJACENT TO EACH WASHOUT FACILITY TO INFORM CONCRETE EQUIPMENT OPERATORS TO UTILIZE THE PROPER FACILITIES.
3. TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE CONSTRUCTED ABOVE GRADE. TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE CONSTRUCTED AND MAINTAINED IN SUFFICIENT QUANTITY AND SIZE TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS.
4. TEMPORARY WASHOUT FACILITIES SHOULD HAVE A TEMPORARY PIT OR BERMED AREAS OF SUFFICIENT VOLUME TO COMPLETELY CONTAIN ALL LIQUID AND WASTE CONCRETE MATERIALS GENERATED DURING WASHOUT PROCEDURES.
5. WASHOUT OF CONCRETE TRUCKS SHOULD BE PERFORMED IN DESIGNATED AREAS ONLY.
6. ONLY CONCRETE FROM MIXER TRUCK CHUTES SHOULD BE WASHED INTO CONCRETE WASH OUT.
7. ONCE CONCRETE WASTES ARE WASHED INTO THE DESIGNATED AREA AND ALLOWED TO HARDEN, THE CONCRETE SHOULD BE BROKEN UP, REMOVED, AND DISPOSED OF PER SOLID WASTE MANAGEMENT STANDARDS. DISPOSE OF HARDENED CONCRETE ON A REGULAR BASIS.

6 CONCRETE WASHOUT
NTS



7 TREE PROTECTION
NTS

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SITE DETAILS - 2

SCALE: AS SHOWN

L402

Last Saved: 6/9/2026
Plotted On: Jun 09, 2026 - 1:43pm By: EGjertsen
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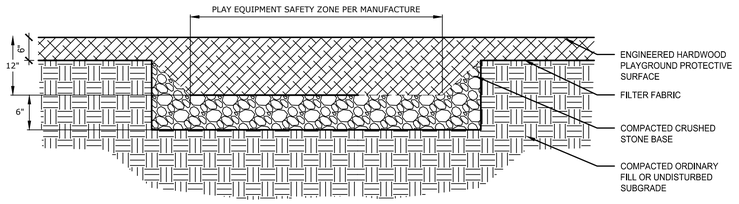
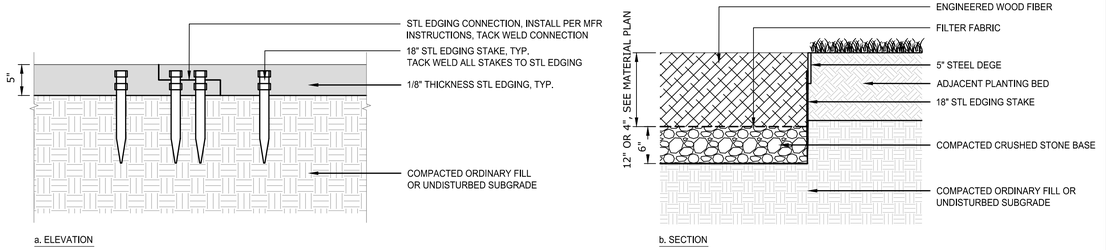


1 ENGINEERED WOOD FIBER SURFACING
NTS



2 STEEL EDGING
NTS

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SITE DETAILS - 3

SCALE: AS SHOWN

L403

Last Saved: 6/9/2026
Plotted On:Jun 09, 2026-1:44pm By: EGjertsen
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