

THE CITY OF WALTHAM
MASSACHUSETTS

PURCHASING DEPARTMENT

Cornelia Warren Park Improvements, 2019

ADDENDUM NO. 2

May 24th, 2019

CHANGES, CORRECTIONS AND CLARIFICATIONS

The attention of bidders submitting proposals for the above subject project is called to the following addendum to the specifications. The items set forth herein, whether of omission, addition, substitution or clarification are all to be included in and form a part of the proposal submitted.

THE NUMBER OF THIS ADDENDUM (NO. 1) MUST BE ACKNOWLEDGED ON YOUR FORM FOR GENERAL BID PAGE.

ITEM 1: ANSWERS TO POSED QUESTIONS

- Q1.** Is wiring to the athletic lighting and parking lot lighting by others? If by the contractor please specify the circuitry including wire size and quantity of conductors.
- A1.** Contractor is responsible for the athletic and parking lot lighting. Refer to attached electrical Specification Section 26 00 00.
- Q2.** Is the "wood guiderail" detailed on C5.2 the same as the "guardrail" noted on C3.1?
- A2.** Yes, the wood guiderail detail on C5.2 is for the guardrail as shown on plan C3.1.
- Q3.** On the layout drawing for the handicap curb ramp, can you show the limits of concrete pavement vs bituminous?
- A3.** Concrete shall extend to the top of the two ramp sections on either side of the flush concrete section, before beginning the bituminous sidewalk.
- Q4.** For the stone walls, are we to assume that there will be enough salvaged suitable stone available to construct the new ones?
- A4.** It is expected that there is adequate amount of stone, however, the contractor shall determine how much existing stone is salvageable and if additional matching stone is needed to supplement the wall.
- Q5.** What is the depth of the 12" wide concrete edge for the Golf Green & Fringe?
- A5.** Depth is 24". See revised Detail sheet C5.2.

- Q6.** Is the detail "Concrete Curb & Footing" that shows a 6" depth for the playground curbing?
A6. No, please see revised Detail sheet C5.2.
- Q7.** There is no detail showing the 4' High "Legi" fence. Please provide one if possible.
A7. Welded wire "Legi" fence specifications are provided in Specification Section 32 31 19 for fence and gate type. Footing details are provided on Detail sheet C5.2. Please refer to manufacturer's drawings for additional product and installation information.
- Q8.** The fence specifications call for .148 inch diameter wire 9 gauge. However the detail for the 8' high chain link fence calls for 1 3/4 mesh x 6 gauge. Please specify which type of chain link fabric is to be used.
A8. 8' high and 4' high chain link fence shall be 2" mesh x 9 gauge prior to PVC coating. Softball backstop shall be 1 3/4" mesh x 6 gauge.
- Q9.** The specifications call for round wire ties to be used to secure chain link to framework. Detail show SS Band-It or approved equal ties. Please specify which type to use.
A9. Ties - Fabric shall be attached using "Bandit" multi-lock cable ties or an approved equal. Multi-lock cable ties shall match color of fence fabric.
- Q10.** Please specify the type of finish to be used on the vehicular pipe gate. Galvanized, powder coated black or painted?
A10. Powder coated black finish on vehicular pipe gate.
- Q11.** What color should the plastic timbers being used for the backstop be?
A11. Dark green or wood colored plastic timbers for the backstop. Contractor to submit color choices for review and selection.
- Q12.** I wanted to find out if you are excepting alternates on the scoreboard going to Cornelia Park. If we are approved can you please let me know if this is going to be a new structure for the installation, or is it existing? If existing can you please send an as-builts you may have in order to figure install?
A12. We are accepting alternates for the scoreboard. A new structure will be required for the installation. There is no existing structure.
- Q13.** We cannot find any information on the type [of flag] (fiberglass/aluminum) or the size of the unit. Would also need to know if a flag is required.
A13. Flag pole shall be 30' fiberglass. 5'x8' American flag shall be furnished and installed by contractor.
- Q14.** The trees that are to be selectively removed along the west side are tangled in the fence line. Are we to remove and replace the fence?
A14. No fencing along the west side of the property shall be removed. Tree branches shall be pruned back to the limits of the fence.
- Q15.** On C3.2 there is a note for mountable curb. C3.1 only notes vertical curb. Can you please confirm the limits of mountable curb?
A15. Mountable curb is indicated on C3.1 as well as C3.2. It shall only be located in front of the vehicular pipe gate, approximately 12' in length.

ITEMS

- ITEM NO. 1** ADD sports field lighting structural base drawing, C1. See attached.
- ITEM NO. 2** Revision to Detail sheet C5.2 for revised concrete edge details at fitness area and golf area. Replace Drawing C5.2 with revised Drawing C5.2 attached.
- ITEM NO. 3** Revision to Irrigation Drawings and Specifications:
Irrigation plans and specifications entail a switch from PVC to SiDR-15 100 psi Polyethylene for mainline and pipe, except for a small area downstream of the backflow preventer cabinet (branching athletic field from site landscape). As required by the specifications, all mainline or constantly pressurized polyethylene pipe shall have barbed PVC insert fittings with two (2) stainless steel clamps on each side while laterals and non-pressurized pipe shall have one (1) clamp. Rotor sprinklers within the athletic field shall still have PVC swing joints with connection to the polyethylene lateral via a combination Insert x Insert x FPT PVC tee. No swing or funny pipe is allowed with rotor sprinklers.
In addition, the City of Waltham has requested a Hunter-brand controller capable of internet-based management. The controller to be submitted and installed shall be a Hunter HCC with Hydrowse and EZDS decoder system. A Wi-Fi service shall be coordinated with the site contractor to provide internet service for the HCC Controller.
- Replace Drawing IR-1.0 with revised Drawing IR-1.0 attached.
Replace Drawing IR-2.0 with revised Drawing IR-2.0 attached.
Replace Drawing IR-3.0 with revised Drawing IR-3.0 attached.
Replace Specification Section 32 84 00 with revised Specification Section 32 84 00 attached.
- ITEM NO. 4** Revision to Specification Section 32 18 13, Synthetic Grass Surfacing, Paragraph 2.2.A.1 Yarn Fiber: from "Monofilament polyethylene" to "polypropylene twisted slit-film".
- Replace Specification Section 32 18 13 with revised Specification Section 32 18 13 attached.
- ITEM NO. 5** Revision to Specification Section 32 33 00, Site Furnishings. All site furnishings, other than play equipment and fitness equipment, to be supplied by contractor.
- Replace Specification Section 32 33 00 with revised Specification Section 32 33 00 attached.
- ITEM NO. 6** ADD Specification Section 26 00 00 - Electrical.

End of Addendum 2

DESIGN NOTES

DESIGN PARAMETERS:
WIND: $V_{50} = 130$ MPH, $V_{30} = 101$ MPH (EXPOSURE C, RISK CATEGORY II) PER MASSACHUSETTS STATE BUILDING CODE - 780 CMR, 9TH EDITION (IBC 2015 / ASCE 7-10).
GEO TECHNICAL PARAMETERS:
ALLOWABLE LATERAL SOIL BEARING PRESSURE: 1,500 PSF OR SKIN FRICTION: 250 PSF
ALLOWABLE LATERAL SOIL BEARING PRESSURE:
100 PSF/FT (GRADE TO -2'-0"); 200 PSF/FT (BELOW -2'-0")
IN ACCORDANCE WITH MASSACHUSETTS STATE BUILDING CODE - 780 CMR, 9TH EDITION, CHAPTER 18. SEE TABLE 1806.2, SOIL MATERIAL CLASS 5 & SECTION 1806.3.1.
DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE.
A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.
ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT. CONCRETE BACKFILL MUST BE PLACED WITH A TREMIE WHEN SLURRY OR WATER IS PRESENT WITHIN THE EXCAVATION OR WHEN THE FREE DROP EXCEEDS 6'-0".
CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.
CONCRETE:
CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A MINIMUM COMPRESSIVE DESIGN STRENGTH AT 28 DAYS OF 3,000 PSI. 3,000 PSI CONCRETE SPECIFIED FOR EARLY POLE ERECTION. ACTUAL REQUIRED MINIMUM ALLOWABLE CONCRETE STRENGTH IS 1,000 PSI. ALL PIERS AND CONCRETE BACKFILL MUST BEAR ON AND AGAINST FIRM UNDISTURBED SOIL.
GENERAL NOTES:
FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H : 1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.



POLE FOUNDATION SCHEDULE

POLE DESIGNATION	FORCES (1)			DRILLED PIER		CONCRETE BACKFILL YD' (2)
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS	DIAMETER INCHES	EMBEDMENT DEPTH	
A1	35,066	1,028	1,055	30	10'-0"	1.3
A2	38,409	1,090	1,126	30	10'-0"	1.3
B1	57,363	1,407	1,417	30	12'-0"	1.5
B2	77,215	1,809	2,054	30	14'-0"	1.6
C1	38,599	1,127	1,138	30	10'-0"	1.3
C2	38,198	1,137	1,138	30	10'-0"	1.3

- ASD LOAD COMBINATION D + 0.6W. VERTICAL FORCE IS WEIGHT OF DRESSED POLE (DOES NOT INCLUDE PRECAST BASE WEIGHT).
- MINIMUM CONCRETE BACKFILL VOLUME. SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.

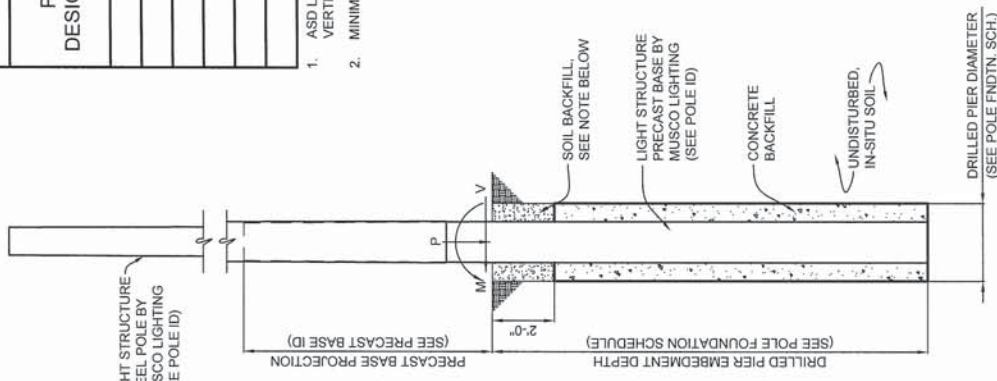
PRECAST BASE IDENTIFICATION

PRECAST BASE TYPE	PRECAST BASE WEIGHT	PRECAST BASE LENGTH	PROJECTION ABOVE GRADE	STANDARD EMBEDMENT	OUTSIDE DIAMETER
2B	1,690 LBS	17'-3"	7'-3"	10'-0"	12.00"
3B	2,470 LBS	20'-0"	8'-0"	12'-0"	13.38"
4B	3,490 LBS	22'-0"	8'-0"	14'-0"	15.75"

POLE IDENTIFICATION

POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX PER XARM)	FIXTURE AND ACCESSORIES EPA (FT ²)
A1	LSS60A	2B	4 (2)	7.7
A2	LSS60A	2B	5 (2)	9.8
B1	LSS70A	3B	5 (4)	9.5
B2	LSS70C	4B	7 (4) / (2)	13.3
C1	LSS60A	2B	5 (3)	10.6
C2	LSS60A	2B	5 (3)	10.9

- POLE A1 HAS (1) MUSCO LED AT 50'-0" AGL, INCLUDED ABOVE.
- POLE A2 HAS (2) MUSCO LED AT 50'-0" AGL, INCLUDED ABOVE.
- A & B POLES HAVE (1) MUSCO LED AT 15'-6" AGL, INCLUDED ABOVE.
- POLES C1 & C2 HAVE (2) MUSCO LED AT 15'-6" AGL, INCLUDED ABOVE.



POLE FOUNDATION ELEV.

SCALE: NOT TO SCALE
SOIL BACKFILL NOTE:
THE TOP TWO FEET OF ANNULUS SHALL BE BACKFILLED WITH SOIL WITH A CLASSIFICATION OF CLASS 5 (TABLE 1806.2) OR BETTER. COMPACTION 95% FOR COHESIVE SOIL AND 98% FOR A COHESIONLESS SOIL BASED UPON STANDARD PROCTOR TESTING (ASTM D698).

PREPARED FOR:
CITY OF WALTHAM
 610 MAIN STREET
 WALTHAM, MASSACHUSETTS

RECORD OWNER:
CITY OF WALTHAM
 4600/739
 054-004-0005

COMPILED BY: BEALS & THOMAS, INC.
 101 BEAVER STREET, SUITE 200
 WALTHAM, MASSACHUSETTS 01981

PREPARED BY:
BEALS & THOMAS
 Civil Engineers • Landscape Architects •
 Environmental Scientists

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 141 North Cooper Street
 Southborough, Massachusetts 01772-2104
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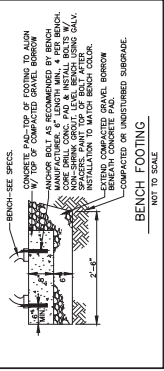
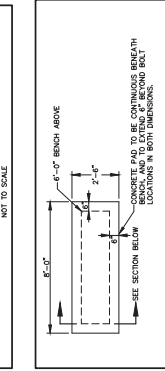
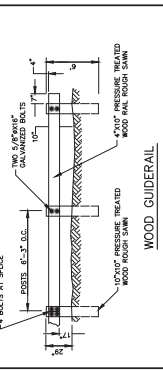
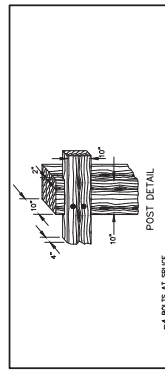
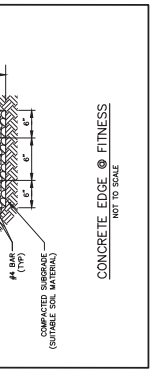
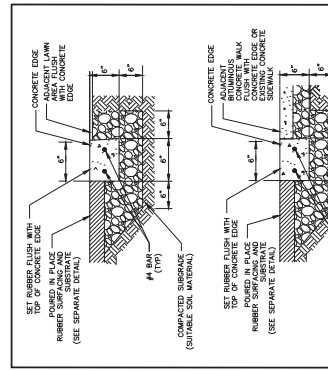
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3		
2	15/07/2019	ADDITION 2
1	10/03/2019	ISSUED FOR BIDDING
ISSUE DATE		DESCRIPTION
DSS	DWN	CHKD APP'D

PROJECT:
CORNELIA WARREN PARK
 WALTHAM, MASSACHUSETTS

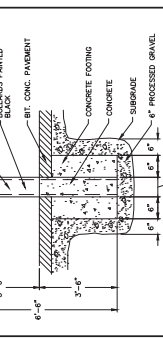
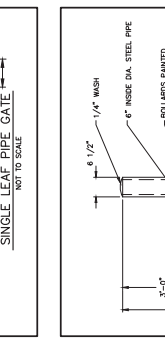
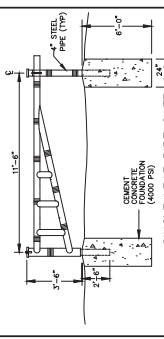
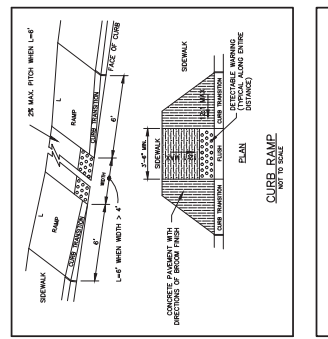
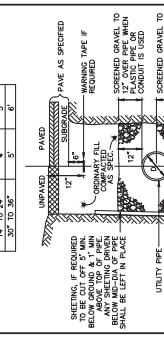
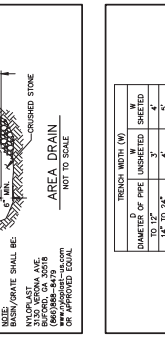
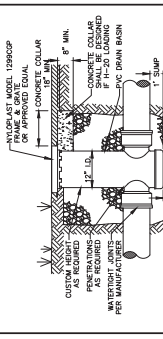
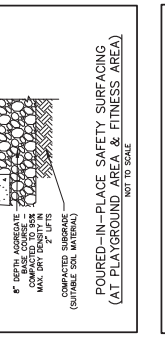
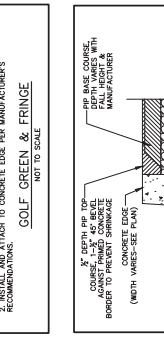
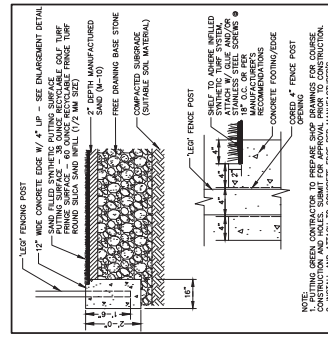
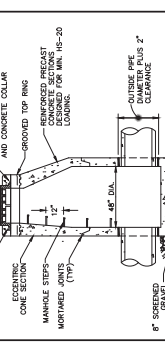
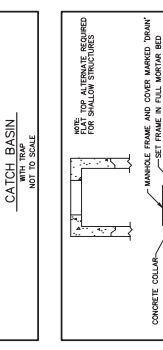
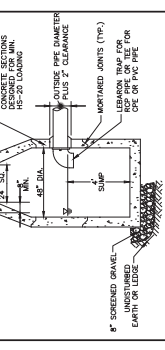
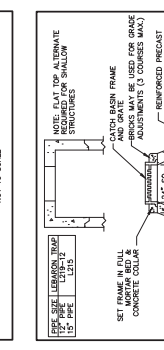
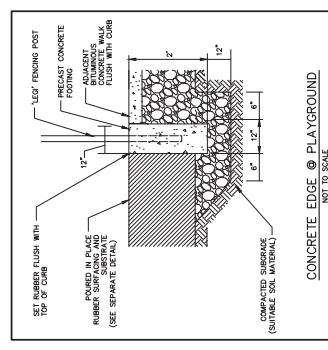
SCALE AS NOTED DATE: MAY 3, 2019

SITE DETAILS

BAT NO. 190392.00
 BAT PLAN NO. 20090109-004
C5.2

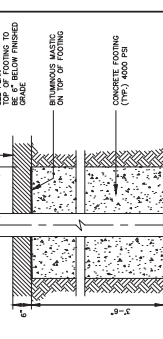
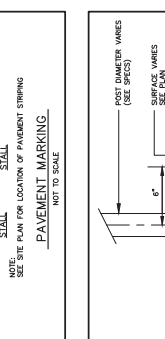
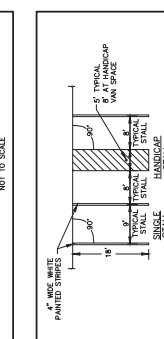
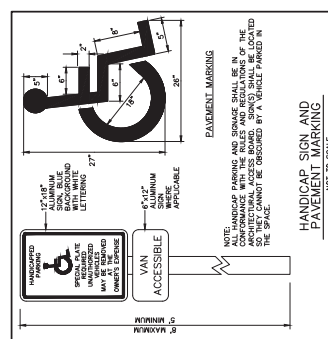
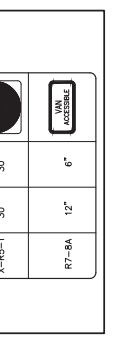


FOR NOTES, REFERENCES AND LEGEND SEE SHEET C.11.
 BEALS AND THOMAS, INC. SHALL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, OR PROCEDURES UTILIZED BY THE CONTRACTOR, NOR FOR THE SAFETY OF PUBLIC OR CONTRACTOR'S PERSONNEL. THE CONTRACTOR IS TO VERIFY ALL THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
 NO PART OF THIS DOCUMENT SHALL BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION SYSTEM WITHOUT THE PRIOR WRITTEN PERMISSION OF BEALS AND THOMAS, INC. EXCEPT THAT ANY REPRODUCTION OF THIS DOCUMENT FOR THE PURPOSES OF THE CONTRACT IS PERMITTED. ANY REPRODUCTION OF THIS DOCUMENT FOR OTHER PURPOSES WITHOUT THE PRIOR WRITTEN PERMISSION OF BEALS AND THOMAS, INC. SHALL BE AT THE USER'S RISK.



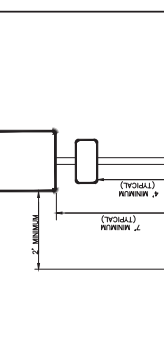
TRAFFIC SIGN SUMMARY

MUTCD NUMBER	SPECIFICATIONS	DESCRIPTION
K-1829	18" x 24"	RIGHT TURN ONLY
R-2-2	24" x 24"	NO LEFT TURN
X-105-1	30" x 30"	NO PARKING
R7-8A	12" x 6"	VAN ACCESSIBLE



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PREPARED FOR:
CITY OF WALTHAM
 610 MAIN STREET
 WALTHAM, MASSACHUSETTS

DESIGNED BY:
BEALS AND THOMAS, INC.
 1000 STATE STREET
 WALTHAM, MA 01904
 (978) 470-1695
 www.bealsthomasonline.com

PROJECT:
CORNELIA WARREN PARK
 WALTHAM, MASSACHUSETTS

SCALE: AS SHOWN. DATE: 05/03/2019

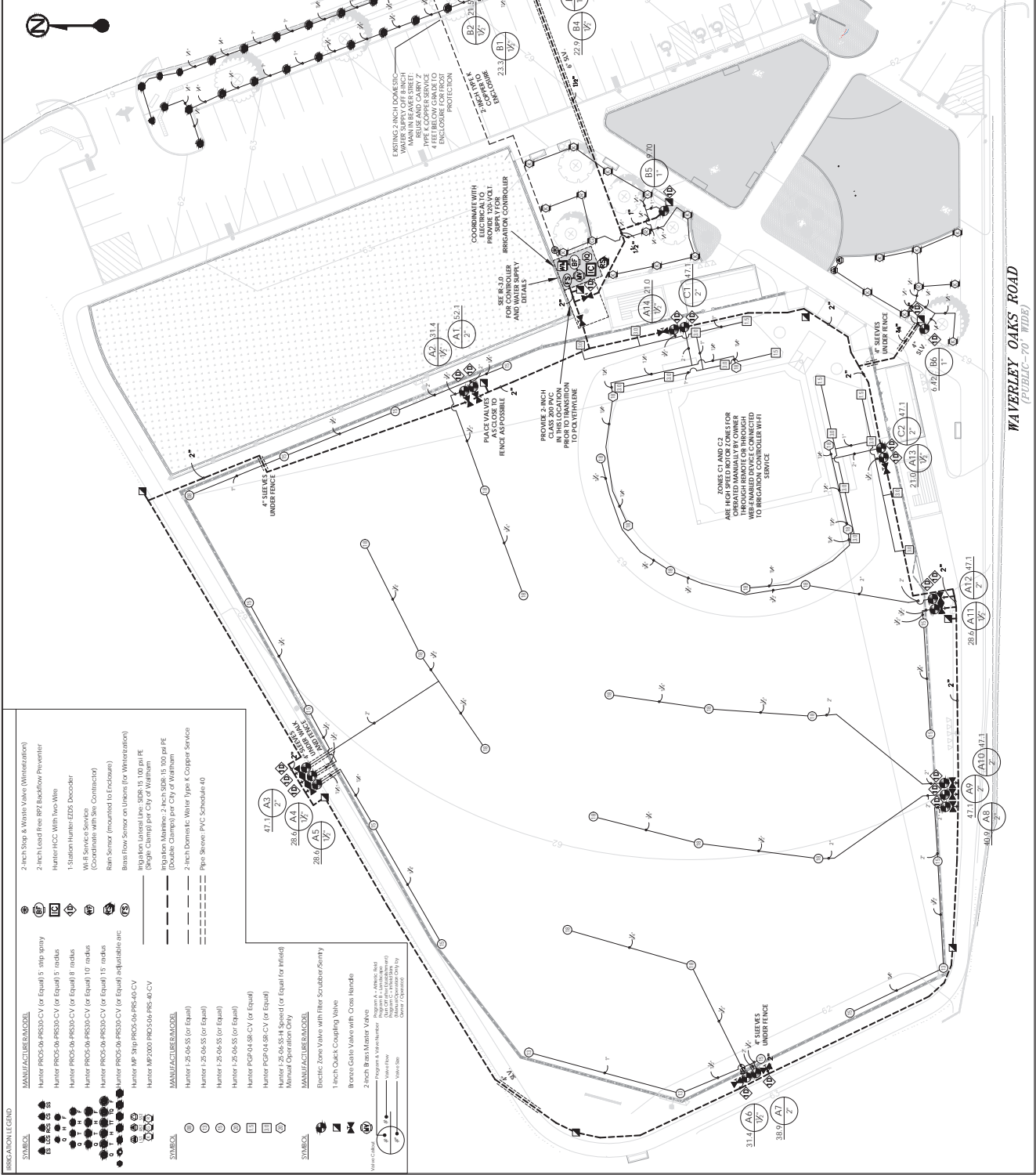
IRRIGATION LAYOUT PLAN

JOB NO. 19-001
 PLAN NO. IR-1.0

IRRIGATION NOTES:

1. ALL IRRIGATION MATERIALS AND COMPONENTS SHALL BE APPROVED BY THE CITY OF WALTHAM.
2. ALL IRRIGATION COMPONENTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CITY OF WALTHAM SPECIFICATIONS AND STANDARDS.
3. COORDINATE FINAL LOCATION OF SPRINKLERS, NOZZLES, AND VALVES WITH FINAL APPROVED LANDSCAPE.
4. SHALL FIELD VERIFY LOCATION AND DIMENSIONS FOR ALL IRRIGATION COMPONENTS.
5. SCHEDULED WORK IN MAINTENANCE AREAS SHALL BE APPROVED BY OWNER'S MAINTENANCE DEPARTMENT.
6. IRRIGATION SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE CITY OF WALTHAM SPECIFICATIONS AND STANDARDS.
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IRRIGATION DESIGN BY:
Aqueous
AQUEOUS CONSULTANTS, LLC
 1000 STATE STREET
 WALTHAM, MA 01904
 (978) 470-1695
 www.aqueous.net



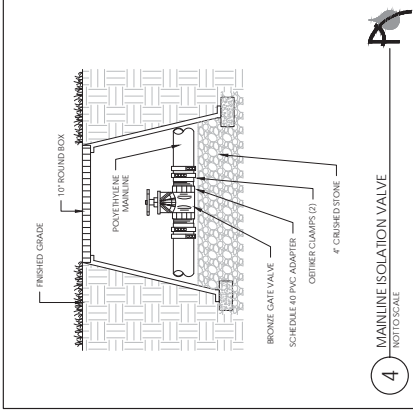
SYMBOL LEGEND:

SYMBOL	DESCRIPTION
(Symbol)	2 inch Stop & Waste Valve (Minimization)
(Symbol)	2 inch Lead Free RPZ Backflow Preventer
(Symbol)	1 Station Hunter-EDZ Decoder
(Symbol)	W-R Service Sensor
(Symbol)	Rain Sensor (mounted for Enclosure)
(Symbol)	Brass Flow Sensor on Unions (for Winterization)
(Symbol)	Irrigation Lateral Line, SDR 15, 100 psi PE
(Symbol)	Double Clamp per City of Waltham
(Symbol)	2 inch Domestic Water Type K Copper Service
(Symbol)	Pipe Sleeve PVC Schedule 40
(Symbol)	1 inch Quick Coupling Valve
(Symbol)	Brass Gate Valve with Cross Handle
(Symbol)	2 inch Brass Meter Valve
(Symbol)	Electric Zone Valve with Filter Scrubber/50mty
(Symbol)	1 inch Quick Coupling Valve
(Symbol)	Brass Gate Valve with Cross Handle
(Symbol)	2 inch Brass Meter Valve

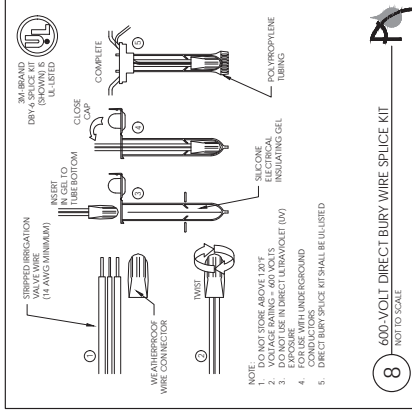
PROJECT:
**CORNELIA
WARREN PARK**
WALTHAM,
MASSACHUSETTS

SCALE: AS SHOWN DATE: 05/03/2019

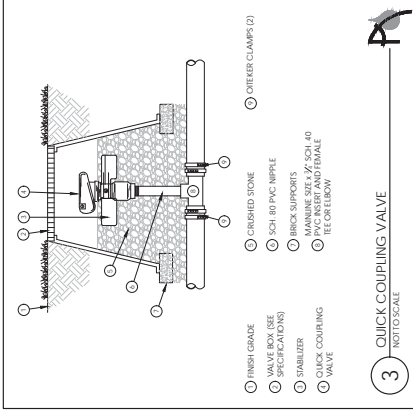
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PLAN NO.	IR-2.0



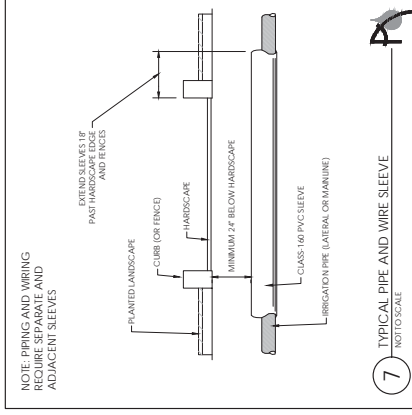
4 MAINLINE ISOLATION VALVE
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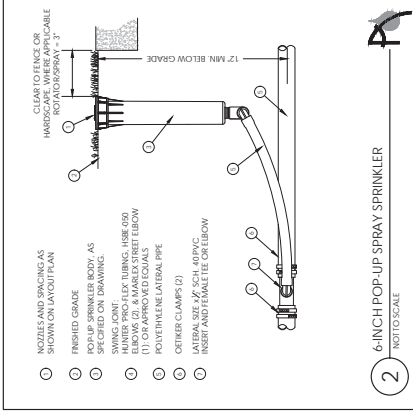
8 600-VOLT DIRECT BURY WIRE SPLICER KIT
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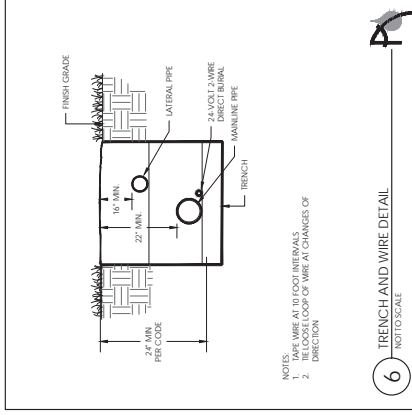
3 QUICK COUPLING VALVE
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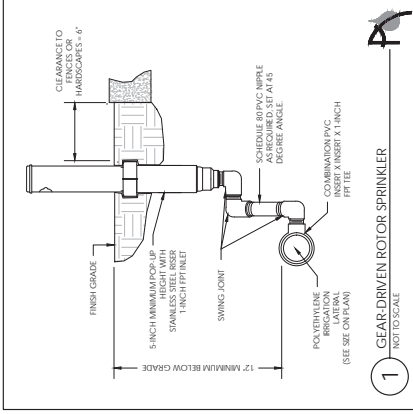
7 TYPICAL PIPE AND WIRE SLEEVE
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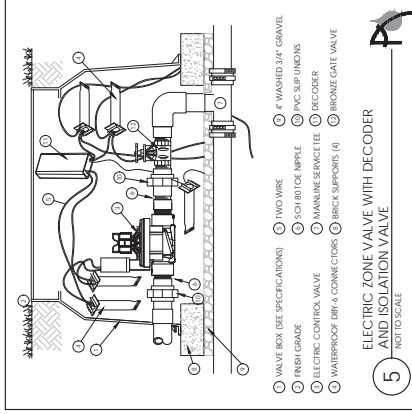
2 6-INCH POP-UP SPRAY SPRINKLER
NOT TO SCALE



6 TRENCH AND WIRE DETAIL
NOT TO SCALE



1 GEAR-DRIVEN ROTOR SPRINKLER
NOT TO SCALE



5 ELECTRIC ZONE VALVE WITH DECODER AND ISOLATION VALVE
NOT TO SCALE

PREPARED FOR:

**CITY OF
WALTHAM**
610 MAIN STREET
WALTHAM, MASSACHUSETTS

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PREPARED BY:
B E A L S + T H O M A S
Civil Engineers & Landscape Architects *
Environmental Specialists

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Regional Corporate Center
1200 Main Street
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3	REVISED	DATE	DESCRIPTION
2	REVISED	DATE	DESCRIPTION
1	ISSUED	05/27/19	CITY SPECIFICATIONS
0	ISSUE DATE		
DES	MT	MT	MT
DWN	CHK'D	LAPP'D	

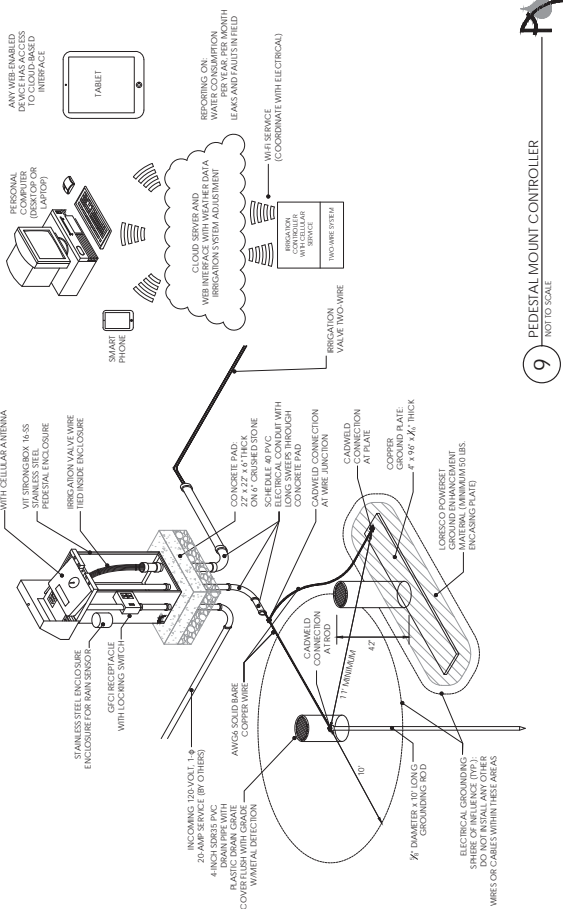
PROJECT:
**CORNELIA
WARREN PARK**
WALTHAM,
MASSACHUSETTS

SCALE: AS SHOWN. DATE: 05/03/2019

**IRRIGATION
WATER SUPPLY**

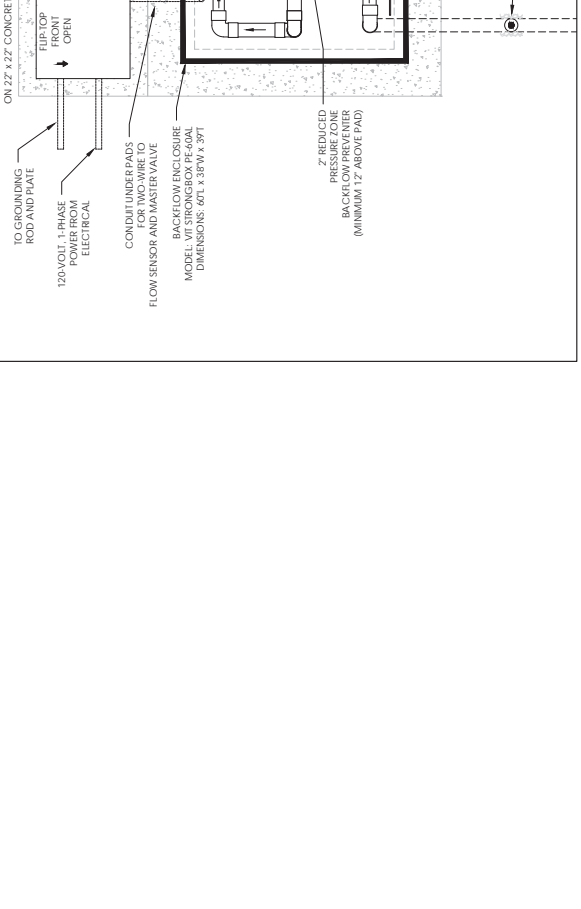
JOB NO. 18-0018
PLAN NO. **IR-3.0**

CENTRAL AND REMOTE CONTROL OPTIONS



9 **PEDESTAL MOUNT CONTROLLER**
NOT TO SCALE

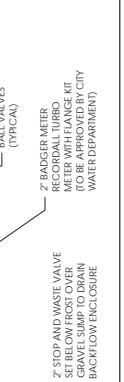
BACKFLOW & METER ENCLOSURE



10 **BACKFLOW & METER ENCLOSURE WITH FLOW SENSOR AND MASTER VALVE**
NOT TO SCALE

BACKFLOW & METER ENCLOSURE SHALL BE WITH FLOW SENSOR, MODEL PE-60AL OR APPROVED EQUAL MEETING FOLLOWING SPECIFICATIONS:

DIMENSIONS: 60" LONG x 38" WIDE x 39" TALL
ENCLOSURE SHALL BE CONSTRUCTED OF A VANDAL AND WEATHER RESISTANT NATURE. MANUFACTURED ENTIRELY OF MARINE GRADE ALUMINUM ALLOY 5052-H24 WITH A WALL THICKNESS OF 1/8" INCH.
MOUNTING BASE SHALL BE MANUFACTURED ENTIRELY OF STAINLESS STEEL.
MOUNTING LIPS SHALL BE A SOLID SHEET CONSTRUCTION PUNCHED ON THE ENDS WITH LOUVERS FOR VENTILATION.
ENCLOSURE SHALL BE A CENTER SPLIT DESIGN, HAVING MOUNTING LIPS ON EACH END.
MOUNTING BASE SHALL BE SUBMERGED INTO CONCRETE PAD A MINIMUM OF 2 INCHES, POSITIONING ENCLOSURE 2 1/2 INCHES ABOVE CONCRETE FOR DRAINAGE.
LOCKING MECHANISM SHALL BE A FULL RELEASE TYPE WHICH ALLOWS FOR COMPLETE REMOVAL OF THE ENCLOSURE FROM ITS MOUNTING BASE WITHOUT USE OF TOOLS.
ENCLOSURE SHALL BE A STAINLESS STEEL CROSS BAR STYLE AND PROVIDE FOR A PADLOCK.
ALTERNATIVES AND APPROVED EQUALS FOR BACKFLOW & METER ENCLOSURE SHALL ALSO BE SUBMITTED WITH DRAWINGS TO DEMONSTRATE ADEQUATE SPACE FOR BACKFLOW PREVENTER AND CITY METER.



BACKFLOW & METER ENCLOSURE WITH FLOW SENSOR AND MASTER VALVE

SECTION 328400 – IRRIGATION AND WATER SUPPLY

PART 1 GENERAL

1.1 SUMMARY

- A. Provide all materials, labor, installation equipment, and technical service to complete automatic athletic field irrigation system, as well as the testing and warranty of the system as defined in this Specification and Construction Drawings.
- B. Items of work specifically included are:
 - 1. Procurement of all applicable licenses, permits, and fees.
 - 2. Coordination of all utilities.
 - 3. Verification of site conditions.
 - 4. Maintenance during guarantee period.

1.2 QUALIFICATIONS.

- A. Qualified irrigation system installers must have a minimum experience of five (5) years with work and products specified herein, including:
 - 1. Two-Wire Controller and Valve Installation
 - 2. Weather-Based Smart Controllers
 - 3. Athletic Field Irrigation Systems
 - 4. Domestic Water Plumbing Systems
- B. Submit three (3) references for similar work performed in the last five (5) calendar years, including:
 - 1. Contact name
 - 2. Company Name
 - 3. Contact Phone Number
 - 4. Project Name and Location
 - 5. Brief Project Description

1.3 WORK DESCRIPTION

- A. Athletic Field Irrigation System for Cornelia Warren Park shall be a new, two-wire irrigation system with its own controller and water supply. Sprinkler head placement and throw radius shall be better than head-to-head coverage.
- B. Reuse existing 2-inch municipal water supply within Cornelia Warren Park. Provide new backflow preventer, master valve and flow sensor in vandal-proof enclosure for irrigation water supply. Install 2-inch water meter to be provided by the City of Waltham (Owner).
- C. Provide drain, blow-out port, and stop and waste valve for winterization.
- D. Provide and train Owner on remote irrigation management through Internet based platform through Wi-Fi internet service to be coordinated with site contractor.

1.4 UTILITIES

A. Water Service Point of Connection

1. Existing static water pressure within Beaver Street is purported to be 90 psi.
2. Reuse existing 2-Inch water supply within Cornelia Warren Park. Approximate point of connection within site is located on Drawings.
 - a. Equipment requirements within vandal-proof enclosure (see Irrigation Product Below):
 - 1) Enclosure (Painted Hunter Green at Factory)
 - 2) Irrigation Backflow Preventer
 - a) Size: 2-Inch
 - b) Construction: Bronze with Quarter Turn Ball Valve, Bronze Strainer,
 - c) Ratings: 175 psi Maximum
 - d) Manufacturer/Model: Watts Model 002M2-QT
 - 3) Water Meter (to be provided by City of Waltham)
 - a) Size: 2-Inch
 - b) Construction: Bronze
 - c) Features: Automatic Meter Register (ARM), Threaded Input and Output for Nipples and Unions
 - 4) 2-Inch Brass Master Valve (see Irrigation Product Below)
 - 5) 2-Inch Brass Flow Sensor (see Irrigation Product Below)
 - b. Flow and pressure requirements at Athletic Field:
 - 1) Flow: Maximum 53 gallons per minute
 - 2) Pressure: 70 pounds per square inch (downstream of all plumbing)

B. Electrical Power Source to New Outdoor Controller

1. New electrical circuits to be provided by Electrical Contractor (Refer to Division 26 Electrical).
 - a. Power Requirements for Irrigation Controller within Pedestal
 - 1) 120-Volt, 1-Phase, 60-Hz, 20-Amp Breaker
 - 2) Irrigation Controller has internal transformer for 24VAC valve two-wire
 - b. Conduits
 - 1) Provide minimum Schedule 80 PVC conduits through Irrigation Controller pedestal concrete pad with long elbow sweeps and under all hardscape through sleeves.

C. Internet for Outdoor Controller

1. Coordinate on-site Wi-Fi service for Irrigation Controller for remote, internet-based access through any web-enabled device.

D. Pipe Sleeves

1. Pipe sleeves to be provided by Earthwork Contractor beneath all hardscape, as indicated on Construction Drawings.
 - a. Pipe sleeve requirements

- 1) Two (2) parallel 4-inch Schedule 40 PVC
- 2) Extend 18 inches beyond edge of hardscape
- 3) Minimum cover: 24 inches

1.5 RELATED REQUIREMENTS

- A. Coordinate with other project trades and refer to overall project Construction Document Specifications and Drawings, including, but not limited to:
1. Division 01 – General Requirements
 2. Division 02 – Existing Conditions
 3. Division 03 – Concrete
 4. Division 22 – Plumbing
 5. Division 26 – Electrical
 6. Division 31 – Earthwork
 7. Division 32 – Exterior Improvements
 8. Division 33 – Utilities
 9. Construction Drawings:
 - a. IR1.0 – Irrigation Plan
 - b. IR2.0 – Irrigation Details
 - c. IR3.0 – Irrigation Water Supply Details
 - d. Review all other Project Construction Documents for coordination.

1.6 APPLICABLE STANDARDS AND CODES

- A. At a minimum, comply with the following standards and codes:
1. American Society for Testing and Materials (ASTM)
 2. National Standard Plumbing Code (NSPC)
 3. National Electric Code (NEC)
 4. National Sanitary Foundation (NSF)
 5. Underwriters Laboratories, Inc. (UL)
 6. Occupational Safety and Health Administration (OSHA)
- B. Comply with applicable laws, standards, and regulations of the local governing authority. All local laws more stringent than those referenced above shall take precedent.

1.7 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 00 – Submittal Procedures:
1. Literature: Manufacturer's product data sheets, specifications and installation instructions for materials listed in this Specification (Part 2 – Products).
 - a. Product submittals shall be concise (no extraneous pages or sections) and clearly marked to show submitted product model, type, size, etc.
 - b. Substitute Product Submittal:
 - 1) Provide specified product submittals for “an approved equal” to Owner’s Representative for approval.
 - 2) Alternate products are acceptable when products of equal or better quality and performance are submitted and approved by the Owner’s

Representative.

- 3) Substitute Product Submittals constitute representation that:
 - a) Substitute products have been thoroughly investigated and have been determined to be equal or superior in all respects to that specified.
 - b) Substitute products shall provide the same warranties as specified products.
 - c) Substitute products are compatible with interfacing items.
 - d) Assume responsibility of and guarantee system performance as a result of product substitution, including making all subsequent changes to meet design specifications.
 - c. Work shall not commence until all products specified are submitted and approved in a written notification by Owner's Representative.
 - d. All product installed shall be new, without defects, and of quality and performance as specified.
2. Schedule: Submit Schedule of all products to be furnished hereunder, indicating manufacturer, size, and model.
 - a. Ensure that all of the types/styles of products and installation equipment specified herein can be furnished by the manufacturer submitted.
 - b. Provide all spare irrigation parts as noted (see Spare Irrigation Parts)
 - c. Prior to submitting schedule, confirm current site conditions are as provided in the Construction Drawings.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver materials to the site, until all specified submittals have been submitted to, and approved by, the Owner's Representative.
- B. Coordinate with Owner's Representative for temporary storage and staging areas.
- C. Protect materials from damage from construction traffic, weather, corrosion, and other causes while stored on-site. Minimize on-site storage as possible.
- D. Store and handle all products and materials in compliance with manufacturer instructions and recommendations.

1.9 GUARANTEE AND REPLACEMENT

- A. Guarantee entire irrigation system, parts and labor, for one (1) year from official written date of acceptance by Owner's Representative. Provide written warranty showing date of completion and period of warranty prior to request for final payment.
- B. System malfunctions occurring during the guarantee period due to defective materials, poor workmanship, or improper adjustment shall be corrected to satisfaction of Owner's Representative at no additional cost to the Owner.
 1. Repair all defects within 10 days of notification from Owner or Owner's Representative.
 2. Repair defects with approved products.
- C. First-year spring system start-up and winterization shall be included in system guarantee.

- D. Manufacturer warranties shall be provided for all products and materials where such warranties are offered in published product data. Copies of manufacturer warranties are to be included in the Operations and Maintenance Manual (See Operation and Maintenance).

PART 2 PRODUCTS

2.1 AUTOMATIC IRRIGATION CONTROLLER

A. Controller

1. Size: 54-Station Maximum
2. Construction: Electronic with 120-Volt Input and 24-28 Volt Output; Outdoor Stainless-Steel Pedestal Enclosure.
3. Standards: UL-Listed
4. Features: Manual and Automatic Control, Water Budgeting, Cycle-Soak, Sensor Input Terminals, Internal Transformer, Flow Monitoring Capability, Lightning Protection, Remote Control via Internet, Conventional Wire with Two-Wire Capability.
5. Manufacturer/Model: Hunter HCC with EZDS Decoder System (per City of Waltham).

B. External Devices (Matching Manufacturer and Compatible with Controller)

1. Stainless Steel Pedestal Enclosure (VIT Strongbox, Model SB-16SS)
2. Wireless Rain Sensor (free of Overhead Obstruction)
3. 2-Inch Brass Flow Sensor (HC-200-FLOW)
 - a. Provide Isolation Valves and Unions on Each Side for Winterization
 - b. Flow Range = 2 – 105 gpm
4. EZDS Zone Valve Decoders (No Surge or Grounding Required)
5. Surge Suppression and Grounding (at Controller)

C. Outdoor Controller Grounding

1. Size
 - a. Wire: 6AWG
 - b. Rod: 5/8-Inch Diameter x 12-Foot Long
 - c. Plate: 4-Inch x 96-Inch x 1/16-Inch Thick
2. Construction
 - a. Wire: Bare Copper
 - b. Rod: Copper
 - c. Plate: Copper with Loresco PowerSet Ground Enhancement Material Above and Below
3. Ratings: UL-Listed
 - d. Features: Cadweld Connectors from Wire to Rod, Plate Manufacturer provided Plate Connections, PVC or ADS Drain Pipe and Grate Cover over Rod Plate with

Metal Detection

2.2 WIRE

A. Two-Wire

1. Size: 14/2 AWG Minimum
2. Construction: Dual Strand Solid Copper Conductors with PVC Insulation and Poly Jacket.
3. Ratings: UL-Listed, NEC (Class II Circuit), Direct Burial UF/TWU, up to 600-Volt Potential
4. Standards: ASTM B-3, ASTM B-8
5. Markings: Manufacturer, Rating, Size, and Type
6. Manufacturer/Model: Coleman Cable #51452; Paige P7072D, P7296D, P7350D, and P7354D; Regency 14/2 and 12/2 Maxi Cable; Hunter Decoder Jacketed; Service Wire Company DEC12/2BE and DEC 14/2BE; or Approved Equal.

B. Conventional Wire (From Decoders to Electric Zone Valves)

1. Size: 14AWG Minimum
2. Construction: Single Strand Solid Copper Conductor with PVC Insulation
3. Ratings: UL-Listed, NEC (Class II Circuit), Direct Burial UF/TWU, up to 600-Volt Potential
4. Standards: ASTM B-3, ASTM B-8
5. Markings: Manufacturer, Rating, Size, and Type
6. Manufacturer/Model: Paige Electric Model P7001D; Service Wire Company UF14, UF12; Regency Wire & Cable 14AWG, 12AWG; or Approved Equal.

C. Wire Splices

1. Type: Direct Burial Wire Splice Kit (All Components Intact)
2. Construction: Lockable Plastic Tube, Pre-Filled with Insulation Gel
3. Ratings: UL-Listed, NEC, Direct Burial and Submersion, up to 600-Volt Potential
4. Manufacturer/Model: 3M DBY-6; Rain Bird DB Series; or Approved Equal.

D. Wire Conduit

1. Size: 1-Inch Minimum
2. Construction: PVC, Solvent Weld
3. Ratings: Schedule 80
4. Fittings: Long Sweep Elbows
5. Manufacturer: Cresline; Certainteed, JM Eagle; or Approved Equal.

2.3 PIPE AND FITTINGS

A. Irrigation Water Service at Enclosure (Prior to Irrigation Mainline)

1. Size: 2-Inch Maximum
2. Construction: Polyvinyl Chloride (PVC), Solvent Weld
3. Ratings: Class 200 SDR 21
4. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date, Pipe Insertion Mark.
5. Manufacturer: Cresline; Certainteed; JM Eagle; or Approved Equal.
6. Fittings
 - a. For Valves Toe Nipples: Schedule 80 PVC
 - b. Other Fittings: Schedule 40 PVC

7. Markings: NSF Designation, Size, Class or Schedule
8. Manufacturer: Lasco; Spears; Dura; or Approved Equal
9. Solvent
 - a. Type: NSF Type I or Type II PVC
 - b. Standards: ASTM D-2564
 - c. Manufacturer: IPS Weld-On 711; Oatey HD Cement; Rectorseal Gold; or Approved Equal
10. Primer
 - a. Type: NSF for PVC
 - b. Standards: ASTM F-656
 - c. Manufacturer: IPS Weld-On P-68; Oatey Clear Primer; Rectorseal Jim PR-2; or Approved Equal

B. Irrigation Mainline

1. Size: 2-Inch Maximum
2. Construction: Polyethylene (PE) 3408
3. Ratings: 100 psi, SDR-15, Class C, Type III
4. Standards: ASTM D-2609
5. Fittings: PVC Insert (per ASTM D-2609) with Stainless Steel Clamps on Each Side
 - a. Two (2) Clamps per Side for Mainline
 - b. One (1) Clamp per Side for Laterals
6. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date, Pipe Insertion Mark
7. Pipe Manufacturers: Oil Creek; Certainteed; JM Eagle; or Approved Equal
8. Insert Fittings: Lasco, Dura, or Approved Equal
9. Clamps: Oetiker, or Approved Equal

2.4 ELECTRIC ZONE VALVES

A. Sprinkler Zone Valve

1. Size: 1-Inch, 1.5-Inch, 2-inch
2. Construction: Plastic Globe Valve with Reinforced Nylon or Fiberglass Body
3. Ratings: 200 psi
4. Features: Manual Bleed Screw, Flow Control, Pressure Regulation, and Filter/Scrubber
5. Manufacturer/Model: Hunter ICV-FS; Rain Bird PESB; or Approved Equal

B. Master Valve (installed in Backflow Enclosure)

1. Size: 2-Inch
2. Construction: Brass Globe Valve
3. Ratings: 220 psi
4. Features: Manual Bleed Screw, Flow Control, Pressure Regulation, and Filter
5. Manufacturer/Model: Hunter IBV-FS; or Approved Equal

2.5 ISOLATION VALVES

A. Small Mainline Isolation Valve

1. Size: 2-Inch and Smaller
2. Construction: Bronze, Gate Valve
3. Ratings: 200 psi
4. Features: Steel Cross Handle, Non-Rising Stem
5. Manufacturer/Model: Nibco T-113K; Apollo 102T-K; or Approved Equal

2.6 QUICK COUPLING VALVES

A. Small Mainline Quick Coupling Valve

1. Size: 1-Inch, Normally Closed
2. Construction: Brass, Spring-Loaded Valve Seat, Key Engaged
3. Ratings: 125 psi
4. Features: 1-Inch NPT Inlet, ACME Key, Locking Vinyl Cover, Anti-Rotation Stabilization Wings
 - a. Swing Joint Assembly
 - 1) Size: 1-Inch
 - 2) Construction: PVC, with O-Ring Seals and Brass Threaded Outlet
 - 3) Manufacturer: Hunter HSJ-1 with SnapLok; or Approved Equal
5. Manufacturer/Model: Hunter HQ-44RC-AW; or Approved Equal.

2.7 VALVE BOXES

A. General

1. Size:
 - a. 12-Inch Standard Valve Box
 - 1) Single 2-Inch Electric Zone Valve
 - 2) Double 1-Inch or 1½-Inch Electric Zone Valves
 - b. 6-Inch Round
 - 1) Wire Splice
 - 2) Decoder Cable Fuse Device
 - 3) Decoder Grounding Rod
 - c. 10-Inch Round
 - 1) Single 1-Inch or 1½-Inch Electric Zone Valve
 - 2) Isolation Valve
 - 3) Quick Coupling Valve
2. Construction: Resin
3. Ratings: Tensile Strength 3,000-5,000 psi
4. Color: Green or Black (per Owner's Representative)
5. Features: Lockable, Bolt-Down Covers, Brick Supported
6. Manufacturer/Model: Carson, Model Specification Grade NDS Pro; Rain Bird VB; or Approved Equal

2.8 SPRAY SPRINKLERS

A. Body

1. Size: 6-Inch Pop-Up for Lawn
2. Construction: Plastic, Ratcheting Riser, Removable Nozzle, Internal Check Valve
3. Ratings: Pressure Regulated to 30 psi
4. Manufacturer/Model: Hunter PROS-4-PRS30-CV, Hunter PROS-6-PRS30-CV and Hunter PROS-12-PRS30-CV; or Approved Equal

B. Nozzles

1. Size: 2' – 15' Radius (see Contract Drawings)
2. Features: Full and Part-Circle Fixed-Arc and Strip Patterns, Special Micro-Stream
3. Manufacturer/Model: Hunter Pro Spray; Rain Bird MPR; Toro Precision; or Approved Equal

2.9 ROTARY SPRINKLERS

A. Body

1. Size: 6-Inch Pop-Up
2. Construction: Plastic, Ratcheting Riser, Removable Nozzle, Internal Check Valve
3. Ratings: Pressure Regulated to 40 psi
4. Manufacturer/Model: Hunter PROS-06-PRS40-CV; Rain Bird 1806-SAM-PRS-P45, or Approved Equal

B. Nozzles

1. 12' – 30' Radius (see Contract Drawings)
2. Features: Full and Part-Circle Fixed-Arc and Strip Patterns
3. Manufacturer/Model: Hunter MP Rotator, Toro Precision Rotating, or Approved Equal

2.10 GEAR-DRIVEN ROTOR SPRINKLERS

A. General

1. Size: 6-Inch Stainless Steel Pop-Up Riser with 1-Inch NPT Bottom Inlet
2. Ratings: 37 – 71 feet Radius, 30 – 100 psi Pressure, 2.9 – 31.5 gpm Flow
3. Construction: Gear-Driven, Removable Nozzle, Internal Check Valve, Stainless Steel Retraction Spring, Rubber Cover, Stainless Steel Riser
4. Features: Adjustable, Part, and Full Circle
5. Manufacturer/Model: Hunter I-25-06-SS; Rain Bird 8005-SS-XX; or Approved Equal
6. Spacing: As shown on Drawings, generally 80% - 100% of manufacturer rating

B. Swing Joint Assembly

1. Size: 1-Inch with 12-Inch Lay Arm
2. Construction: PVC, with O-Ring Seals and Threaded Outlet
3. Manufacturer: Hunter HSJ-1-12; Rain Bird TSJ-12; Lasco G132-100 or Approved Equal
4. Provide Combination PVC Insert Tee Fitting with FPT Outlet at Lateral for Swing Joint

2.11 EARTH MATERIALS

A. Stone (in Valve Boxes)

1. Type: ¾-Inch (minimum) Crushed Stone

- B. Clean Sand
 - 1. Gradation: (passing by weight)
 - a. No. 4 Sieve= 80% Minimum
 - b. No. 200 Sieve = 5% Maximum
 - C. Concrete
 - 1. Ratings: 3,000 psi 28-day Compressive Strength
 - 2. Standards: ASTM C-33, ASTM C-94, ASTM-C150
- 2.12 CURB STOP AND WASTE VALVE
- A. Size: 2-inch, Flared Ends with Curb Stop Key
 - B. Construction: Brass
 - C. Ratings: 175 psi Maximum
 - D. Features: Stop and Waste Feature for Winterization near Backflow Enclosure
 - E. Manufacturer: Mueller, Ford, or approved manufacturer
- 2.13 CURB BOXES AND LIDS
- A. Size: 1-inch Upper Section, 2-inch Lower Section, Length to Match Finish Grade
 - B. Construction: Cast Iron Base and Lid per ASTM A48, Brass Plug per AWWA C800, Steel Upper Section
 - C. Ratings: 300 psi Maximum
 - D. Features: Arch Pattern, Phosphor Bronze Spring Friction Ring, Plug Style Lid
 - E. Manufacturer: Ford, EA2-xx-40 style or approved manufacturer
- 2.14 BACKFLOW PREVENTER
- A. Size: 2-inch
 - B. Construction: Bronze with Quarter Turn Ball Valve with Strainer
 - C. Ratings: 175 psi Maximum
 - D. Manufacturer: Watts, Model 009M2-QT-S, or approved equal
- 2.15 WATER METER
- A. Size: 2-inch
 - B. Construction: Bronze
 - C. Features: Automatic Meter Reading Option, Threaded Inlet and Outlet
 - D. Manufacturer: Provided by City of Waltham
- 2.16 BACKFLOW AND METER ENCLOSURE
- A. Size: 60 inches long x 24 inches wide x 39 inches high. Concrete Pad shall be 72 inches long x 36 inches wide x 8 inches thick (4-inch reveal) with 1-inch Chamfer on Top Edge. Enclosure

pad shall be installed on 12 inches of level crushed stone.

- B. Construction: Marine-Grade Aluminum (Painted Hunter Green at Factory, to be approved by Owner)
- C. Features: Lockable with Padlock
- D. Ratings: Insulated
- E. Manufacturer: VIT Strongbox, Model PE-60AL, or approved equal

2.17 COPPER PIPE

- A. Size: 2-inch
- B. Construction: Type K Copper
- C. Standards: ASTM B-88
- D. Fittings: Wrought Copper, Silver Solder Joint (per ASTM B-828), Non-Corrosive Flux

2.19 SPARE PARTS

- A. Wrenches, Keys, and Tools for Servicing and Adjusting Sprinkler Heads (2)
- B. Quick Coupler Valve Keys (1)
- C. Gate Valve (1 of each size on Drawings)
- D. Electric Zone Valve (1 of each size on Drawings)
- E. Sprinkler Heads and Nozzles (3 of Each)
- F. Assorted Valves and Fittings

PART 3 EXECUTION

3.1 GENERAL

- A. Competent superintendents and assistants shall be on-site at all times during product delivery, installation, testing, and system adjustments.
 - 1. Field communication by Owner or Owner's Representative to superintendent shall be binding.
- B. System features shall be laid out as indicated on Drawings, making minor adjustments for variations in planting arrangements or field conditions. Major changes shall be reviewed with Owner's Representative before acceptance.
 - 1. Irrigation lines shown on Construction Drawings are diagrammatic only. Location of irrigation equipment is contingent upon and subject to integration with all other underground utilities, tree roots, and hardscape design elements.

3.2 EXAMINATION

- A. Review and verify project conditions are as indicated on Construction Drawings prior to starting work, including but not limited to:
 - 1. Utilities provided by Others

2. Site grades and dimensions
3. Athletic Field, landscaping and features
4. Structures
5. Pipe sleeves

- B. Report any irregularities of site conditions to the Owner's Representative prior to beginning work.
- C. Beginning of installation connotes acceptance of existing project conditions.

3.3 PROJECT COORDINATION

- A. Coordinate with Owner's Representative to expeditiously install system.
- B. Provide written notifications (electronic is acceptable) to Owner's Representative prior to work commencement, weekly for progress report, for any proposed changes to system design, and upon installation completion.
- C. All questions of design intent, proposed design changes, field notifications, and product substitution after installation commences shall be in writing to Owner's Representative as a Request for Information (RFI).
- D. Utility Coordination:
 1. Maintain 6-inch minimum clearance between irrigation lines and any utility line. Do not install sprinkler lines directly above another utility of any kind.
 2. Exercise care when excavating, trenching and working near existing utilities.

3.4 SITE PROTECTION

- A. Protect landscaping, paving, structures, walls, footings, etc. from damage caused during work. Damage to work of another trade shall be reported at once.
- B. Replace or repair any damage with same product or material, to the satisfaction of Owner's Representative at no additional cost to the Owner per Guarantee.
- C. Route pipe as necessary to prevent damage to tree roots. Where trenching must occur near trees, provide proper root pruning and sealing methods to all roots 1-inch and larger.

3.5 EXCAVATION, TRENCHING, AND BACKFILLING

- A. Notify and request approval from Owner's Representative if pipe pulling is the intended installation method. Pipe pulling is an accepted installation practice only under the following conditions:
 1. Maximum pipe size 2 inches, and
 2. Suitable soils (i.e. naturally rounded loamy soils without sharp rocks), and
 3. Specified pipe burial depth can be maintained.
- B. Pipe Trench:
 1. Excavate trenches straight and true, minimizing site disturbance as possible.
 2. Final trench bottom shall be undisturbed soil and shall be free of rocks and debris larger than 1 inch or with sharp edges. If trench base is unsuitable for laying pipe, over excavate 2 inches below pipe invert, and place Clean Sand or Stone.

- C. Clean Backfill:
 - 1. Material: Clean Sand (See Earth Materials)
 - a. Clean backfill must be free of foreign material, debris, frozen material and rocks larger than 1-inch.
 - 2. Carefully place clean backfill a minimum depth of 10-inches over pipe and wire, tamp in place.
 - 3. Carefully place material around pipe and wire, tamp in place.
- D. Trench Backfill:
 - 1. Material: Re-use excavated material
 - a. Clean backfill must be free of foreign material, debris, frozen material, and rocks larger than 1-inch.
 - 2. Place and compact in maximum 6-inch lifts to dry density equal to undisturbed soil. Compaction by truck or equipment tires is prohibited.
 - 3. Avoid backfilling in hot weather.
 - 4. Match adjacent subsurface grades without hills or depressions. Repair settling (as required by Guarantee).
 - 5. If final planting soils, mulch, or sod were removed or disturbed during trenching, replace to match Project Specifications and regrade as necessary.
 - a. Use sod cutter where applicable, or reseed disturbed areas to acceptance of Owner.

3.6 PIPE INSTALLATION

- A. PVC Pipe Installation:
 - 1. Cut plastic pipe with handsaw or pipe cutter, removing all burrs at cut ends. All pipe cuts shall be square and true. Bevel cut end as required to conform to manufacturer instructions.
 - 2. Make all solvent-weld joints as per manufacturer's instructions and avoid applying excess primer or solvent. Do not wipe off excess solvent from each connection.
 - a. Allow welded joints minimum 5 minutes set-up/curing time before moving or handling.
 - 1) Above 80°F: Allow connections to set 24 hours
 - 2) Below 80°F: Follow manufacturer instructions
 - 3) Below 40°F: Prohibited
 - 3. Maximum deflection per joint shall not exceed manufacturer limits.
 - 4. Maintain 1-inch minimum between lines which cross at angles of 45 to 90 degrees
- B. Pipe and wire shall run in same trench as mainline, at the elevation of the pipe invert (See Wire Installation).
- C. Pipe Cover (unpaved surfaces):
 - a. PVC Mainline = 22 inches
 - b. PVC Lateral = 16 inches

D. Pipe Protection:

1. Prevent foreign material from entering pipe during installation.
2. Open ends of pipe shall be closed by watertight plug or seal when not in use.
3. Securely store pipe when not scheduled for installation.
4. Pipe shall not be installed when water is in trench, during rainstorms, or when temperature is below 40 °F.
 - a. No additional pipe may be installed or backfilled if water enters trench during pipe installation. Remove all water from trench before resuming installation.
 - b. Pipe installed at temperatures below 40 °F shall be removed and replaced at no cost to owner.
5. Trenched PVC pipe shall be snaked to accommodate for expansion and contraction due to changes in temperature.

3.7 PIPE SLEEVE INSTALLATION

- A. Coordinate with Owner's Representative for provided pipe sleeves and locations installed by Earthwork Contractor.
- B. New Pipe Sleeves:
 1. Pipe Sleeve Cover: Minimum 24 inches
 2. Install pipe sleeves where irrigation pipe runs under hardscape (see Construction Drawings).
 3. Extend pipe sleeves minimum 18 inches beyond edges of hardscapes.
 4. Prior to installation of pipe, pipe sleeve ends shall be field marked with vertical wood stakes extending above grade to allow field location during irrigation system installation.
- C. Cutting through or jacking under new pavement shall be strictly prohibited. Failure to provide sleeves shall require notification to Owner's Representative for resolution.

3.8 ELECTRICAL CONDUIT INSTALLATION

1. Outdoor Electrical conduit shall be installed:
 - a. Under and through all hardscape areas
 - b. For all above ground wiring
2. Electrical conduit shall extend 18 inches beyond edges of hardscape.

3.9 ELECTRIC ZONE VALVE INSTALLATION

- A. Install electric zone valves on level crushed stone base generally where shown on Construction Drawings. Do not pour stone around valves that are already installed.
- B. Install all Schedule 80 PVC threaded nipples with Teflon tape, isolation valves, and/or union couplings in and out of electric zone valves as shown on details on Construction Drawings.
- C. Set valves plumb with adjusting handle and all bolts, screws, and wiring accessible through valve box opening.
- D. Install at sufficient depth to provide between 4-6 inches of cover from top of valve to finish grade.

- E. Install specified valve box over all electric zone valves. Ensure lid is flush with final proposed grade (coordinate with Site Contractor).
- F. Adjust zone valve operation after installation using flow control device on valve.

3.10 ISOLATION VALVE INSTALLATION

- A. Install isolation valves per detail where indicated on Construction Drawings.
- B. Install all isolation valves on level crushed stone base for operation ease with appropriate valve wrench. Do not pour stone around valves that are already installed.
- C. Install specified valve box over all isolation valves. Ensure lid is flush with final proposed grade (coordinate with Site Contractor).
- D. Check and tighten valve bonnet packing before valve box and backfill installation.

3.11 QUICK COUPLING VALVE INSTALLATION

- A. Install quick coupling valves where indicated on Construction Drawings; generally, at ends of mainline branches and immediately downstream of well.
- B. Mount mainline quick coupling valves on 1-inch diameter, 12-inch long brass swing joint assemblies and stabilizers.
- C. Where mainline pressure exceeds 60 psi, install pressure regulating valves to 40 psi off quick coupling valve service tee.

3.12 WIRE INSTALLATION

- A. Install wiring per local codes for less than 30-Volt service.
- B. Install valve two-wire in trench alongside mainline at invert elevation. Backfill carefully to avoid any damage to wire insulation on conductors.
 - 1. In areas of unsuitable material, use clean sand in bottom of trench before placing wire (see Excavation, Trenching, and Backfilling)
 - 2. Minimum cover: 12-inches
- C. Maintain sufficient slack for expansion, contraction and servicing. Do not install wiring tightly.
 - 1. Provide and install additional 8 to 12 inches slack for conventional wire from decoder to valve.
 - 2. Provide 30 inches slack between decoders for two-wire.
 - 3. Provide sufficient length of wire in valve boxes to allow valve solenoid, splice, decoder wire, and all connections to be brought above grade for servicing.
 - 4. Coil slack for neatness in valve box.
- D. Install Decoder Cable Fuse Device as shown on Contract Drawings.
- E. Provide waterproof splices at all in-ground wire connections using approved splice kits. All splices shall be made in valve boxes and recorded on Record Drawings.
- F. Provide complete wiring diagram showing wire routing for connections between controller and valves as specified in Record Documents.
- G. Securely store wire when not scheduled for installation.

3.13 GROUND INSTALLATION

A. Controller Grounding

1. Wire 6AWG Bare Copper Wire to Grounding Rod and Plate as shown on drawings.
2. Grounding Rod
 - a. Coordinate with Site Contractor to ensure no obstructions below grade at grounding rod site (Call 811 / DIG-SAFE if necessary)
 - b. Prepare valve box for grounding rod installation 8 feet from all valve boxes and electrical equipment. Drive 8-foot grounding rod into earth with 6 inches minimum below valve box lid.
 - c. Make Cadweld connection between bare copper wire from lightning arrestor splice to grounding rod lug.

3.14 SPRINKLER INSTALLATION

- A. Sprinklers shall not exceed maximum spacing as indicated on Construction Drawings.
- B. Install sprinklers flush with grade on PVC swing joints as specified.
- C. Flush system before installing internals, flush caps, and nozzles (see Testing and Adjustments)
- D. Adjust all sprinklers after installation using flow control device on valve. Do not exceed radius reduction recommendations from manufacturer.

3.15 VALVE BOX INSTALLATION

- A. Furnish and install valve boxes as per valve schedule above for each valve, splice, or sensor.
- B. Install valve boxes on minimum 4-inches crushed stone base. Pouring stone into valve box after installation is not acceptable.
- C. Finish elevation of all boxes shall be at grade, unless otherwise noted in Drawings.
- D. Provide level brick supports beneath valve boxes.
 1. For square/rectangular boxes, provide four (4) supports - one at each corner.
 2. For round boxes, provide three (3) supports equally spaced.

3.16 AUTOMATIC IRRIGATION CONTROLLER INSTALLATION

A. Controller

1. Controller located inside Stainless Steel Enclosure.
2. Wire valves and external sensors into controller through conduits and set proper programming.
 - a. Program "Cycle-Soak" feature for all zones with sloped or poorly draining soils.
 - b. Install and calibrate soil moisture sensors as per manufacturer instructions.
 - c. Soil moisture sensors are not required for each irrigation zone. Assign representative soil moisture sensors for similar zones, such as:
 - 1) Sun vs. Shade
 - 2) Lawn vs. Plantings
 - 3) Heavy vs. Light Soils

3. Use Irrigation Plans provided for Recommended Quantity and Assignment
4. Using licensed electrical, wire controller to 120-Volt, 20-Amp electrical supply provided by Electrical Contractor.
5. Provide keys to Owner after final walkthrough.

B. Rain Sensors

1. Install sensors within Sensor Guard welded to irrigation controller enclosure. Wire sensor through Sensor Guard, through enclosure, and into Controller.
2. Exposed sensor wire shall be installed within ½-inch galvanized conduit, where applicable.
3. Rain Sensor shall have direct overhead exposure to atmospheric conditions and not in contact with overhead irrigation.

C. Grounding

1. Provide outdoor grounding for irrigation controller with grounding rod and grounding plate. Refer to Ground Installation and Construction Drawings details for installation steps.

3.17 TESTING AND ADJUSTMENTS

A. Include all testing and adjustments in submitted bid price.

B. System Flushing:

1. Open electric zone valves and flush out irrigation system under full head of water before installing sprinkler internals, flush caps, and nozzles.
2. Flush entire irrigation system after complete installation.
3. Clogged nozzles shall be remedied after completion of irrigation system.

C. Testing:

1. Test all pipe and valves for leaks at operating pressure. Repair all leaks and retest until leaks are remedied.
2. Perform coverage test with Owner's Representative present. Operate electric zone valves for five (5) minutes minimum during coverage test. Readjust sprinkler nozzles and head locations (as necessary) to attain proper coverage. Replace any equipment that does not meet specified standards.
3. After testing, clean all equipment of debris during installation.

D. Adjust sprinkler heads and valve boxes as necessary for mowing and landscaping.

E. Throughout guarantee period, adjust sprinklers and ensure coverage due to settlement and landscaping operations.

3.18 RECORD DOCUMENTS

A. Record (As-Built) Drawings

1. Maintain and update Record Drawings with red-line markings as project progresses, including locations of:
 - a. Sprinklers and descriptions (nozzle, pop-up height, and type)
 - b. Valve Boxes and descriptions (valve type, zone numbers, splice, etc.)
 - c. All equipment installed with distinct symbols

- d. Pipe routing and tees
 - e. Wire routing and splices
 2. Locations of installed equipment (valve, controller, sensors) shall be referenced by two permanent locations (swing ties) or GPS.
 3. Make all notes legible as work progresses, any new equipment added shall use distinct symbols denoting location.
 4. Document any changes from original Construction Drawings.
 5. Prints of original Construction Drawings may be obtained from the Owner's Representative at cost (0% markup).
 6. Record Drawings shall be used as basis of payment for work completed. Provide copies of red-lined set to Owner's Representative along with payment request.
- B. Record Documents
1. Record Documents shall be on-site at all times. Maintain record of the following as the project progresses:
 - a. Materials Approved and approval date
 - b. Pressure Test results, testing personnel and testing date.
 - c. Materials delivered, Accepted, and Installed by whom and date.
 - d. Field Communications and Requests for Information (RFI)
 - C. Prior to final punchlist, provide complete electronic and hard copy files of Record Drawings and Documents to Owner's Representative as part of project completion. All information must be complete and shall be added to submitted documents prior to acceptance.

3.19 OPERATION AND MAINTENANCE

- A. General
1. Bid price shall include up to four (4) hours of irrigation system overview and instruction with Owner and/or Owner's Representative.
- B. Operation and Maintenance Manual
1. Provide three (3) hard cover binders titled "Operation and Maintenance Cornelia Warren Park Irrigation System" prior to application for acceptance and final payment.
 2. Operation and Maintenance Manual shall include, but not be limited to:
 - a. Title Page and Table of Contents
 - b. One-Paragraph Written Description of Irrigation System
 - c. Manufacturers' Data and Cut Sheets of Equipment, including:
 - 1) Copies of all approved submittals
 - 2) Wire resistance readings to each electric valve at completion (for future troubleshooting)
 - 3) Recommended operating settings
 - 4) Recommended maintenance schedule
 - 5) Name, address, and telephone number of installer (for repairs, spring startup, and winterization during 1-year guarantee period)
 - 6) Irrigation program for periods without rain and recommended settings

including, zone run time, days per week, cycle-soak, and rain sensor suspension.

- 7) Hydrawise (Weather Network) settings, login, and troubleshooting
- d. Winterization and Spring Startup Instructions (after 1-year guarantee period)
- e. Guarantee Data
- f. Pockets with Folded Plans of:
 - 1) Original Design Drawing
 - 2) Final Record Drawing
 - 3) Controller Valve and Wiring System Diagram Drawing
 - 4) Stop-and-Waste Valve Locations

3.20 SITE CLEANUP

- A. Remove all unused materials and equipment from project site safely and efficiently. Dispose of all unused materials legally - including construction debris and trash.
- B. Adjust ground, compact, and re-plant around irrigation sprinkler heads and trenches as necessary for proper angle and elevation.
- C. Fill all depressions, erosion rills, tire tracks, etc. with proper planting soil mix to ensure site drainage.

3.21 FINAL OWNER ACCEPTANCE

- A. Final Owner Acceptance of Irrigation System is predicated on:
 1. Complete system installation, adjustment, testing, and instructional overview.
 2. Submission of Operation and Maintenance Manuals to Owner's Representative.
 3. Proper Programming and Internet Connection of Automatic Irrigation Controller
 4. Completed and approved all punchlist items.
- B. Owner and/or Owner's Representative shall provide written notice (hard copy and/or electronic) for Final Acceptance. Date of Final Acceptance notice shall serve as start of 1-year Guarantee period as described above.

END OF SECTION 32 84 00

SECTION 321813 - SYNTHETIC GRASS SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes synthetic grass surfacing for golf putting area.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for preparation, compaction, and grading of granular base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For synthetic grass surfacing.
 - 1. Include sections and details.
 - 2. Show locations of seams and method of seaming.
- C. Samples: For each type of synthetic grass surfacing indicated.
 - 1. Turf Fabric: 12 inches (300 mm) square.
 - 2. Infill Material: 4 oz. (100 g) of each type.
 - 3. Seam Sample: 24 inches (600 mm) square with seam centered in sample.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each synthetic grass surfacing assembly.
- C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For synthetic grass surfacing, including maintenance cleaning instructions, to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Turf Fabric: Minimum of 300 sq. ft. for each type indicated.
 - 2. Infill: Minimum of two bags of each type.
 - 3. Seaming Tape and Adhesive: One roll of seaming tape and one gallon of adhesive.
 - 4. One new set of maintenance tools, of type recommended by synthetic grass surfacing manufacturer for installation.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in location and manner to allow installation of synthetic grass surfacing without excess disturbance of granular base.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace synthetic grass surfacing that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration and excessive wear.
 - b. Deterioration from UV light.
 - c. Seam separation.
 - 2. Warranty Period: 12 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Permeability: 290 in./h of rainfall capacity according to ASTM F2898 or EN 15330-1.

2.2 SYNTHETIC GRASS SURFACING

- A. Golf Green Fabric: Woven turf fabric with multicolored fiber and UV resistance, complying with the following:
 - 1. Yarn Fiber: polypropylene twisted slit-film
 - 2. Pile Weight: 34 oz/sq. yd.
 - 3. Pile Height: 1.125 inches
 - 4. Color: Manufacturer's standard golf green color
 - 5. In-fill requirement: 6-8 lbs/sq. ft.
 - 6. Or approved equal
- B. Golf Fringe Fabric: Woven turf fabric with multicolored fiber and UV resistance, complying with the following:
 - 1. Yarn Fiber: Monofilament polyethylene
 - 2. Pile Weight: 60 oz/sq. yd.
 - 3. Pile Height: 1.6 inches
 - 4. Color: Manufacturer's standard golf fringe color
 - 5. In-fill requirement: 2-4 lbs/sq. ft.
 - 6. Or approved equal
- C. Backing: Manufacturer's standard woven polypropylene primary backing with polyethylene adhesive applied to synthetic turf with a polypropylene non-woven geotextile as a secondary backing reinforcement.
 - 1. Backing shall be urethane-free
 - 2. Backing shall be 100% recyclable
 - 3. Backing shall be DuraFlo E.E.B.S. as manufactured by Challenger Sports Solutions, 743 Hill Road, Dalton GA (800-334-8873)
 - 4. Or approved equal.
- D. Infill: Manufacturer's standard sand infill.
- E. Seaming Method: Adhesive or Sewn, per manufacturer's recommendations.

2.3 MATERIALS

- A. Sand Infill: Uniformly sized silica sand free of silts, clays, and contaminants, and of subangular or rounder shape according to ASTM F1632; mesh size as recommended by synthetic grass surfacing manufacturer.
- B. Seam Adhesive: One- or two-part urethane, recommended or approved by synthetic grass surfacing manufacturer, and suitable for ambient conditions at time of installation.
- C. Seam Tape: Synthetic grass manufacturer's recommended seam tape, minimum 12 inches wide.

- D. Seaming Cord: Seaming cord or thread, recommended by the synthetic grass surfacing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine base and other conditions, with Installer present, for compliance with requirements for installation tolerances, permeability, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Avoid disturbance of base during installation of turf fabric.
- B. Roll out turf fabric and allow to relax at least four hours prior to seaming.
- C. Provide seams flat and snug, with no gaps or fraying. Remove yarns that are trapped within seams. Attach turf fabric to perimeter restraint system as recommended by the manufacturer.
- D. Repair loose seams and bubbles formed due to expansion of turf fabric prior to installation of infill.
- E. Evenly broadcast and groom infill by machine in proportions and depth after settling as recommended by the manufacturer, and to meet indicated performance requirements. Rake fibers trapped by infill to surface.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Permeability: 290 in./h of rainfall capacity according to ASTM F2898 or EN 15330-1.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel in proper maintenance procedures for synthetic grass surfacing.

END OF SECTION 321813

SECTION 323300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes installation of:
 - 1. Benches
 - 2. Picnic Tables
 - 3. Bike Racks
 - 4. Trash/recycling receptacles
 - 5. Custom Dugouts
 - 6. Shade Coverings
 - 7. Shade Structure
 - 8. Flag pole
 - 9. Bollards
- B. Related Sections:
 - 1. Section 033053 "Miscellaneous Cast-in-Place Concrete"
 - 2. Section 321313 "Concrete Paving"
 - 3. Section 321413 "Concrete Unit Paving"
 - 4. Section 321840 "Poured-In-Place Protective Surfacing"

1.3 GENERAL DESCRIPTION

- A. The Contractor shall furnish and install all site furnishings shown on the Drawings. See Section 01 41 00 - Control of the Work, Section 1.13 for a description of the Contractor's responsibilities in checking, receiving, storing and coordinating with the manufacturer to receive a complete and satisfactory order.
- B. The work shall include the installation of the following site furnishings, furnished and installed by the Contractor;
 - 1. Benches, picnic tables, bike racks, and trash receptacles are manufactured by DuMor, or approved equal, and consist of installations as shown on the Drawings.
 - 2. Custom dugouts and hexagon shade structure are manufactured by Poligon, or approved equal, and consist of installations as shown on the Drawings.

3. Shade coverings over bleachers are manufactured by Shade Systems, Inc, or approved equal, and consist of installations as shown on the Drawings.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Shop Drawings: Shop drawings or manufacturer's specifications shall be submitted for all work furnished in this Section, in accordance with the provisions of the Special Conditions Section of the Contract Specifications.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.6 WARRANTY/GUARANTEE

- A. The Contractor/Manufacturer's Representative shall provide information on the equipment manufacturer's warranty/guarantee with bid.

1.7 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 HARDWARE AND FASTENERS:

- A. All hardware and fasteners shall be zinc-coated, except for reinforcing bars. Nuts and bolts shall be Grade A steel, hexagon-type. Washers shall be carbon steel.

2.2 SITE FURNISHINGS:

- A. Equipment to be furnished and installed by the Contractor and shown on the Drawings:
 1. Bench (5)- DuMor 160-60 cast bench, steel seat
 2. Playground Bench (3) - DuMor 165-60PL cast bench, recycled plastic seat
 3. Backless Bench (3) - DuMor 166-60PL backless cast bench, recycled plastic seat
 4. Picnic table (4) - DuMor Pedestal Tables – 76 Series, 76-44PL
 5. ADA Accessible Picnic Table (1) - DuMor Pedestal Tables – 76 Series, 76-43PL
 6. Bike loop (3) - DuMor 83 Series, 83-00/S-2
 7. Trash/recycling receptacle (3 pairs, 6 total) - DuMor – 287-32SH-RC0001 & 287-32-SO

8. Custom dugout (2) (Poligon, 10'x32' steel custom)
9. Shade Covering over Bleacher (2) (Shade Systems, Inc. 13x24' custom)
10. 24' Hexagon Shade Structure (1) - (Poligon – HXE-24 w/ MULTI-RIB)
11. Flag pole (1)
12. Bollards (9) – 42" high steel, powder coated bollards

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Assemble furnishings in accordance with manufacturer's written instructions and install in accordance with the Drawings.

END OF SECTION 323300

SECTION 26 00 00 - ELECTRICAL

PART I GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

- A. The Contractor shall furnish a complete finished product, which meets all applicable codes and standards, and the intent and specific requirements of the Drawings and specifications for this project. It is the intent of these specifications that the electrical system shall be suitable in every way for the service (and use) required. All materials and all work, which may be reasonably implied as being incidental to the work of this Section, shall be furnished at no extra cost to the Owner.
- B. As used in this Section, "*provide*" means "furnish and install", "*furnish*" means "to purchase and deliver to the project site complete with every necessary appurtenance and support", and "*install*" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".
- C. Perform work and provide (furnish and install) material and equipment as shown on Drawings and as specified, or indicated, in this Section of the specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation. Drawings and specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- D. Remove all debris caused by Contractors' work.
- E. Provide demolition and relocation of existing electrical items as shown on the drawings.

- F. The work to be done under this contract generally includes, but is not limited to the following:

Electrical Demolition

1. Contractor shall coordinate removal of NSTAR 120/240V existing service {meter #5065366} and associated customer owned equipment as shown on the plans and cut over the 120/240 to new 15KVA transformer supplied from 277/480 volt service.

New Sports Lighting System

2. Provide a complete sports-lighting system for the Baseball field and parking lighting and system as detailed on contract plans and within MUSCO SPECIFICATION SECTION 26 56 68 – EXTERIOR ATHLETIC LIGHTING
3. Provide fully functional Sports Lighting for each field including (but not limited to) precast concrete foundations, galvanized steel light poles, LED lighting controls, pole-mounted junction boxes, brackets for fixture mounting, wiring, etc. Sports Lighting shall be in locations as shown on Contract Drawings.
4. Provide underground conduit and handhole system from the field house to each of the new lighting poles and concrete foundations for the parking area and baseball
5. Provide and install Lighting Contactor Cabinet (LCC) to be installed in new Electrical Cabinet for control of Sports Lighting system. Lighting Contactor Cabinet to be manufactured by Musco Lighting
6. At each Sports Lighting Pole location provide a electric handhole with 2" conduits from and to adjacent electric handholes (number as shown on Drawings) with a 1-2" conduit tap to Sports Lighting Pole.
7. Provide Sports Lighting Poles as shown on Drawings.
8. Provide Sports Lighting pole precast concrete foundations per manufacturer's detailed design. Pole foundations to be installed per Manufacturer's requirements with all necessary concrete, reinforcement, backfill, compaction, testing, etc. at no, additional cost to Owner. Sports Lighting Pole Foundation to be able to accommodate 1-2" electric and future 1 - 1" communications conduit in pole openings
9. Provide new underground secondary ductbank of 3-2" PVC from control cabinet in field house to sports lighting poles as shown on Contract Drawings. Provide
10. Provide all necessary grounding
11. Provide new conduits and handholes Basketball/Parking area lighting as shown in Contract Drawings.
12. Provide other associated electrical equipment necessary for a complete system, shown, or implied in these Specifications and on Contract Drawings.

13. Provide ant site work for installation of new conduits, cables, handholes, foundations, electrical cabinet, light poles, etc. as shown on Contract Drawings or as required for a complete functional system.

1.03 SITE VISIT

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

1.04 AS-BUILT DRAWINGS:

- A. After completion of the electrical installation, the Contractor shall furnish an "as-built" drawings showing all conduits, cables, cabinets, transformers, light poles, etc. to scale with dimensions where required. Instruction sheets and parts lists covering all operating equipment will be bound into a folder and furnished to the Owner in duplicate.

1.05 INSTRUCTIONS:

- A. Within 10 days, after completion and testing of the system, the Contractor will instruct the Owner's personnel in the proper operations and maintenance of the system, in a 2 hour training session.

1.06 GUARANTEE

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

1.07 REFERENCE STANDARDS AND SPECIFICATIONS

- A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and federal government, and other authorities that have lawful jurisdiction.
- B. All materials and installations shall be in accordance with the latest edition of the Massachusetts Electrical Code, and all applicable local codes and ordinances. Materials and equipment shall be listed by Underwriters Laboratories (UL). Special Attention shall be paid to the latest edition of the following standards:

American National Standards Institute	ANSI
American Society for Testing & Materials	ASTM
Illuminating Engineering Society	I ES
Institute of Electrical & Electronics Engineers	IEEE
Insulated Cable Engineers' Association	ICEA
National Electrical Code	NEC
National Electrical Manufacturer's Association	NEMA
National Electrical Safety Code	NESC
InterNational Electrical Testing Association	NETA
National Fire Protection Association	NFPA
Occupational Safety & Health Administration	OSHA
Underwriter's Laboratories, Inc.	UL

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

1.08 SUBMITTALS

- A. Within 10 days after Award of General Contract, submit shop drawings and product data on below listed items for approval. Submit copies as requested.
- B. Check, stamp and mark with project name shop drawings and product data before submitting for approval. Specifically indicate on shop drawing transmittal form or by separate letter any deviations from Contract Documents because of standard shop practice or other reason. Rectify with no extra cost to Owner, deviations which escape Engineer's scrutiny and have not been indicated on shop drawings.
- C. List of materials and equipment requiring shop drawings shall include:
1. Conduits and Wiring
 2. Panelboards
 3. Service Cabinets and Equipment
 4. Transformer
 5. Circuit Breakers
 6. Concrete Products and Light Bases
 7. Wiring Devices and Receptacles
 8. Parking Lighting
 9. Sports Lighting
 10. Handholes
- D. The Engineer's review shall be only for conformance with the design concept of the project and compliance with the specifications and Drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and Drawings which may not be indicated on the shop drawings is included under the work of this Section.

- E. The Contractor shall furnish at least two (2) complete sets of operating and instruction manuals for the equipment provided under this Contract. These manuals shall detail the operation, testing, and maintenance of the electrical equipment and systems. Manuals shall be provided upon Engineer's request or upon project completion, whichever comes first.

1.09 INSPECTIONS AND FEES

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

1.10 INTERPRETATION OF DRAWINGS

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

1.11 ELETRIC UTILITY

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

PART II — MATERIALS & PRODUCTS

2.01 GENERAL

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

2.02 RACEWAYS

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

wiring. Insulated metallic bushings shall be used on all conduits entering panel cabinets, pull-boxes, and wiring gutters, except on branch lighting circuits.

- D. Expansion fittings shall be provided on all conduits as required by the 2017 National Electrical Code, and as required by local and state codes. This includes, but is not limited to, vertical conduit risers coming from below-grade.

2.03 WIRE AND CABLE

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

	208Y/120 V. 3 Phase	240D/120 V 3 Phase	480Y/277 V 3 Phase
Phase A	Black	Black	Brown
Phase B	Red	Red	Orange
Phase C	Blue	Orange	Yellow
Neutral	White	White	Gray
Ground	Green	Green	Green

2.04 WIRE AND CABLE CONNECTORS AND DEVICES

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

2.05 BOXES

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

2.06 WARNING TAPE

- A. Warning tape shall be six (6) inches wide, polyethylene not less than 3.5 mil thick with a minimum strength of 1,500 psi. Install 8 inches below final grade. Tape shall be red for electric conduit, and red or yellow for communication conduit. Tape shall have black lettering on two lines as indicated below:
- B. For Electric conduit:
CAUTION CAUTION CAUTION
BURIED ELECTRIC LINE BELOW
- C. For Telephone, Fire Alarm and Communication conduit:
CAUTION CAUTION CAUTION
BURIED COMMUNICATION LINE BELOW

2.07 PANELBOARDS

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

2.08 ELECTRICAL ENCLOSURE & CABINETS

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

2.09 ELECTRIC HANDHOLES

- A. Electric Handholes are to be strong, lightweight, and non-conductive, and provided in the dimensions as shown on the Contract Drawings. Electric Handholes shall be Ultraviolet (UV) resistant, along with being unaffected by moisture, freezing temperatures, soil, and sub-soil chemicals. Electric Handholes to be fiberglass composite, as approved by Engineer.

- B. Handholes shall be provided with skid-resistant surface covers, with an "Electric" logo for power and "Communications" logo for audio, etc.. Handholes and Covers shall be design for street-rated, heavy duty applications, meeting the requirements of the either: AASHTO HS-20 or ANSI/SCTE 77-2002 Tier 15 loading, with a minimum design load of 15,000 lbs for both the handhole box and cover. Covers shall include recessed stainless steel captive bolts of a penta-head design. The nuts for the bolts shall be self-centering and corrosion resistant. Handholes shall meet the requirements of the latest edition of the National Electric Code (2008 or later) with regards to structural integrity, installation methods, grounding of the cover and metallic parts, etc. Handholes shall be UL listed for the intended use.
- C. Color of electric handholes and covers to be green in grass areas, as approved by Engineer. Handholes to be installed flush with final grade.
- E. Conduits in handholes shall be swept up using 45 degree sweeps, terminating a minimum of 4-inches above the gravel sub-surface. Conduits shall enter from each end, below, the bottom of each handhole, within an area 1/3 of the length from the end of the handhole,

2.09 PRE-PACKAGED SPORTS LIGHTING SYSTEM

- A. Provide a pre-packaged sport lighting system (Standard Musco Lighting) as specified in this section and shown on the drawings and detailed in SECTION 26 56 68 – EXTERIOR ATHLETIC LIGHTING
- B. Provide a complete, pre-packed sports lighting, to illuminate the parking area wired and assembled with approved brackets, foundations, and other devices as necessary.

PART III — EXECUTION

3.01 GENERAL

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

3.02 MATERIALS AND WORKMANSHIP

- A. Work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Do not run raceway exposed unless shown exposed on Drawings. Material and equipment shall be new and installed according to manufacturer's recommended best practice so that complete installation shall operate safely and efficiently.

3.03 CONTINUITY OF SERVICES

- A. Do not interrupt existing services without Owner's, Utilities, Engineer's and Architect's approvals.

3.04 TESTING, INSPECTION AND CLEANING

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

- F. Clean panels and other equipment, Panelboard interiors shall be cleaned and vacuumed. Equipment with damage to painted finish shall be repaired to Engineer's or Architect's satisfaction. After completion of project, clean exterior surfaces of electrical equipment.

3.05 WIRING METHODS

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

3.06 GROUNDING

- A. Bond and ground equipment and systems connected under this Section in accordance with standards of the NEC and other applicable regulations and codes.
- B. Conduit system shall be electrically continuous throughout, grounded at service entrance. equipment frames, enclosures, boxes, etc. shall be grounded by use of green-jacketed (or bare copper) ground sized as per Table 250-95 of the NEC.
- C. Green bonding jumper shall be installed in flexible conduits.
- D. Copper fittings for ground connections shall conform to the requirements of ASTM B 30. All bolts, u-bolts, cap screws, nuts, and lock washers for copper fitting shall be of approved corrosion-resisting material. Compression connectors required for all below-grade grounding connections.
- E. Ground Rods shall be 5/8" diameter and 8' in length, copperweld as required by applicable codes (NEC, NESC). Bonding connections to ground rods shall be permanent, welded or

crimped, with copper connectors. All wire used for grounding shall be no smaller than #4 Awg copper, stranded conductor.

3.07 EXECUTION — INSTALLATION OF ELECTRICAL EQUIPMENT

- A. Contractor to furnish and Install the following major electrical components, and all necessary minor and expected accessories.
- B. Provide, furnish and install all products and work outlined in Paragraph 1.02.G of this Specification Section.
- C. Provide new conduit system for lighting and electrical work, in locations as shown on Contract Drawings. Utilize existing empty conduits (installed by others) where possible and install new conduits for a complete and functional system. Provide all new cabling for all electrical equipment listed.
- D. Install all equipment in locations as shown on Contract Drawings. All deviations must be approved, in advance by City, Architect and Engineer.
- E. Install all equipment per manufacturer's instructions.
- F. Balance the lighting, receptacle and electrical load evenly on all circuits and on all phases of each circuit.
- G. Clean-up excavated areas, and restore with new loam & seed, as directed by Architect.
- H. Provide complete "As-Built" drawings to Engineer & Owner.