BIRCH MEADOW PARK | PHASE I RENOVATIONS

TOWN OF READING

62 Oakland Road | Reading, MA 01867

BID DOCUMENTS
PROJECT MANUAL

CONTRACT 23-22

JANUARY 27, 2023

PREPARED BY:

ACTIVITAS

landscape architecture | civil engineering

PROJECT TEAM

OWNER:

Town of Reading
62 Oakland Road
Reading, MA 01867

LANDSCAPE ARCHITECT/CIVIL ENGINEER:

Activitas
70 Milton Street
Dedham, MA 02026
(781) 326-2600

ARCHITECT:

OCO Architecture :: Design
709 Hingham Street
Hingham, MA 02043
(617) 699-8395

ELECTRICAL ENGINEER:

NV5
200 Brickstone Square
Andover, MA 01810
(978) 296-6232

WETLAND DELINEATION:

Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754
(978) 897-7100

SURVEY:

Reed Land Surveying, Inc.
109 Rhode Island Road, Suite 4A
Lakeville, MA 02347
(508) 923-1181

TABLE OF CONTENTS

DIVISION 00 00 00 - PROCUREMENTS AND CONTRACTING REQUIREMENTS **

INVITATION TO BID	
SECTION I	GENERAL INSTRUCTIONS FOR BIDDERS
SECTION II	FORM OF GENERAL BID
SECTION III	REQUIRED FORMS
SECTION IV	CONTRACT AGREEMENT
SECTION V	GENERAL CONDITIONS
SECTION VI	SPECIFICATIONS
SECTION VII	PREVAILING WAGE RATES
SECTION VIII	APPENDIX

**Provided by the Town of Reading

DIVISION 01 00 00 - GENERAL REQUIREMENTS

SECTION 01 11 00	SUMMARY OF WORK
SECTION 01 22 00	UNIT PRICES
SECTION 01 23 00	ALTERNATES
SECTION 01 31 19	PROJECT MEETINGS
SECTION 01 33 00	SUBMITTALS
SECTION 01 50 00	TEMPORARY FACILITIES
SECTION 01 70 00	PROJECT CLOSEOUT
SECTION 01 78 36	WARRANTIES
SECTION 01 78 39	PROJECT RECORD DOCUMENTS

DIVISION 02 00 00 - EXISTING CONDITIONS

SECTION 02 00 00	SITE REQUIREMENTS

DIVISION 03 00 00 - CONCRETE

SECTION 03 00 00	CAST-IN-PLACE CONCRETE

DIVISION 10 00 00 - SPECIALTIES

SECTION 10 14 00	EXTERIOR SITE SIGNAGE

DIVISION 11 00 00 - EQUIPMENT

SECTION 11 68 00	ATHLETIC EQUIPMENT

DIVISION 26 00 00 - ELECTRICAL

SECTION 26 00 00	ELECTRICAL (prepared by NV5)

DIVISION 31 00 00 - EARTHWORK

SECTION 31 10 00	SITE PREPARATION
SECTION 31 20 00	EARTHWORK
SECTION 31 25 00	EROSION AND SEDIMENT CONTROL

DIVISION 32 00 00 - EXTERIOR IMPROVEMENTS

SECTION 32 12 16	BITUMINOUS CONCRETE PAVEMENT

SECTION 32 13 13	CEMENT CONCRETE PAVEMENT
SECTION 32 15 40	STONE DUST
SECTION 32 16 13	VERTICAL GRANITE CURB
SECTION 32 17 23	PAVEMENT MARKINGS
SECTION 32 18 23.29	INFILLED SYNTHETIC TURF
SECTION 32 31 29	WOOD GUARDRAIL
SECTION 32 33 00	SITE FURNISHINGS
SECTION 32 92 19	LOAM AND SEED
SECTION 32 92 23	LOAM AND SOD
SECTION 32 93 00	PLANTING

DIVISION 33 00 00 – UTILITIES

SECTION 33 10 00	SITE WATER LINES
SECTION 33 30 00	SANITARY SEWER SYSTEM
SECTION 33 40 00	STORM DRAINAGE SYSTEM

APPENDIX

SCP STANDARD T-WALL DETAIL, as provided by Scituate Companies

END OF TABLE OF CONTENTS

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 00 00 00

PROCUREMENT
AND CONTRACTING
REQUIREMENTS

ACTIVITAS

MAURA HEALEY
Governor

KIM DRISCOLL
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Town of Reading

Contract Number: 23-22 **City/Town:** READING

Description of Work: Renovate and install new walkways, lighting, trees, fields, etc.

Job Location: 0 Birch Meadow Drive, Reading, MA 01867

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- **The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor.** For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Issue Date: 01/24/2023 **Wage Request Number:** 20230124-037

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$35.95	$13.41	$16.01	$0.00	$65.37
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.02	$13.41	$16.01	$0.00	$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.14	$13.41	$16.01	$0.00	$65.56
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.93	$9.10	$17.57	$0.00	$70.60
	06/01/2023	$44.93	$9.10	$17.57	$0.00	$71.60
	12/01/2023	$46.18	$9.10	$17.57	$0.00	$72.85
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$43.33	$9.35	$17.82	$0.00	$70.50
	06/01/2023	$44.33	$9.35	$17.82	$0.00	$71.50
	12/01/2023	$45.58	$9.35	$17.82	$0.00	$72.75
	06/01/2024	$47.06	$9.35	$17.82	$0.00	$74.23
	12/01/2024	$48.53	$9.35	$17.82	$0.00	$75.70
	06/01/2025	$50.03	$9.35	$17.82	$0.00	$77.20
	12/01/2025	$51.53	$9.35	$17.82	$0.00	$78.70
	06/01/2026	$53.08	$9.35	$17.82	$0.00	$80.25
	12/01/2026	$54.58	$9.35	$17.82	$0.00	$81.75
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	12/01/2020	$38.10	$12.80	$9.45	$0.00	$60.35
ASPHALT RAKER *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.83	$9.35	$17.82	$0.00	$70.00
	06/01/2023	$43.83	$9.35	$17.82	$0.00	$71.00
	12/01/2023	$45.08	$9.35	$17.82	$0.00	$72.25
	06/01/2024	$46.56	$9.35	$17.82	$0.00	$73.73
	12/01/2024	$48.03	$9.35	$17.82	$0.00	$75.20
	06/01/2025	$49.53	$9.35	$17.82	$0.00	$76.70
	12/01/2025	$51.03	$9.35	$17.82	$0.00	$78.20
	06/01/2026	$52.58	$9.35	$17.82	$0.00	$79.75
	12/01/2026	$54.08	$9.35	$17.82	$0.00	$81.25
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.63	$14.25	$16.05	$0.00	$83.93
	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.63	$14.25	$16.05	$0.00	$83.93
	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 1*	12/01/2022	$43.93	$9.10	$17.57	$0.00	$70.60
	06/01/2023	$44.93	$9.10	$17.57	$0.00	$71.60
	12/01/2023	$46.18	$9.10	$17.57	$0.00	$72.85
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$43.33	$9.35	$17.82	$0.00	$70.50
	06/01/2023	$44.33	$9.35	$17.82	$0.00	$71.50
	12/01/2023	$45.58	$9.35	$17.82	$0.00	$72.75
	06/01/2024	$47.06	$9.35	$17.82	$0.00	$74.23
	12/01/2024	$48.53	$9.35	$17.82	$0.00	$75.70
	06/01/2025	$50.03	$9.35	$17.82	$0.00	$77.20
	12/01/2025	$51.53	$9.35	$17.82	$0.00	$78.70
	06/01/2026	$53.08	$9.35	$17.82	$0.00	$80.25
	12/01/2026	$54.58	$9.35	$17.82	$0.00	$81.75
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2023	$47.37	$7.07	$20.31	$0.00	$74.75
	01/01/2024	$48.12	$7.07	$20.60	$0.00	$75.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$30.79	$7.07	$13.22	$0.00	$51.08
2	65	$30.79	$7.07	$13.22	$0.00	$51.08
3	70	$33.16	$7.07	$14.23	$0.00	$54.46
4	75	$35.53	$7.07	$15.24	$0.00	$57.84
5	80	$37.90	$7.07	$16.25	$0.00	$61.22
6	85	$40.26	$7.07	$17.28	$0.00	$64.61
7	90	$42.63	$7.07	$18.28	$0.00	$67.98
8	95	$45.00	$7.07	$19.32	$0.00	$71.39

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$31.28	$7.07	$13.22	$0.00	$51.57
2	65	$31.28	$7.07	$13.22	$0.00	$51.57
3	70	$33.68	$7.07	$14.23	$0.00	$54.98
4	75	$36.09	$7.07	$15.24	$0.00	$58.40
5	80	$38.50	$7.07	$16.25	$0.00	$61.82
6	85	$40.90	$7.07	$17.28	$0.00	$65.25
7	90	$43.31	$7.07	$18.28	$0.00	$68.66
8	95	$45.71	$7.07	$19.32	$0.00	$72.10

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (LYNN)*	08/01/2022	$59.15	$11.49	$22.34	$0.00	$92.98
	02/01/2023	$60.35	$11.49	$22.34	$0.00	$94.18
	08/01/2023	$62.40	$11.49	$22.34	$0.00	$96.23
	02/01/2024	$63.65	$11.49	$22.34	$0.00	$97.48
	08/01/2024	$65.75	$11.49	$22.34	$0.00	$99.58
	02/01/2025	$67.05	$11.49	$22.34	$0.00	$100.88
	08/01/2025	$69.20	$11.49	$22.34	$0.00	$103.03
	02/01/2026	$70.55	$11.49	$22.34	$0.00	$104.38
	08/01/2026	$72.75	$11.49	$22.34	$0.00	$106.58
	02/01/2027	$74.15	$11.49	$22.34	$0.00	$107.98

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Lynn*

Effective Date - 08/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.58	$11.49	$22.34	$0.00	$63.41
2	60	$35.49	$11.49	$22.34	$0.00	$69.32
3	70	$41.41	$11.49	$22.34	$0.00	$75.24
4	80	$47.32	$11.49	$22.34	$0.00	$81.15
5	90	$53.24	$11.49	$22.34	$0.00	$87.07

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.18	$11.49	$22.34	$0.00	$64.01
2	60	$36.21	$11.49	$22.34	$0.00	$70.04
3	70	$42.25	$11.49	$22.34	$0.00	$76.08
4	80	$48.28	$11.49	$22.34	$0.00	$82.11
5	90	$54.32	$11.49	$22.34	$0.00	$88.15

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$42.33	$9.10	$17.72	$0.00	$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	09/01/2022	$45.18	$8.68	$19.97	$0.00	$73.83
	03/01/2023	$45.78	$8.68	$19.97	$0.00	$74.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.59	$8.68	$1.73	$0.00	$33.00
2	60	$27.11	$8.68	$1.73	$0.00	$37.52
3	70	$31.63	$8.68	$14.78	$0.00	$55.09
4	75	$33.89	$8.68	$14.78	$0.00	$57.35
5	80	$36.14	$8.68	$16.51	$0.00	$61.33
6	80	$36.14	$8.68	$16.51	$0.00	$61.33
7	90	$40.66	$8.68	$18.24	$0.00	$67.58
8	90	$40.66	$8.68	$18.24	$0.00	$67.58

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.89	$8.68	$1.73	$0.00	$33.30
2	60	$27.47	$8.68	$1.73	$0.00	$37.88
3	70	$32.05	$8.68	$14.78	$0.00	$55.51
4	75	$34.34	$8.68	$14.78	$0.00	$57.80
5	80	$36.62	$8.68	$16.51	$0.00	$61.81
6	80	$36.62	$8.68	$16.51	$0.00	$61.81
7	90	$41.20	$8.68	$18.24	$0.00	$68.12
8	90	$41.20	$8.68	$18.24	$0.00	$68.12

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $30.71/ 3&4 $36.93/ 5&6 $56.82/ 7&8 $63.06

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	04/01/2022	$23.66	$7.21	$4.80	$0.00	$35.67
	04/01/2023	$24.16	$7.21	$4.80	$0.00	$36.17

All Aspects of New Wood Frame Work

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Wood Frame) - Zone 3*

Effective Date - 04/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.20	$7.21	$0.00	$0.00	$21.41
2	60	$14.20	$7.21	$0.00	$0.00	$21.41
3	65	$15.38	$7.21	$0.00	$0.00	$22.59
4	70	$16.56	$7.21	$0.00	$0.00	$23.77
5	75	$17.75	$7.21	$3.80	$0.00	$28.76
6	80	$18.93	$7.21	$3.80	$0.00	$29.94
7	85	$20.11	$7.21	$3.80	$0.00	$31.12
8	90	$21.29	$7.21	$3.80	$0.00	$32.30

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.50	$7.21	$0.00	$0.00	$21.71
2	60	$14.50	$7.21	$0.00	$0.00	$21.71
3	65	$15.70	$7.21	$0.00	$0.00	$22.91
4	70	$16.91	$7.21	$0.00	$0.00	$24.12
5	75	$18.12	$7.21	$3.80	$0.00	$29.13
6	80	$19.33	$7.21	$3.80	$0.00	$30.34
7	85	$20.54	$7.21	$3.80	$0.00	$31.55
8	90	$21.74	$7.21	$3.80	$0.00	$32.75

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $17.86/ 3&4 $20.22/ 5&6 $27.57/ 7&8 $29.94

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LYNN)*	01/01/2023	$49.45	$12.75	$22.74	$0.87	$85.81
	07/01/2023	$50.59	$12.75	$22.74	$0.87	$86.95
	01/01/2024	$51.73	$12.75	$22.74	$0.87	$88.09

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.73	$12.75	$15.49	$0.00	$52.97
2	60	$29.67	$12.75	$22.74	$0.87	$66.03
3	65	$32.14	$12.75	$22.74	$0.87	$68.50
4	70	$34.62	$12.75	$22.74	$0.87	$70.98
5	75	$37.09	$12.75	$22.74	$0.87	$73.45
6	80	$39.56	$12.75	$22.74	$0.87	$75.92
7	90	$44.51	$12.75	$22.74	$0.87	$80.87

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.30	$12.75	$15.49	$0.00	$53.54
2	60	$30.35	$12.75	$22.74	$0.87	$66.71
3	65	$32.88	$12.75	$22.74	$0.87	$69.24
4	70	$35.41	$12.75	$22.74	$0.87	$71.77
5	75	$37.94	$12.75	$22.74	$0.87	$74.30
6	80	$40.47	$12.75	$22.74	$0.87	$76.83
7	90	$45.53	$12.75	$22.74	$0.87	$81.89

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$54.68	$14.25	$16.05	$0.00	$84.98
	06/01/2023	$55.95	$14.25	$16.05	$0.00	$86.25
	12/01/2023	$57.23	$14.25	$16.05	$0.00	$87.53
	06/01/2024	$58.55	$14.25	$16.05	$0.00	$88.85
	12/01/2024	$60.03	$14.25	$16.05	$0.00	$90.33
	06/01/2025	$61.36	$14.25	$16.05	$0.00	$91.66
	12/01/2025	$62.83	$14.25	$16.05	$0.00	$93.13
	06/01/2026	$64.16	$14.25	$16.05	$0.00	$94.46
	12/01/2026	$65.64	$14.25	$16.05	$0.00	$95.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$35.08	$14.25	$16.05	$0.00	$65.38
	06/01/2023	$35.90	$14.25	$16.05	$0.00	$66.20
	12/01/2023	$36.72	$14.25	$16.05	$0.00	$67.02
	06/01/2024	$37.57	$14.25	$16.05	$0.00	$67.87
	12/01/2024	$38.52	$14.25	$16.05	$0.00	$68.82
	06/01/2025	$39.37	$14.25	$16.05	$0.00	$69.67
	12/01/2025	$40.32	$14.25	$16.05	$0.00	$70.62
	06/01/2026	$41.18	$14.25	$16.05	$0.00	$71.48
	12/01/2026	$42.13	$14.25	$16.05	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$8.65	$0.00	$0.00	$36.68
2	55	$30.83	$8.65	$6.27	$0.00	$45.75
3	60	$33.64	$8.65	$6.84	$0.00	$49.13
4	65	$36.44	$8.65	$7.41	$0.00	$52.50
5	70	$39.24	$8.65	$19.63	$0.00	$67.52
6	75	$42.05	$8.65	$20.20	$0.00	$70.90
7	80	$44.85	$8.65	$20.77	$0.00	$74.27
8	90	$50.45	$8.65	$21.91	$0.00	$81.01

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$8.65	$0.00	$0.00	$37.28
2	55	$31.49	$8.65	$6.27	$0.00	$46.41
3	60	$34.36	$8.65	$6.84	$0.00	$49.85
4	65	$37.22	$8.65	$7.41	$0.00	$53.28
5	70	$40.08	$8.65	$19.63	$0.00	$68.36
6	75	$42.95	$8.65	$20.20	$0.00	$71.80
7	80	$45.81	$8.65	$20.77	$0.00	$75.23
8	90	$51.53	$8.65	$21.91	$0.00	$82.09

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 1*	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2022	$44.33	$9.10	$17.57	$0.00	$71.00
	06/01/2023	$45.33	$9.10	$17.57	$0.00	$72.00
	12/01/2023	$46.58	$9.10	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 1*	12/01/2022	$44.08	$9.10	$17.57	$0.00	$70.75
	06/01/2023	$45.08	$9.10	$17.57	$0.00	$71.75
	12/01/2023	$46.33	$9.10	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 1*	12/01/2022	$44.33	$9.10	$17.57	$0.00	$71.00
	06/01/2023	$45.33	$9.10	$17.57	$0.00	$72.00
	12/01/2023	$46.58	$9.10	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2022	$44.08	$9.10	$17.57	$0.00	$70.75
	06/01/2023	$45.08	$9.10	$17.57	$0.00	$71.75
	12/01/2023	$46.33	$9.10	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 1*	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN *ELECTRICIANS LOCAL 103*	09/01/2022	$58.28	$13.00	$21.35	$0.00	$92.63
	03/01/2023	$59.23	$13.00	$21.63	$0.00	$93.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$23.31	$13.00	$0.70	$0.00	$37.01
2	40	$23.31	$13.00	$0.70	$0.00	$37.01
3	45	$26.23	$13.00	$15.87	$0.00	$55.10
4	45	$26.23	$13.00	$15.87	$0.00	$55.10
5	50	$29.14	$13.00	$16.36	$0.00	$58.50
6	55	$32.05	$13.00	$16.86	$0.00	$61.91
7	60	$34.97	$13.00	$17.36	$0.00	$65.33
8	65	$37.88	$13.00	$17.86	$0.00	$68.74
9	70	$40.80	$13.00	$18.35	$0.00	$72.15
10	75	$43.71	$13.00	$18.86	$0.00	$75.57

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$23.69	$13.00	$0.71	$0.00	$37.40
2	40	$23.69	$13.00	$0.71	$0.00	$37.40
3	45	$26.65	$13.00	$16.13	$0.00	$55.78
4	45	$26.65	$13.00	$16.13	$0.00	$55.78
5	50	$29.62	$13.00	$16.63	$0.00	$59.25
6	55	$32.58	$13.00	$17.13	$0.00	$62.71
7	60	$35.54	$13.00	$17.63	$0.00	$66.17
8	65	$38.50	$13.00	$18.13	$0.00	$69.63
9	70	$41.46	$13.00	$18.62	$0.00	$73.08
10	75	$44.42	$13.00	$19.13	$0.00	$76.55

Notes: :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2022	$65.62	$16.03	$20.21	$0.00	$101.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.81	$16.03	$0.00	$0.00	$48.84
2	55	$36.09	$16.03	$20.21	$0.00	$72.33
3	65	$42.65	$16.03	$20.21	$0.00	$78.89
4	70	$45.93	$16.03	$20.21	$0.00	$82.17
5	80	$52.50	$16.03	$20.21	$0.00	$88.74

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2022	$45.93	$16.03	$20.21	$0.00	$82.17

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.83	$9.35	$17.82	$0.00	$70.00
	06/01/2023	$43.83	$9.35	$17.82	$0.00	$71.00
	12/01/2023	$45.08	$9.35	$17.82	$0.00	$72.25
	06/01/2024	$46.56	$9.35	$17.82	$0.00	$73.73
	12/01/2024	$48.03	$9.35	$17.82	$0.00	$75.20
	06/01/2025	$49.53	$9.35	$17.82	$0.00	$76.70
	12/01/2025	$51.03	$9.35	$17.82	$0.00	$78.20
	06/01/2026	$52.58	$9.35	$17.82	$0.00	$79.75
	12/01/2026	$54.08	$9.35	$17.82	$0.00	$81.25

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/05/2022	$48.67	$14.25	$16.05	$0.00	$78.97
	05/01/2023	$49.91	$14.25	$16.05	$0.00	$80.21
	11/01/2023	$51.15	$14.25	$16.05	$0.00	$81.45
	05/01/2024	$52.39	$14.25	$16.05	$0.00	$82.69
	11/01/2024	$53.68	$14.25	$16.05	$0.00	$83.98
	05/01/2025	$55.12	$14.25	$16.05	$0.00	$85.42
	11/01/2025	$56.41	$14.25	$16.05	$0.00	$86.71
	05/01/2026	$57.85	$14.25	$16.05	$0.00	$88.15
	11/01/2026	$59.14	$14.25	$16.05	$0.00	$89.44
	05/01/2027	$60.57	$14.25	$16.05	$0.00	$90.87

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2022	$50.22	$14.25	$16.05	$0.00	$80.52
	05/01/2023	$51.47	$14.25	$16.05	$0.00	$81.77
	11/01/2023	$52.72	$14.25	$16.05	$0.00	$83.02
	05/01/2024	$53.97	$14.25	$16.05	$0.00	$84.27
	11/01/2024	$55.27	$14.25	$16.05	$0.00	$85.57
	05/01/2025	$56.72	$14.25	$16.05	$0.00	$87.02
	11/01/2025	$58.02	$14.25	$16.05	$0.00	$88.32
	05/01/2026	$59.47	$14.25	$16.05	$0.00	$89.77
	11/01/2026	$60.77	$14.25	$16.05	$0.00	$91.07
	05/01/2027	$62.22	$14.25	$16.05	$0.00	$92.52
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2022	$24.31	$14.25	$16.05	$0.00	$54.61
	05/01/2023	$25.05	$14.25	$16.05	$0.00	$55.35
	11/01/2023	$25.78	$14.25	$16.05	$0.00	$56.08
	05/01/2024	$26.51	$14.25	$16.05	$0.00	$56.81
	11/01/2024	$27.27	$14.25	$16.05	$0.00	$57.57
	05/01/2025	$28.12	$14.25	$16.05	$0.00	$58.42
	11/01/2025	$28.88	$14.25	$16.05	$0.00	$59.18
	05/01/2026	$29.73	$14.25	$16.05	$0.00	$60.03
	11/01/2026	$30.49	$14.25	$16.05	$0.00	$60.79
	05/01/2027	$31.34	$14.25	$16.05	$0.00	$61.64
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	09/01/2022	$58.28	$13.00	$21.35	$0.00	$92.63
	03/01/2023	$59.23	$13.00	$21.63	$0.00	$93.86
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 103*	09/01/2022	$46.42	$13.00	$18.87	$0.00	$78.29
	03/01/2023	$48.34	$13.00	$19.01	$0.00	$80.35
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$43.54	$14.25	$16.05	$0.00	$73.84
	06/01/2023	$44.56	$14.25	$16.05	$0.00	$74.86
	12/01/2023	$45.57	$14.25	$16.05	$0.00	$75.87
	06/01/2024	$46.63	$14.25	$16.05	$0.00	$76.93
	12/01/2024	$47.81	$14.25	$16.05	$0.00	$78.11
	06/01/2025	$48.87	$14.25	$16.05	$0.00	$79.17
	12/01/2025	$50.04	$14.25	$16.05	$0.00	$80.34
	06/01/2026	$51.10	$14.25	$16.05	$0.00	$81.40
	12/01/2026	$52.28	$14.25	$16.05	$0.00	$82.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$25.23	$9.35	$17.82	$0.00	$52.40
	06/01/2023	$25.98	$9.35	$17.82	$0.00	$53.15
	12/01/2023	$25.98	$9.35	$17.82	$0.00	$53.15
	06/01/2024	$27.01	$9.35	$17.82	$0.00	$54.18
	12/01/2024	$27.01	$9.35	$17.82	$0.00	$54.18
	06/01/2025	$28.09	$9.35	$17.82	$0.00	$55.26
	12/01/2025	$28.09	$9.35	$17.82	$0.00	$55.26
	06/01/2026	$29.21	$9.35	$17.82	$0.00	$56.38
	12/01/2026	$29.21	$9.35	$17.82	$0.00	$56.38
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	03/01/2022	$49.93	$8.68	$20.27	$0.00	$78.88

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.97	$8.68	$1.79	$0.00	$35.44
2	55	$27.46	$8.68	$1.79	$0.00	$37.93
3	60	$29.96	$8.68	$14.90	$0.00	$53.54
4	65	$32.45	$8.68	$14.90	$0.00	$56.03
5	70	$34.95	$8.68	$16.69	$0.00	$60.32
6	75	$37.45	$8.68	$16.69	$0.00	$62.82
7	80	$39.94	$8.68	$18.48	$0.00	$67.10
8	85	$42.44	$8.68	$18.48	$0.00	$69.60

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $32.94/ 3&4 $39.66/ 5&6 $60.32/ 7&8 $67.10

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.63	$14.25	$16.05	$0.00	$83.93
	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$35.08	$14.25	$16.05	$0.00	$65.38
	06/01/2023	$35.90	$14.25	$16.05	$0.00	$66.20
	12/01/2023	$36.72	$14.25	$16.05	$0.00	$67.02
	06/01/2024	$37.57	$14.25	$16.05	$0.00	$67.87
	12/01/2024	$38.52	$14.25	$16.05	$0.00	$68.82
	06/01/2025	$39.37	$14.25	$16.05	$0.00	$69.67
	12/01/2025	$40.32	$14.25	$16.05	$0.00	$70.62
	06/01/2026	$41.18	$14.25	$16.05	$0.00	$71.48
	12/01/2026	$42.13	$14.25	$16.05	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	01/01/2023	$45.56	$8.65	$23.05	$0.00	$77.26
	07/01/2023	$46.76	$8.65	$23.05	$0.00	$78.46
	01/01/2024	$47.96	$8.65	$23.05	$0.00	$79.66
	07/01/2024	$49.16	$8.65	$23.05	$0.00	$80.86
	01/01/2025	$50.36	$8.65	$23.05	$0.00	$82.06

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$8.65	$0.00	$0.00	$31.43
2	55	$25.06	$8.65	$6.27	$0.00	$39.98
3	60	$27.34	$8.65	$6.84	$0.00	$42.83
4	65	$29.61	$8.65	$7.41	$0.00	$45.67
5	70	$31.89	$8.65	$19.63	$0.00	$60.17
6	75	$34.17	$8.65	$20.20	$0.00	$63.02
7	80	$36.45	$8.65	$20.77	$0.00	$65.87
8	90	$41.00	$8.65	$21.91	$0.00	$71.56

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$8.65	$0.00	$0.00	$32.03
2	55	$25.72	$8.65	$6.27	$0.00	$40.64
3	60	$28.06	$8.65	$6.84	$0.00	$43.55
4	65	$30.39	$8.65	$7.41	$0.00	$46.45
5	70	$32.73	$8.65	$19.63	$0.00	$61.01
6	75	$35.07	$8.65	$20.20	$0.00	$63.92
7	80	$37.41	$8.65	$20.77	$0.00	$66.83
8	90	$42.08	$8.65	$21.91	$0.00	$72.64

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.63	$14.25	$16.05	$0.00	$83.93
	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$29.50	$14.25	$0.00	$0.00	$43.75
2	60	$32.18	$14.25	$16.05	$0.00	$62.48
3	65	$34.86	$14.25	$16.05	$0.00	$65.16
4	70	$37.54	$14.25	$16.05	$0.00	$67.84
5	75	$40.22	$14.25	$16.05	$0.00	$70.52
6	80	$42.90	$14.25	$16.05	$0.00	$73.20
7	85	$45.59	$14.25	$16.05	$0.00	$75.89
8	90	$48.27	$14.25	$16.05	$0.00	$78.57

Effective Date - 06/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$30.18	$14.25	$0.00	$0.00	$44.43
2	60	$32.93	$14.25	$16.05	$0.00	$63.23
3	65	$35.67	$14.25	$16.05	$0.00	$65.97
4	70	$38.42	$14.25	$16.05	$0.00	$68.72
5	75	$41.16	$14.25	$16.05	$0.00	$71.46
6	80	$43.90	$14.25	$16.05	$0.00	$74.20
7	85	$46.65	$14.25	$16.05	$0.00	$76.95
8	90	$49.39	$14.25	$16.05	$0.00	$79.69

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2022	$53.66	$14.11	$26.64	$2.83	$97.24
	02/01/2023	$55.31	$14.11	$26.64	$2.83	$98.89
	08/01/2023	$57.01	$14.11	$26.64	$2.83	$100.59
	02/01/2024	$58.71	$14.11	$26.64	$2.83	$102.29
	08/01/2024	$60.46	$14.11	$26.64	$2.83	$104.04
	02/01/2025	$62.21	$14.11	$26.64	$2.83	$105.79
	08/01/2025	$64.06	$14.11	$26.64	$2.83	$107.64
	02/01/2026	$66.01	$14.11	$26.64	$2.83	$109.59

For apprentice rates see "Apprentice- SHEET METAL WORKER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	09/01/2022	$58.28	$13.00	$21.35	$0.00	$92.63
	03/01/2023	$59.23	$13.00	$21.63	$0.00	$93.86
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2022	$53.66	$14.11	$26.64	$2.83	$97.24
	02/01/2023	$55.31	$14.11	$26.64	$2.83	$98.89
	08/01/2023	$57.01	$14.11	$26.64	$2.83	$100.59
	02/01/2024	$58.71	$14.11	$26.64	$2.83	$102.29
	08/01/2024	$60.46	$14.11	$26.64	$2.83	$104.04
	02/01/2025	$62.21	$14.11	$26.64	$2.83	$105.79
	08/01/2025	$64.06	$14.11	$26.64	$2.83	$107.64
	02/01/2026	$66.01	$14.11	$26.64	$2.83	$109.59
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 1*	12/01/2022	$43.93	$9.10	$17.57	$0.00	$70.60
	06/01/2023	$44.93	$9.10	$17.57	$0.00	$71.60
	12/01/2023	$46.18	$9.10	$17.57	$0.00	$72.85
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$43.33	$9.35	$17.82	$0.00	$70.50
	06/01/2023	$44.33	$9.35	$17.82	$0.00	$71.50
	12/01/2023	$45.58	$9.35	$17.82	$0.00	$72.75
	06/01/2024	$47.06	$9.35	$17.82	$0.00	$74.23
	12/01/2024	$48.53	$9.35	$17.82	$0.00	$75.70
	06/01/2025	$50.03	$9.35	$17.82	$0.00	$77.20
	12/01/2025	$51.53	$9.35	$17.82	$0.00	$78.70
	06/01/2026	$53.08	$9.35	$17.82	$0.00	$80.25
	12/01/2026	$54.58	$9.35	$17.82	$0.00	$81.75
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2022	$53.85	$13.80	$17.14	$0.00	$84.79

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.93	$13.80	$12.42	$0.00	$53.15
2	60	$32.31	$13.80	$13.36	$0.00	$59.47
3	70	$37.70	$13.80	$14.31	$0.00	$65.81
4	80	$43.08	$13.80	$15.25	$0.00	$72.13

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	09/16/2022	$51.59	$8.25	$26.70	$0.00	$86.54

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 09/16/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$30.95	$8.25	$26.70	$0.00	$65.90
2	70	$36.11	$8.25	$26.70	$0.00	$71.06
3	75	$38.69	$8.25	$26.70	$0.00	$73.64
4	80	$41.27	$8.25	$26.70	$0.00	$76.22
5	85	$43.85	$8.25	$26.70	$0.00	$78.80
6	90	$46.43	$8.25	$26.70	$0.00	$81.38

Notes:

Apprentice to Journeyworker Ratio:1:4

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 1*	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10

Apprentice - *LABORER - Zone 1*

Effective Date - 12/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.91	$9.10	$17.57	$0.00	$52.58
2	70	$30.23	$9.10	$17.57	$0.00	$56.90
3	80	$34.54	$9.10	$17.57	$0.00	$61.21
4	90	$38.86	$9.10	$17.57	$0.00	$65.53

Effective Date - 06/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$26.51	$9.10	$17.57	$0.00	$53.18
2	70	$30.93	$9.10	$17.57	$0.00	$57.60
3	80	$35.34	$9.10	$17.57	$0.00	$62.01
4	90	$39.76	$9.10	$17.57	$0.00	$66.43

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.58	$9.35	$17.82	$0.00	$69.75
	06/01/2023	$43.58	$9.35	$17.82	$0.00	$70.75
	12/01/2023	$44.83	$9.35	$17.82	$0.00	$72.00
	06/01/2024	$46.31	$9.35	$17.82	$0.00	$73.48
	12/01/2024	$47.78	$9.35	$17.82	$0.00	$74.95
	06/01/2025	$49.28	$9.35	$17.82	$0.00	$76.45
	12/01/2025	$50.78	$9.35	$17.82	$0.00	$77.95
	06/01/2026	$52.33	$9.35	$17.82	$0.00	$79.50
	12/01/2026	$53.83	$9.35	$17.82	$0.00	$81.00

Apprentice - *LABORER (Heavy & Highway) - Zone 1*

Effective Date - 12/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.55	$9.35	$17.82	$0.00	$52.72
2	70	$29.81	$9.35	$17.82	$0.00	$56.98
3	80	$34.06	$9.35	$17.82	$0.00	$61.23
4	90	$38.32	$9.35	$17.82	$0.00	$65.49

Effective Date - 06/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$26.15	$9.35	$17.82	$0.00	$53.32
2	70	$30.51	$9.35	$17.82	$0.00	$57.68
3	80	$34.86	$9.35	$17.82	$0.00	$62.03
4	90	$39.22	$9.35	$17.82	$0.00	$66.39

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 1*	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 1*	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 1*	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	06/01/2024	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.83	$9.35	$17.82	$0.00	$70.00
	06/01/2023	$43.83	$9.35	$17.82	$0.00	$71.00
	12/01/2023	$45.08	$9.35	$17.82	$0.00	$72.25
	06/01/2024	$46.56	$9.35	$17.82	$0.00	$73.73
	12/01/2024	$48.03	$9.35	$17.82	$0.00	$75.20
	06/01/2025	$49.53	$9.35	$17.82	$0.00	$76.70
	12/01/2025	$51.03	$9.35	$17.82	$0.00	$78.20
	06/01/2026	$52.58	$9.35	$17.82	$0.00	$79.75
	12/01/2026	$54.08	$9.35	$17.82	$0.00	$81.25
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 1*	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 1*	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.83	$9.35	$17.82	$0.00	$70.00
	06/01/2023	$43.83	$9.35	$17.82	$0.00	$71.00
	12/01/2023	$45.08	$9.35	$17.82	$0.00	$72.25
	06/01/2024	$46.56	$9.35	$17.82	$0.00	$73.73
	12/01/2024	$48.03	$9.35	$17.82	$0.00	$75.20
	06/01/2025	$49.53	$9.35	$17.82	$0.00	$76.70
	12/01/2025	$51.03	$9.35	$17.82	$0.00	$78.20
	06/01/2026	$52.58	$9.35	$17.82	$0.00	$79.75
	12/01/2026	$54.08	$9.35	$17.82	$0.00	$81.25
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2022	$45.29	$11.49	$20.37	$0.00	$77.15
	02/01/2023	$46.25	$11.49	$20.37	$0.00	$78.11
	08/01/2023	$47.89	$11.49	$20.37	$0.00	$79.75
	02/01/2024	$48.89	$11.49	$20.37	$0.00	$80.75
	08/01/2024	$50.57	$11.49	$20.37	$0.00	$82.43
	02/01/2025	$51.61	$11.49	$20.37	$0.00	$83.47
	08/01/2025	$53.33	$11.49	$20.37	$0.00	$85.19
	02/01/2026	$54.41	$11.49	$20.37	$0.00	$86.27
	08/01/2026	$56.17	$11.49	$20.37	$0.00	$88.03
	02/01/2027	$57.29	$11.49	$20.37	$0.00	$89.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.65	$11.49	$20.37	$0.00	$54.51
2	60	$27.17	$11.49	$20.37	$0.00	$59.03
3	70	$31.70	$11.49	$20.37	$0.00	$63.56
4	80	$36.23	$11.49	$20.37	$0.00	$68.09
5	90	$40.76	$11.49	$20.37	$0.00	$72.62

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.13	$11.49	$20.37	$0.00	$54.99
2	60	$27.75	$11.49	$20.37	$0.00	$59.61
3	70	$32.38	$11.49	$20.37	$0.00	$64.24
4	80	$37.00	$11.49	$20.37	$0.00	$68.86
5	90	$41.63	$11.49	$20.37	$0.00	$73.49

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2022	$59.17	$11.49	$22.31	$0.00	$92.97
	02/01/2023	$60.37	$11.49	$22.31	$0.00	$94.17
	08/01/2023	$62.42	$11.49	$22.31	$0.00	$96.22
	02/01/2024	$63.67	$11.49	$22.31	$0.00	$97.47
	08/01/2024	$65.77	$11.49	$22.31	$0.00	$99.57
	02/01/2025	$67.07	$11.49	$22.31	$0.00	$100.87
	08/01/2025	$69.22	$11.49	$22.31	$0.00	$103.02
	02/01/2026	$70.57	$11.49	$22.31	$0.00	$104.37
	08/01/2026	$72.77	$11.49	$22.31	$0.00	$106.57
	02/01/2027	$74.17	$11.49	$22.31	$0.00	$107.97

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 08/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.59	$11.49	$22.31	$0.00	$63.39
2	60	$35.50	$11.49	$22.31	$0.00	$69.30
3	70	$41.42	$11.49	$22.31	$0.00	$75.22
4	80	$47.34	$11.49	$22.31	$0.00	$81.14
5	90	$53.25	$11.49	$22.31	$0.00	$87.05

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.19	$11.49	$22.31	$0.00	$63.99
2	60	$36.22	$11.49	$22.31	$0.00	$70.02
3	70	$42.26	$11.49	$22.31	$0.00	$76.06
4	80	$48.30	$11.49	$22.31	$0.00	$82.10
5	90	$54.33	$11.49	$22.31	$0.00	$88.13

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	01/02/2023	$47.27	$8.58	$21.57	$0.00	$77.42

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*

Effective Date - 01/02/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$26.00	$8.58	$5.72	$0.00	$40.30
2	65	$30.73	$8.58	$17.93	$0.00	$57.24
3	75	$35.45	$8.58	$18.98	$0.00	$63.01
4	85	$40.18	$8.58	$20.01	$0.00	$68.77

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$24.37	$14.25	$16.05	$0.00	$54.67
	06/01/2023	$24.94	$14.25	$16.05	$0.00	$55.24
	12/01/2023	$25.51	$14.25	$16.05	$0.00	$55.81
	06/01/2024	$26.11	$14.25	$16.05	$0.00	$56.41
	12/01/2024	$26.77	$14.25	$16.05	$0.00	$57.07
	06/01/2025	$27.37	$14.25	$16.05	$0.00	$57.67
	12/01/2025	$28.03	$14.25	$16.05	$0.00	$58.33
	06/01/2026	$28.62	$14.25	$16.05	$0.00	$58.92
	12/01/2026	$29.29	$14.25	$16.05	$0.00	$59.59
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$29.57	$14.25	$16.05	$0.00	$59.87
	06/01/2023	$30.27	$14.25	$16.05	$0.00	$60.57
	12/01/2023	$30.96	$14.25	$16.05	$0.00	$61.26
	06/01/2024	$31.68	$14.25	$16.05	$0.00	$61.98
	12/01/2024	$32.48	$14.25	$16.05	$0.00	$62.78
	06/01/2025	$33.20	$14.25	$16.05	$0.00	$63.50
	12/01/2025	$34.00	$14.25	$16.05	$0.00	$64.30
	06/01/2026	$34.72	$14.25	$16.05	$0.00	$65.02
	12/01/2026	$35.52	$14.25	$16.05	$0.00	$65.82
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$8.65	$0.00	$0.00	$36.68
2	55	$30.83	$8.65	$6.27	$0.00	$45.75
3	60	$33.64	$8.65	$6.84	$0.00	$49.13
4	65	$36.44	$8.65	$7.41	$0.00	$52.50
5	70	$39.24	$8.65	$19.63	$0.00	$67.52
6	75	$42.05	$8.65	$20.20	$0.00	$70.90
7	80	$44.85	$8.65	$20.77	$0.00	$74.27
8	90	$50.45	$8.65	$21.91	$0.00	$81.01

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$8.65	$0.00	$0.00	$37.28
2	55	$31.49	$8.65	$6.27	$0.00	$46.41
3	60	$34.36	$8.65	$6.84	$0.00	$49.85
4	65	$37.22	$8.65	$7.41	$0.00	$53.28
5	70	$40.08	$8.65	$19.63	$0.00	$68.36
6	75	$42.95	$8.65	$20.20	$0.00	$71.80
7	80	$45.81	$8.65	$20.77	$0.00	$75.23
8	90	$51.53	$8.65	$21.91	$0.00	$82.09

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$46.96	$8.65	$23.05	$0.00	$78.66
	07/01/2023	$48.16	$8.65	$23.05	$0.00	$79.86
	01/01/2024	$49.36	$8.65	$23.05	$0.00	$81.06
	07/01/2024	$50.56	$8.65	$23.05	$0.00	$82.26
	01/01/2025	$51.76	$8.65	$23.05	$0.00	$83.46

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.48	$8.65	$0.00	$0.00	$32.13
2	55	$25.83	$8.65	$6.27	$0.00	$40.75
3	60	$28.18	$8.65	$6.84	$0.00	$43.67
4	65	$30.52	$8.65	$7.41	$0.00	$46.58
5	70	$32.87	$8.65	$19.63	$0.00	$61.15
6	75	$35.22	$8.65	$20.20	$0.00	$64.07
7	80	$37.57	$8.65	$20.77	$0.00	$66.99
8	90	$42.26	$8.65	$21.91	$0.00	$72.82

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.08	$8.65	$0.00	$0.00	$32.73
2	55	$26.49	$8.65	$6.27	$0.00	$41.41
3	60	$28.90	$8.65	$6.84	$0.00	$44.39
4	65	$31.30	$8.65	$7.41	$0.00	$47.36
5	70	$33.71	$8.65	$19.63	$0.00	$61.99
6	75	$36.12	$8.65	$20.20	$0.00	$64.97
7	80	$38.53	$8.65	$20.77	$0.00	$67.95
8	90	$43.34	$8.65	$21.91	$0.00	$73.90

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$45.02	$8.65	$23.05	$0.00	$76.72
	07/01/2023	$46.22	$8.65	$23.05	$0.00	$77.92
	01/01/2024	$47.42	$8.65	$23.05	$0.00	$79.12
	07/01/2024	$48.62	$8.65	$23.05	$0.00	$80.32
	01/01/2025	$49.82	$8.65	$23.05	$0.00	$81.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.51	$8.65	$0.00	$0.00	$31.16
2	55	$24.76	$8.65	$6.27	$0.00	$39.68
3	60	$27.01	$8.65	$6.84	$0.00	$42.50
4	65	$29.26	$8.65	$7.41	$0.00	$45.32
5	70	$31.51	$8.65	$19.63	$0.00	$59.79
6	75	$33.77	$8.65	$20.20	$0.00	$62.62
7	80	$36.02	$8.65	$20.77	$0.00	$65.44
8	90	$40.52	$8.65	$21.91	$0.00	$71.08

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.11	$8.65	$0.00	$0.00	$31.76
2	55	$25.42	$8.65	$6.27	$0.00	$40.34
3	60	$27.73	$8.65	$6.84	$0.00	$43.22
4	65	$30.04	$8.65	$19.06	$0.00	$57.75
5	70	$32.35	$8.65	$19.63	$0.00	$60.63
6	75	$34.67	$8.65	$20.20	$0.00	$63.52
7	80	$36.98	$8.65	$20.77	$0.00	$66.40
8	90	$41.60	$8.65	$21.91	$0.00	$72.16

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2023	$45.56	$8.65	$23.05	$0.00	$77.26
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2023	$46.76	$8.65	$23.05	$0.00	$78.46
	01/01/2024	$47.96	$8.65	$23.05	$0.00	$79.66
	07/01/2024	$49.16	$8.65	$23.05	$0.00	$80.86
	01/01/2025	$50.36	$8.65	$23.05	$0.00	$82.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$8.65	$0.00	$0.00	$31.43
2	55	$25.06	$8.65	$6.27	$0.00	$39.98
3	60	$27.34	$8.65	$6.84	$0.00	$42.83
4	65	$29.61	$8.65	$7.41	$0.00	$45.67
5	70	$31.89	$8.65	$19.63	$0.00	$60.17
6	75	$34.17	$8.65	$20.20	$0.00	$63.02
7	80	$36.45	$8.65	$20.77	$0.00	$65.87
8	90	$41.00	$8.65	$21.91	$0.00	$71.56

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$8.65	$0.00	$0.00	$32.03
2	55	$25.72	$8.65	$6.27	$0.00	$40.64
3	60	$28.06	$8.65	$6.84	$0.00	$43.55
4	65	$30.39	$8.65	$7.41	$0.00	$46.45
5	70	$32.73	$8.65	$19.63	$0.00	$61.01
6	75	$35.07	$8.65	$20.20	$0.00	$63.92
7	80	$37.41	$8.65	$20.77	$0.00	$66.83
8	90	$42.08	$8.65	$21.91	$0.00	$72.64

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$43.62	$8.65	$23.05	$0.00	$75.32
	07/01/2023	$44.82	$8.65	$23.05	$0.00	$76.52
	01/01/2024	$46.02	$8.65	$23.05	$0.00	$77.72
	07/01/2024	$47.22	$8.65	$23.05	$0.00	$78.92
	01/01/2025	$48.42	$8.65	$23.05	$0.00	$80.12

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.81	$8.65	$0.00	$0.00	$30.46
2	55	$23.99	$8.65	$6.27	$0.00	$38.91
3	60	$26.17	$8.65	$6.84	$0.00	$41.66
4	65	$28.35	$8.65	$7.41	$0.00	$44.41
5	70	$30.53	$8.65	$19.63	$0.00	$58.81
6	75	$32.72	$8.65	$20.20	$0.00	$61.57
7	80	$34.90	$8.65	$20.77	$0.00	$64.32
8	90	$39.26	$8.65	$21.91	$0.00	$69.82

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.41	$8.65	$0.00	$0.00	$31.06
2	55	$24.65	$8.65	$6.27	$0.00	$39.57
3	60	$26.89	$8.65	$6.84	$0.00	$42.38
4	65	$29.13	$8.65	$7.41	$0.00	$45.19
5	70	$31.37	$8.65	$19.63	$0.00	$59.65
6	75	$33.62	$8.65	$20.20	$0.00	$62.47
7	80	$35.86	$8.65	$20.77	$0.00	$65.28
8	90	$40.34	$8.65	$21.91	$0.00	$70.90

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.58	$9.35	$17.82	$0.00	$69.75
	06/01/2023	$43.58	$9.35	$17.82	$0.00	$70.75
	12/01/2023	$44.83	$9.35	$17.82	$0.00	$72.00
	06/01/2024	$46.31	$9.35	$17.82	$0.00	$73.48
	12/01/2024	$47.78	$9.35	$17.82	$0.00	$74.95
	06/01/2025	$49.28	$9.35	$17.82	$0.00	$76.45
	12/01/2025	$50.78	$9.35	$17.82	$0.00	$77.95
	06/01/2026	$52.33	$9.35	$17.82	$0.00	$79.50
	12/01/2026	$53.83	$9.35	$17.82	$0.00	$81.00
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$35.78	$13.41	$16.01	$0.00	$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$9.40	$23.12	$0.00	$57.06
2	60	$29.44	$9.40	$23.12	$0.00	$61.96
3	70	$34.35	$9.40	$23.12	$0.00	$66.87
4	75	$36.80	$9.40	$23.12	$0.00	$69.32
5	80	$39.26	$9.40	$23.12	$0.00	$71.78
6	80	$39.26	$9.40	$23.12	$0.00	$71.78
7	90	$44.16	$9.40	$23.12	$0.00	$76.68
8	90	$44.16	$9.40	$23.12	$0.00	$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $34.01/ 3&4 $41.46/ 5&6 $62.80/ 7&8 $69.25

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$23.18	$11.70	$8.25	$0.00	$43.13
2	45	$26.07	$11.70	$20.24	$0.00	$58.01
3	60	$34.76	$11.70	$20.24	$0.00	$66.70
4	70	$40.56	$11.70	$20.24	$0.00	$72.50
5	80	$46.35	$11.70	$20.24	$0.00	$78.29

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

PIPELAYER *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.83	$9.35	$17.82	$0.00	$70.00
	06/01/2023	$43.83	$9.35	$17.82	$0.00	$71.00
	12/01/2023	$45.08	$9.35	$17.82	$0.00	$72.25
	06/01/2024	$46.56	$9.35	$17.82	$0.00	$73.73
	12/01/2024	$48.03	$9.35	$17.82	$0.00	$75.20
	06/01/2025	$49.53	$9.35	$17.82	$0.00	$76.70
	12/01/2025	$51.03	$9.35	$17.82	$0.00	$78.20
	06/01/2026	$52.58	$9.35	$17.82	$0.00	$79.75
	12/01/2026	$54.08	$9.35	$17.82	$0.00	$81.25

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	09/04/2022	$63.49	$14.07	$18.36	$0.00	$95.92
	02/26/2023	$65.19	$14.07	$18.36	$0.00	$97.62
	09/03/2023	$66.94	$14.07	$18.36	$0.00	$99.37
	03/03/2024	$68.74	$14.07	$18.36	$0.00	$101.17
	09/01/2024	$70.54	$14.07	$18.36	$0.00	$102.97
	03/02/2025	$72.34	$14.07	$18.36	$0.00	$104.77

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 09/04/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.22	$14.07	$6.63	$0.00	$42.92
2	40	$25.40	$14.07	$7.52	$0.00	$46.99
3	55	$34.92	$14.07	$10.24	$0.00	$59.23
4	65	$41.27	$14.07	$12.04	$0.00	$67.38
5	75	$47.62	$14.07	$13.85	$0.00	$75.54

Effective Date - 02/26/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.82	$14.07	$6.63	$0.00	$43.52
2	40	$26.08	$14.07	$7.52	$0.00	$47.67
3	55	$35.85	$14.07	$10.24	$0.00	$60.16
4	65	$42.37	$14.07	$12.04	$0.00	$68.48
5	75	$48.89	$14.07	$13.85	$0.00	$76.81

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$69.00, Step5 with lic$76.87

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.83	$9.35	$17.82	$0.00	$70.00
	06/01/2023	$43.83	$9.35	$17.82	$0.00	$71.00
	12/01/2023	$45.08	$9.35	$17.82	$0.00	$72.25
	06/01/2024	$46.56	$9.35	$17.82	$0.00	$73.73
	12/01/2024	$48.03	$9.35	$17.82	$0.00	$75.20
	06/01/2025	$49.53	$9.35	$17.82	$0.00	$76.70
	12/01/2025	$51.03	$9.35	$17.82	$0.00	$78.20
	06/01/2026	$52.58	$9.35	$17.82	$0.00	$79.75
	12/01/2026	$54.08	$9.35	$17.82	$0.00	$81.25
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER *LABORERS - ZONE 1*	12/01/2022	$44.18	$9.10	$17.57	$0.00	$70.85
	06/01/2023	$45.18	$9.10	$17.57	$0.00	$71.85
	12/01/2023	$46.43	$9.10	$17.57	$0.00	$73.10
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$43.58	$9.35	$17.82	$0.00	$70.75
	06/01/2023	$44.58	$9.35	$17.82	$0.00	$71.75
	12/01/2023	$45.83	$9.35	$17.82	$0.00	$73.00
	06/01/2024	$47.31	$9.35	$17.82	$0.00	$74.48
	12/01/2024	$48.78	$9.35	$17.82	$0.00	$75.95
	06/01/2025	$50.28	$9.35	$17.82	$0.00	$77.45
	12/01/2025	$51.78	$9.35	$17.82	$0.00	$78.95
	06/01/2026	$53.33	$9.35	$17.82	$0.00	$80.50
	12/01/2026	$54.83	$9.35	$17.82	$0.00	$82.00
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.63	$14.25	$16.05	$0.00	$83.93
	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.63	$14.25	$16.05	$0.00	$83.93
	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$35.08	$14.25	$16.05	$0.00	$65.38
	06/01/2023	$35.90	$14.25	$16.05	$0.00	$66.20
	12/01/2023	$36.72	$14.25	$16.05	$0.00	$67.02
	06/01/2024	$37.57	$14.25	$16.05	$0.00	$67.87
	12/01/2024	$38.52	$14.25	$16.05	$0.00	$68.82
	06/01/2025	$39.37	$14.25	$16.05	$0.00	$69.67
	12/01/2025	$40.32	$14.25	$16.05	$0.00	$70.62
	06/01/2026	$41.18	$14.25	$16.05	$0.00	$71.48
	12/01/2026	$42.13	$14.25	$16.05	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
READY-MIX CONCRETE DRIVER *TEAMSTERS 42 - J.G. MacLeallan (Wakefield)*	05/01/2022	$29.00	$12.00	$7.00	$0.00	$48.00
	05/01/2023	$29.25	$12.00	$7.00	$0.00	$48.25
	05/01/2024	$29.50	$12.00	$7.00	$0.00	$48.50
	05/01/2025	$30.00	$12.00	$7.00	$0.00	$49.00
	05/01/2026	$30.50	$12.00	$7.00	$0.00	$49.50
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2022	$48.53	$12.28	$19.45	$0.00	$80.26
	02/01/2023	$49.78	$12.28	$19.45	$0.00	$81.51
	08/01/2023	$51.28	$12.28	$19.45	$0.00	$83.01
	02/01/2024	$52.53	$12.28	$19.45	$0.00	$84.26
	08/01/2024	$54.03	$12.28	$19.45	$0.00	$85.76
	02/01/2025	$55.28	$12.28	$19.45	$0.00	$87.01
	08/01/2025	$56.78	$12.28	$19.45	$0.00	$88.51
	02/01/2026	$58.03	$12.28	$19.45	$0.00	$89.76

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.27	$12.28	$5.21	$0.00	$41.76
2	60	$29.12	$12.28	$19.45	$0.00	$60.85
3	65	$31.54	$12.28	$19.45	$0.00	$63.27
4	75	$36.40	$12.28	$19.45	$0.00	$68.13
5	85	$41.25	$12.28	$19.45	$0.00	$72.98

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.89	$12.28	$5.21	$0.00	$42.38
2	60	$29.87	$12.28	$19.45	$0.00	$61.60
3	65	$32.36	$12.28	$19.45	$0.00	$64.09
4	75	$37.34	$12.28	$19.45	$0.00	$69.07
5	85	$42.31	$12.28	$19.45	$0.00	$74.04

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2022	$48.78	$12.28	$19.45	$0.00	$80.51
	02/01/2023	$50.03	$12.28	$19.45	$0.00	$81.76
	08/01/2023	$51.53	$12.28	$19.45	$0.00	$83.26
	02/01/2024	$52.78	$12.28	$19.45	$0.00	$84.51
	08/01/2024	$54.28	$12.28	$19.45	$0.00	$86.01
	02/01/2025	$55.53	$12.28	$19.45	$0.00	$87.26
	08/01/2025	$57.03	$12.28	$19.45	$0.00	$88.76
	02/01/2026	$58.28	$12.28	$19.45	$0.00	$90.01
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2022	$53.66	$14.11	$26.64	$2.83	$97.24
	02/01/2023	$55.31	$14.11	$26.64	$2.83	$98.89
	08/01/2023	$57.01	$14.11	$26.64	$2.83	$100.59
	02/01/2024	$58.71	$14.11	$26.64	$2.83	$102.29
	08/01/2024	$60.46	$14.11	$26.64	$2.83	$104.04
	02/01/2025	$62.21	$14.11	$26.64	$2.83	$105.79
	08/01/2025	$64.06	$14.11	$26.64	$2.83	$107.64
	02/01/2026	$66.01	$14.11	$26.64	$2.83	$109.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 08/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$22.54	$14.11	$6.13	$0.00	$42.78
2	42	$22.54	$14.11	$6.13	$0.00	$42.78
3	47	$25.22	$14.11	$11.90	$1.54	$52.77
4	47	$25.22	$14.11	$11.90	$1.54	$52.77
5	52	$27.90	$14.11	$12.88	$1.65	$56.54
6	52	$27.90	$14.11	$13.13	$1.65	$56.79
7	60	$32.20	$14.11	$14.54	$1.83	$62.68
8	65	$34.88	$14.11	$15.52	$1.94	$66.45
9	75	$40.25	$14.11	$17.48	$2.16	$74.00
10	85	$45.61	$14.11	$18.94	$2.36	$81.02

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$23.23	$14.11	$6.13	$0.00	$43.47
2	42	$23.23	$14.11	$6.13	$0.00	$43.47
3	47	$26.00	$14.11	$11.90	$1.54	$53.55
4	47	$26.00	$14.11	$11.90	$1.54	$53.55
5	52	$28.76	$14.11	$12.88	$1.65	$57.40
6	52	$28.76	$14.11	$13.13	$1.65	$57.65
7	60	$33.19	$14.11	$14.54	$1.83	$63.67
8	65	$35.95	$14.11	$15.52	$1.94	$67.52
9	75	$41.48	$14.11	$17.48	$2.16	$75.23
10	85	$47.01	$14.11	$18.94	$2.36	$82.42

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.53	$13.41	$16.01	$0.00	$65.95
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	10/01/2022	$65.56	$15.50	$22.10	$0.00	$103.16
	03/01/2023	$67.26	$15.50	$22.10	$0.00	$104.86
	10/01/2023	$69.01	$15.50	$22.10	$0.00	$106.61
	03/01/2024	$70.81	$15.50	$22.10	$0.00	$108.41
	10/01/2024	$72.61	$15.50	$22.10	$0.00	$110.21
	03/01/2025	$74.41	$15.50	$22.10	$0.00	$112.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 10/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.95	$15.50	$9.60	$0.00	$48.05
2	40	$26.22	$15.50	$9.60	$0.00	$51.32
3	45	$29.50	$15.50	$9.60	$0.00	$54.60
4	50	$32.78	$15.50	$9.60	$0.00	$57.88
5	55	$36.06	$15.50	$9.60	$0.00	$61.16
6	60	$39.34	$15.50	$11.10	$0.00	$65.94
7	65	$42.61	$15.50	$11.10	$0.00	$69.21
8	70	$45.89	$15.50	$11.10	$0.00	$72.49
9	75	$49.17	$15.50	$11.10	$0.00	$75.77
10	80	$52.45	$15.50	$11.10	$0.00	$79.05

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$23.54	$15.50	$9.60	$0.00	$48.64
2	40	$26.90	$15.50	$9.60	$0.00	$52.00
3	45	$30.27	$15.50	$9.60	$0.00	$55.37
4	50	$33.63	$15.50	$9.60	$0.00	$58.73
5	55	$36.99	$15.50	$9.60	$0.00	$62.09
6	60	$40.36	$15.50	$11.10	$0.00	$66.96
7	65	$43.72	$15.50	$11.10	$0.00	$70.32
8	70	$47.08	$15.50	$11.10	$0.00	$73.68
9	75	$50.45	$15.50	$11.10	$0.00	$77.05
10	80	$53.81	$15.50	$11.10	$0.00	$80.41

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	09/01/2022	$46.42	$13.00	$18.87	$0.00	$78.29
	03/01/2023	$48.34	$13.00	$19.01	$0.00	$80.35

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.89	$13.00	$0.63	$0.00	$34.52
2	45	$20.89	$13.00	$0.63	$0.00	$34.52
3	50	$23.21	$13.00	$15.13	$0.00	$51.34
4	50	$23.21	$13.00	$15.13	$0.00	$51.34
5	55	$25.53	$13.00	$15.51	$0.00	$54.04
6	60	$27.85	$13.00	$15.88	$0.00	$56.73
7	65	$30.17	$13.00	$16.26	$0.00	$59.43
8	70	$32.49	$13.00	$16.62	$0.00	$62.11
9	75	$34.82	$13.00	$17.00	$0.00	$64.82
10	80	$37.14	$13.00	$17.37	$0.00	$67.51

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$21.75	$13.00	$0.65	$0.00	$35.40
2	45	$21.75	$13.00	$0.65	$0.00	$35.40
3	50	$24.17	$13.00	$15.20	$0.00	$52.37
4	50	$24.17	$13.00	$15.20	$0.00	$52.37
5	55	$26.59	$13.00	$15.58	$0.00	$55.17
6	60	$29.00	$13.00	$15.96	$0.00	$57.96
7	65	$31.42	$13.00	$16.34	$0.00	$60.76
8	70	$33.84	$13.00	$16.73	$0.00	$63.57
9	75	$36.26	$13.00	$17.11	$0.00	$66.37
10	80	$38.67	$13.00	$17.48	$0.00	$69.15

Notes:

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2022	$58.09	$11.49	$22.34	$0.00	$91.92
	02/01/2023	$59.29	$11.49	$22.34	$0.00	$93.12
	08/01/2023	$61.34	$11.49	$22.34	$0.00	$95.17
	02/01/2024	$62.59	$11.49	$22.34	$0.00	$96.42
	08/01/2024	$64.69	$11.49	$22.34	$0.00	$98.52
	02/01/2025	$65.99	$11.49	$22.34	$0.00	$99.82
	08/01/2025	$68.14	$11.49	$22.34	$0.00	$101.97
	02/01/2026	$69.49	$11.49	$22.34	$0.00	$103.32
	08/01/2026	$71.69	$11.49	$22.34	$0.00	$105.52
	02/01/2027	$73.09	$11.49	$22.34	$0.00	$106.92

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.05	$11.49	$22.34	$0.00	$62.88
2	60	$34.85	$11.49	$22.34	$0.00	$68.68
3	70	$40.66	$11.49	$22.34	$0.00	$74.49
4	80	$46.47	$11.49	$22.34	$0.00	$80.30
5	90	$52.28	$11.49	$22.34	$0.00	$86.11

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.65	$11.49	$22.34	$0.00	$63.48
2	60	$35.57	$11.49	$22.34	$0.00	$69.40
3	70	$41.50	$11.49	$22.34	$0.00	$75.33
4	80	$47.43	$11.49	$22.34	$0.00	$81.26
5	90	$53.36	$11.49	$22.34	$0.00	$87.19

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$42.58	$9.10	$17.72	$0.00	$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.30	$9.10	$17.72	$0.00	$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.05	$14.25	$16.05	$0.00	$83.35
	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.82	$13.41	$16.01	$0.00	$66.24
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2022	$54.81	$9.35	$18.42	$0.00	$82.58
	06/01/2023	$55.81	$9.35	$18.42	$0.00	$83.58
	12/01/2023	$57.06	$9.35	$18.42	$0.00	$84.83
	06/01/2024	$58.54	$9.35	$18.42	$0.00	$86.31
	12/01/2024	$60.01	$9.35	$18.42	$0.00	$87.78
	06/01/2025	$61.51	$9.35	$18.42	$0.00	$89.28
	12/01/2025	$63.01	$9.35	$18.42	$0.00	$90.78
	06/01/2026	$64.56	$9.35	$18.42	$0.00	$92.33
	12/01/2026	$66.06	$9.35	$18.42	$0.00	$93.83
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2022	$56.81	$9.35	$18.42	$0.00	$84.58
	06/01/2023	$57.81	$9.35	$18.42	$0.00	$85.58
	12/01/2023	$59.06	$9.35	$18.42	$0.00	$86.83
	06/01/2024	$60.54	$9.35	$18.42	$0.00	$88.31
	12/01/2024	$62.01	$9.35	$18.42	$0.00	$89.78
	06/01/2025	$63.51	$9.35	$18.42	$0.00	$91.28
	12/01/2025	$65.01	$9.35	$18.42	$0.00	$92.78
	06/01/2026	$66.56	$9.35	$18.42	$0.00	$94.33
	12/01/2026	$68.06	$9.35	$18.42	$0.00	$95.83
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2022	$46.88	$9.35	$18.42	$0.00	$74.65
	06/01/2023	$47.88	$9.35	$18.42	$0.00	$75.65
	12/01/2023	$49.13	$9.35	$18.42	$0.00	$76.90
	06/01/2024	$50.61	$9.35	$18.42	$0.00	$78.38
	12/01/2024	$52.08	$9.35	$18.42	$0.00	$79.85
	06/01/2025	$53.58	$9.35	$18.42	$0.00	$81.35
	12/01/2025	$55.08	$9.35	$18.42	$0.00	$82.85
	06/01/2026	$56.63	$9.35	$18.42	$0.00	$84.40
	12/01/2026	$58.13	$9.35	$18.42	$0.00	$85.90
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2022	$48.88	$9.35	$18.42	$0.00	$76.65
	06/01/2023	$49.88	$9.35	$18.42	$0.00	$77.65
	12/01/2023	$51.13	$9.35	$18.42	$0.00	$78.90
	06/01/2024	$52.61	$9.35	$18.42	$0.00	$80.38
	12/01/2024	$54.08	$9.35	$18.42	$0.00	$81.85
	06/01/2025	$55.58	$9.35	$18.42	$0.00	$83.35
	12/01/2025	$57.08	$9.35	$18.42	$0.00	$84.85
	06/01/2026	$58.63	$9.35	$18.42	$0.00	$86.40
	12/01/2026	$60.13	$9.35	$18.42	$0.00	$87.90
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
WAGON DRILL OPERATOR *LABORERS - ZONE 1*	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2022	$42.83	$9.35	$17.82	$0.00	$70.00
	06/01/2023	$43.83	$9.35	$17.82	$0.00	$71.00
	12/01/2023	$45.08	$9.35	$17.82	$0.00	$72.25
	06/01/2024	$46.56	$9.35	$17.82	$0.00	$73.73
	12/01/2024	$48.03	$9.35	$17.82	$0.00	$75.20
	06/01/2025	$49.53	$9.35	$17.82	$0.00	$76.70
	12/01/2025	$51.03	$9.35	$17.82	$0.00	$78.20
	06/01/2026	$52.58	$9.35	$17.82	$0.00	$79.75
	12/01/2026	$54.08	$9.35	$17.82	$0.00	$81.25
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2022	$53.63	$14.25	$16.05	$0.00	$83.93
	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	09/04/2022	$63.49	$14.07	$18.36	$0.00	$95.92
	02/26/2023	$65.19	$14.07	$18.36	$0.00	$97.62
	09/03/2023	$66.94	$14.07	$18.36	$0.00	$99.37
	03/03/2024	$68.74	$14.07	$18.36	$0.00	$101.17
	09/01/2024	$70.54	$14.07	$18.36	$0.00	$102.97
	03/02/2025	$72.34	$14.07	$18.36	$0.00	$104.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$29.67	$9.25	$1.89	$0.00	$40.81
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$42.03	$9.25	$10.27	$0.00	$61.55
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$34.62	$9.25	$10.07	$0.00	$53.94
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$42.03	$9.25	$14.35	$0.00	$65.63
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$37.09	$9.25	$10.87	$0.00	$57.21
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$22.25	$9.25	$1.82	$0.00	$33.32
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$49.45	$9.25	$17.48	$0.00	$76.18

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$29.67	$9.25	$3.39	$0.00	$42.31
2	65	$32.14	$9.25	$3.46	$0.00	$44.85
3	70	$34.62	$9.25	$3.54	$0.00	$47.41
4	75	$37.09	$9.25	$5.11	$0.00	$51.45
5	80	$39.56	$9.25	$5.19	$0.00	$54.00
6	85	$42.03	$9.25	$5.26	$0.00	$56.54
7	90	$44.51	$9.25	$7.34	$0.00	$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 01 00 00
GENERAL REQUIREMENTS

ACTIVITAS

SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

1.02 SCOPE

A. Project Description: This project is located at Birch Meadow Park, Reading, MA 01867.

1. Protection of existing structures, roadways, parking areas, utilities, landscape areas and associated facilities as indicated on the Drawings

B. Site Preparation

1. Install sedimentation and erosion control measures, construction fencing and construction entrances as indicated on the Drawings.

2. It is assumed that this project will generate excess topsoil that is kept onsite. Excess topsoil shall be used in landscape areas throughout the project. Topsoil used to build up any landscape berms do not need to be screened; only the top 6" of loam spread on top of the landscape berm needs to be screened.

C. Base Bid Project

1. The proposed project is the complete renovation of the existing gravel parking lot off of Birch Meadow Drive (north of the track and field stadium) and the development of a walkway that runs through the middle of Birch Meadow Park and connects Birch Meadow Drive to the parking areas associated with Reading Memorial High School. This work will also include the following:

a. Parking lot and pedestrian level lighting;
b. a lacrosse/sport wall with infilled synthetic turf at the base;
c. utility improvements (including utilities for a proposed support building that will be constructed as part of another project). Utilities for the the building shall be carried to within 10' of the proposed structure;
d. associated site improvements as illustrated and defined in the drawings and specifications.

D. In addition, the work under the Contract includes:

1. Work outside the Project Site as called for in the Contract Documents and as required for the performance of the Work.

2. The restoration of any items damaged or destroyed by encroaching upon areas outside the Project Site.

3. Providing and restoring, where appropriate, all temporary facilities.

E. Alternates:

1. Alternates for some site furnishings elements, additional granite curbing and

SECTION 01 22 00

UNIT PRICES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

1.02 REQUIREMENTS

A. Unit prices for changes to the work not part of the Base Bid will be paid in accordance with unit prices listed by the Contractor on the Schedule of unit prices, based on quantities measured in the field.

B. All unit prices shall include their pro-rata share of all costs for overhead, profit, bond, materials, equipment and disposal required to complete the work item. The Contactor's mark-up for changes to the work shall not exceed 15% and shall be inclusive of overheard, profit, and additional bonding requirements.

C. The Owner may choose not to approve any or all unit prices if it deems the unit price unreasonable. In this case, the change order process described in the general conditions will be used for work described in the unit price schedule, when any change of the base contract scope is required.

1.03 APPLICABILITY OF UNIT PRICES

A. The payment lines shall be as indicated in the Contract Documents.

B. Prior to commencing any change to the work involving removal or placement of materials set forth in the schedule of unit prices, the Contractor shall notify the Landscape Architect/Civil Engineer in sufficient time to permit proper measurements to be taken on behalf of the Owner. Only quantities which have been approved in writing by the Landscape Architect/Civil Engineer and/or Owner will be considered in the determination of adjustments to the contract sum.

C. Performance of work which is not required under the Contract Documents or which is not authorized by Change Order, whether or not such work item is set forth hereunder as a Unit Price item, shall not be considered cause for extra payment. The Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Landscape Architect/Civil Engineer and/or Owner.

1.04 SCHEDULE OF UNIT PRICES

A. UNIT PRICES for Change Orders as specified in the General Conditions and Section 01 22 00 (UNIT PRICES) above. Prices shall include materials, labor, overhead and profit.

	Description of Work	Unit	Amount to ADD	Amount to DEDUCT
1.	Topsoil	EA	$_____	$_____
2.	Common Fill	CY	$_____	$_____
3.	Dense Grade Crushed Stone	CY	$_____	$_____

4.	Free Draining Crushed Stone	CY	$_____	$_____
5.	Cement Concrete Pavement	SF	$_____	$_____
6.	Bituminous Concrete Pavement	SF	$_____	$_____
7.	Stabilized Stone Dust	CY	$_____	$_____
8.	Granite Curb	LF	$_____	$_____
9.	Bituminous Concrete Curb	LF	$_____	$_____
10.	Wood Guardrail	LF	$_____	$_____
11.	Deciduous Tree (3-3.5" Caliper)	EA	$_____	$_____
12.	Perennial (1 Gallon Container)	EA	$_____	$_____
13.	Shrub (3 Gallon Container)	EA	$_____	$_____
14.	Infilled Synthetic Turf Carpet and Infill	SF	$_____	$_____
15.	Bollard	EA	$_____	$_____
16.	Removable Bollard	EA	$_____	$_____
17.	Picnic Table	EA	$_____	$_____
18.	Trash/Recycling Receptacle	EA	$_____	$_____
19.	Site Bench	EA	$_____	$_____

END OF SECTION

additional site electrical work shall be priced accordingly. Refer to Section 01 23 00 – ALTERNATES.

1.03 PERMITS AND FEES

A. The Contractor, at its cost, shall schedule, secure and obtain all permits, approvals, licenses, and inspections necessary for the proper execution of the work under all sections of this project.

B. The Contractor shall coordinate all its work with appropriate Town of Reading Departments and Agencies as required by the Contract Documents.

1.04 TIME OF COMPLETION

A. In accordance with the General Conditions, the Work shall be commenced at the time stated in the Notice to Proceed and shall be completed as noted in General Instructions to Bidders and Section 01 70 00 – PROJECT CLOSEOUT.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

1.02 SCOPE

A. This Section lists the Alternates, which appear in the Contract Documents. Consult the individual Sections for requirements applicable to all alternates

B. Bid prices for each Alternate shall include overhead, profit, and all other expenses incidental to the Work under each Alternate.

C. The Contactor and Subcontractors shall be responsible for examining the scope of each Alternate generally defined herein and for recognizing modifications to the Work caused by the Alternates and including the cost thereof in the bid price.

1.03 ALTERNATE #1 – SITE FURNISHINGS

A. All site benches, trash, and recycling receptacles shall be bid as part of Alternate #1. All associated cement concrete pads for the site furnishings shall be included as part of the base bid. Refer to drawings.

1.04 ALTERNATE #2 – SUBSTITUTE GRANITE CURBING

A. All bituminous concrete curb shall be substituted with granite curb.

1.05 ALTERNATE #3 – ADDITIONAL ELECTRICAL INFRASTRUCTURE

A. Provide empty conduit system to support the future athletic fields distribution systems. Refer to electrical drawings and specifications.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

1.02 PROJECT MEETINGS

A. Preconstruction Conference: Conduct a preconstruction conference prior to beginning work on site. Require all major subcontractors and suppliers to attend. In general, the meeting shall cover the following subjects:

1. Creation of project team directory listing contract person for each organization.
2. Issuance of Contract Documents.
3. Reviewing of project constraints and work hours.
4. Unloading policies, storage locations, temporary office locations, and temporary facilities.
5. First aid, safety, and security procedures.
6. Cleaning, housekeeping, and waste removal.
7. Change order requirements.
8. Progress payment requirements.
9. Submittal requirements, schedules, and procedures.
10. Record document requirements and procedures.
11. Other subjects as determined by the Contactor, Landscape Architect/Civil Engineer, and Owner.

B. Regular Progress Meetings: Conduct Progress Meetings to aid coordination and planning of the work and to create a forum to resolve coordination and scheduling problems and conflicts. Project meetings will be held as required at the job site. Special project meetings may be called at any time by the Owner and/or Landscape Architect/Civil Engineer, and shall be attended by the Contractor and any required Subcontractors.

1. Chairperson and Minutes: The Contractor will chair the meetings and will prepare written meeting minutes (as necessary).

2. The Contractor shall require appropriate representatives of all major subcontractors and suppliers to attend each Progress Meeting as required. Representatives of Contractor, Subcontractor, and suppliers who are present at Progress Meetings shall have the full authority to commit their respective organizations to decisions, commitments, and agreements made at Progress Meetings.

3. Progress Meeting Agenda: Progress Meetings shall have at least the following agenda:

a. Review and approval of minutes and record of previous meetings.
b. Review progress of work, Progress Schedule, and status of Submittals and Lead Time Items.
c. Identify problems that impede planned progress.
d. Develop corrective measures and procedures to maintain planned schedule.
e. Review apparent conflicts and other problems and develop corrective

measures.

f. Monthly review of payment applications.
g. Pre-installation discussions regarding specific project items.
h. Other current business.

END OF SECTION

SECTION 01 30 00

SUBMITTALS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

1.02 GENERAL PROCEDURES FOR SUBMITTALS

A. Timeliness – The Contractor shall transmit each submittal to the Landscape Architect/Civil Engineer at least 5 days in advance of performing related Work or other applicable activities, so that the installation will not be delayed by processing time, including, disapproval and re-submittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Landscape Architect/Civil Engineer in advance of the Work.

B. Sequence – The Contractor shall transmit each submittal in a sequence which will not result in the approval having to be later modified or rescinded by reason of subsequent submittals which should have been processed earlier or concurrently for coordination.

C. Contractor's Review and Approval – Only submittals received from and bearing the stamp of approval of the Contactor will be considered for review by the Landscape Architect/Civil Engineer. Submittals shall be accompanied by a transmittal notice, stating name of Project, date of submittal, "To" or "From" (Contractor, Subcontractor, Installer, Manufacturer, Supplier), Specification Section or Drawing Number to which the submittal refers, purpose (first submittal, re-submittal), description, remarks, distribution record, and signature of transmitter.

D. Any reference as to a specific type or manufacturer in these specifications is for identification purposes only. Equivalent products will be considered. In the event that samples or specifications on equivalent products are required, it will be at the vendor's expense.

E. Or-Equivalents – On the transmittal, or on a separate sheet attached to the transmittal, the Contractor shall direct attention to any deviations including minor limitations and variations, from the Contract Documents.

1. The Contractor and all Subcontractors shall submit to the Landscape Architect/Civil Engineer for consideration of any Or-Equivalent substitution, a written point by point comparison containing the name and full particulars of the proposed product to the product named or described in the Contract Documents.

2. Such submittal shall in no event be made later than 5 calendar days prior to the incorporation of the item in the Work. In any case in which the time period specified in the Contract Documents from the Notice to Proceed to Substantial Completion is less than 5 days, the Landscape Architect/Civil Engineer can waive this requirements.

3. Upon receipt of a written request for approval of an Or-Equivalent substitution, the Landscape Architect/Civil Engineer shall investigate whether the proposed item shall be considered equivalent to the item named or described in the Contract

Documents. Upon conclusion of the investigation, the Landscape Architect/Civil Engineer shall promptly advise that the item is, or is not, considered acceptable as on Or-Equivalent substitution. Such written notice must have the concurrence of the Owner.

4. In no case may an item be furnished on the Work other than the item named or described, unless the Landscape Architect/Civil Engineer, with the Owner's concurrence, shall consider the item equivalent to the item so named or described.

5. The equivalency of items offered as "Equivalent To" items named or described shall be proved to the satisfaction of the Landscape Architect/Civil Engineer at the expense of the Contractor or Subcontractor submitting the substitution.

6. The Landscape Architect/Civil Engineer and/or the Owner may require that full size samples of both the specified and proposed products be submitted for review and evaluation. The Contractor or Subcontractor, as the case may be, shall bear full cost for providing, delivering, and disposal of all such samples.

7. The Contractor or Subcontractor, as the case may be, shall assume full responsibility for the performance of any item submitted as an "Or-Equivalent" and assumed the costs of any changes in any Work that may be due to such substitutions.

F. Processing – All costs for printing, preparing, packaging, submitting, resubmitting, and mailing, or delivering submittals required by this Contract shall be included in the Contract Sum.

1.03 LANDSCAPE ARCHITECT/CIVIL ENGINEER ACTION

A. The Landscape Architect/Civil Engineer will review the Contractor's submittals and return them with one of the following actions recorded thereon by appropriate markings:

1. Final Unrestricted Release: Where marked "No Exception Taken" the Work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents.

2. Final-But-Restricted-Release: When marked "Reviewed as Noted" or "For Your Information and Use" the Work may proceed provided it complies with the Landscape Architect/Civil Engineer notation or corrections on the submittal and complies with the requirements of the Contract Documents. Acceptance of the Work will depend upon these compliances.

3. Returned for Resubmittal: When marked "Revise & Resubmit", "Incomplete Submittal" or "Rejected", the Work covered by the submittal (purchasing, fabrication, delivery, or other activity) should not proceed. The submittal should be revised or a new submittal resubmitted without delay, in accordance with the Landscape Architect/Civil Engineer notations stating the reasons for returning the submittal.

1.04 SUBMISSION OF SHOP DRAWINGS & PRODUCT DATA

A. Shop drawings shall be complete, give all information necessary or requested in the individual section of the specifications. They shall also show adjoining Work and details of connection thereto.

B. Shop drawings shall be for whole systems. Partial submissions will not be accepted.

C. The Landscape Architect/Civil Engineer reserves the right to review and approve shop drawings only after approval of related products data and samples.

D. Shop drawings shall be properly identified and contain the name of the project, name of the firm submitting the shop drawings, shop drawing number, date of shop drawings and revisions, Contractor's stamp of approval, and sufficient spaces near the title block for the Landscape Architect/Civil Engineer stamp.

E. The Contractor shall submit to the Landscape Architect/Civil Engineer one legible, reproducible electronic copy of each shop drawing. A transmittal notice shall accompany each submittal.

F. When the submittal is returned by the Landscape Architect/Civil Engineer with the stamp "Revise & Resubmit", "Incomplete Submittal" or "Rejected", the Contractor shall correct the original drawings or prepare new drawings and resubmit a electronic copy and two prints thereof to the Landscape Architect/Civil Engineer for approval. This procedure shall be repeated until the Landscape Architect/Civil Engineer approval is obtained.

G. When the submittal is returned by the Landscape Architect/Civil Engineer with the stamp "No Exception Taken", the Contractor shall provide and distribute the prints for all Contractor and Subcontractors use, and in addition submit, within 10 calendar days after approval, 5 prints to the Landscape Architect/Civil Engineer.

H. The Contractor shall maintain one full set of approved shop drawings at the site.

1.05 SUBMISSION OF SAMPLES

A. Unless otherwise specified in the individual section, the Contractor shall submit two specimens of each sample.

B. Samples shall be of adequate size to permit proper evaluation of materials. Where variations in color or in other characteristics are to be expected, samples shall show the maximum range of variation. Materials exceeding the variation of approved samples will not be approved on the Work.

C. Samples that can be conveniently mailed shall be sent directly to the Landscape Architect/Civil Engineer, accompanied by a transmittal notice. All transmittals shall be stamped with the Contractor's approval stamp of the material submitted.

D. All other samples shall be delivered at the field office of the Project Representative with sample identification tag attached and properly filled in. Transmittal notice of sample so delivered with the Contractor's stamp of approval shall be mailed to the Landscape Architect/Civil Engineer.

E. If a sample is rejected by the Landscape Architect/Civil Engineer, a new sample shall be resubmitted in a manner specified herein above. This procedure shall be repeated until the Landscape Architect/Civil Engineer approves the sample.

F. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of samples whether or not particular mention is made in the specifications.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. The Contractor shall be responsible for providing and maintaining all temporary facilities until Substantial Completion. Removal of such, prior to Substantial Completion must be with the concurrence of the Landscape Architect/Civil Engineer. The Contractor bears full responsibility for re-providing any facility removed prior to Substantial Completion if required for the Work. NOTE: There will no access to the Reading Public School buildings during the project unless specifically required under the scope of work (any work that may be required in the buildings will require accompaniment from the Owner).

C. Removal of all temporary facilities shall be a condition precedent to Substantial Completion unless directed otherwise by the Landscape Architect/Civil Engineer or specifically noted in the Specifications.

D. The Contractor must comply with all safety laws and regulations of the Commonwealth of Massachusetts, the United States Government, and local government agencies applicable to work under this contract.

1.02 TEMPORARY TELEPHONES

A. Telephone service, in the form of a cellular phone and beeper, shall be available on site.

B. The Contractor shall pay for all equipment charges for the foregoing temporary telephones and for all calls and charges in connection therewith.

1.03 TOILETS

A. The Contractor shall provide portable bathroom facilities as required.

1.04 TEMPORARY CONSTRUCTION FENCE

A. The Contractor shall be responsible for providing and maintaining temporary fencing or barricades around the construction and additional fencing or barricades as may be necessary to assure the safety of all persons authorized or unauthorized. Such protective measures shall be located and constructed as required by local, state and federal ordinances, laws, codes or regulations at no additional cost to the Owner.

1.05 TEMPORARY STRUCTURES AND MATERIAL HANDLING

A. Materials shall be handled, stored, installed, cleaned, and protected in accordance with the best practice in the industry and, except where otherwise specified in the Contract Documents, in accordance with manufacturer's specifications and directions.

1.06 TEMPORARY WATER

A. The Contractor may make use of the water supply at the site (if available) for construction purposes, provided the permission of the Owner is obtained beforehand and only as long as the water is not used wastefully.

B. The Contactor shall provide all necessary connections, piping and hoses to utilize the available sources of water.

C. The Contractor shall provide an adequate supply of cool drinking water with individual drinking cups for personnel on the job.

D. In the event that water is unavailable, the Contractor shall be responsible for providing water from off site sources.

1.07 TEMPORARY ELECTRICITY

A. The Contractor may make use of the electricity available at the site, metered and paid for by the Owner, provided that the Contractor shall supply proper adapters and extension cords. Where heavy-duty electric equipment drawing current in excess of 15 amp. is involved, the Contractor shall provide temporary service to supply the power. The temporary electric service shall include, but not be limited to labor, materials, and equipment necessary to supply temporary power of adequate capacity for the project. The power company will furnish transformers and meters, when required by the power company, and the Contractor shall bear the costs.

B. Temporary electrical work shall be performed under the direct supervision of at least one master electrician, who will be always present on the project when such work is being performed.

C. All temporary work shall be provided in conformity with the National Electric Code, State Laws and requirements of the power company.

D. The Contractor shall dismantle and completely remove from the project site, temporary electrical facilities only when the permanent electrical system is operational.

1.08 WINTER CONDITIONS

A. Remove snow and ice which may impair progress of work, be detrimental to workmen or impair trucking, delivery or moving of materials at job site, or prevent adequate drainage at site or adjoining areas.

END OF SECTION

SECTION 01 70 00

PROJECT CLOSEOUT

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

1.02 RELATED DOCUMENTS

A. Consult the individual sections of the specifications for specific items required under those sections.

1.03 SUBSTANTIAL COMPLETION

A. Prior to requesting Substantial Completion as provided in the General Conditions the Contractor shall make a thorough inspection of the Work. During this inspection the Contractor shall prepare a comprehensive list of all items remaining to be completed or corrected. This list shall include all remaining Contractor and Subcontractor items to be provided under the Contract Documents.

B. Upon completion of the list, the Contractor shall notify, in writing, the Owner's Representative that the Work is Substantially Complete. The Owner's Representative shall then conduct a similar thorough inspection. If the Owner's Representative agrees that the Work is Substantially Complete, the Owner's Representative will promptly make a thorough inspection and prepare a monetized punch list, setting forth in accurate detail any items on the Contractor's list and additional items that are not acceptable or incomplete. The Contractor shall coordinate all Subcontractors to achieve prompt completion of the punch list.

C. The Contractor shall not be relieved of the responsibility to provide Contract items left off of the Owner's Representative's punch list.

D. If the Owner's Representative determines that the Work is not Substantially Complete, the Owner's Representative shall inform the Contractor of those items that must be completed before the Owner's Representative will prepare a monetized punch list. Upon completion of those items, the Contractor shall again request the Owner's Representative to prepare a punch list.

E. When the punch list has been prepared, the Owner's Representative will arrange a meeting with the Contractor and Subcontractors to identify and explain all punch list items and answer questions on work, which must be done before final acceptance.

F. The Owner's Representative may revise the punch list, from time to time, to ensure that all items of Work are properly completed.

G. The Owner's Representative shall prepare the Certificate of Substantial Completion in accordance with the General Conditions.

1.04 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Prior to final payment and completion, the Contractor shall provide all Operating Manuals and Maintenance Instructions as required by the Contractor Documents and as requested by the Owner.

B. Consult the individual sections of the specifications for the specific requirements for those sections and for further details and descriptions of the requirements

C. Operating Instructions and Manuals:

1. The Contractor shall collect all of the above instructions and copies of all approved submittals and bind them into three complete sets in three ring binders, and submit them to the Owner's Representative who will deliver them to the Owner.

2. Submission of operating and maintenance instructions shall be a condition precedent to the final payment.

D. Instructions of Owner's Personnel:

1. Where specified in the individual sections of the specifications, the Contractor and Subcontractor shall instruct the Owner's personnel at the site, in the use and maintenance of equipment installed under the Contract.

2. Submission to the Owner's Representative of a certificate of compliance to this requirement, signed by the Contractor and the Owner's Representative, shall be a condition precedent to final payment.

1.05 FINAL COMPLETION

A. Related Requirements:

1. The Contractor's attention is directed to the General Conditions of the Contract.

B. Final Completion:

1. Within 14 days after Substantial Completion, if any of the items on the Owner's Representative's punch list are not complete or if the Contractor has not provided the appropriate Record Drawings, Operating Manuals, Warranties, Guarantees, or Spare Parts, the Owner's Representative may assign a monetary value for each incomplete item as well as any other items per the General Laws of the Commonwealth of Massachusetts.

2. The Contractor shall provide the Owner's Representative with a Notarized Contractor's Certificate and Release and an appropriate Application for Payment. This Application shall be for an amount equal to the remaining balance of the Contract less the amount the Owner's Representative's monetized punch list and any other items per the General Laws of the Commonwealth of Massachusetts.

3. The Contractor shall complete all remaining Work in accordance with the provisions of the General Conditions of the Contract.

4. Upon completion of all remaining items, and after receipt of all appropriate Shop Drawing, Record Drawings, Operating Manuals, Warranties, Guarantees and Spare Parts required by the Contract Documents, The Contractor shall provide a notarized Contractor's Certificate and Release and a final Application for Payment to complement this closeout process.

END OF SECTION

SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. This Section contains general information that applies to all work performed under the Contract and is inherently made a part of each specification section.

1.02 WARRANTY REQUIREMENTS

A. Warranties Required: All materials, equipment, and work of the Project shall be covered by comprehensive written warranties. Refer to individual specification sections for additional specific warranty requirements. For work not specified to have additional specific warranty requirements or warranties longer than one year, provide a comprehensive one-year written warranty signed by the Contractor and Subcontractor.

1. Warranty Limitations: Warranties required under the Contract are in addition to and not in lieu of any remedy or warranty to which the Owner is entitled under law. Warranties required under the Contract shall not be interpreted as a waiver of any of the Owner's rights.

2. Warranty Procurement: Do not purchase or subcontract for material, equipment or work until it has been verified that parties required to provide and sign warranties are willing to do so and that warranty language, content, and form are approved by the Owner. Special warranty terms, conditions, and requirements are often specified.

3. Warranties are Irrevocable: After a specific warranty's language, content, and form has been approved by the Owner and after the work covered by a specific warranty is subcontracted or purchase order given to a manufacturer, the warrantor shall not revoke or withhold the warranty for any reason including, without limitation, non-payment or incomplete payment by any party other than the owner, except that if the work has not been installed in compliance with the warrantors installations requirements, then the warranty may be temporarily withheld until corrections are made and the warrantors installation requirements have been met.

4. Warranty Forms: Submit written warranty forms to Owner through Landscape Architect/Civil Engineer for approval prior to award of subcontract, submission or purchase order, and execution of warranty. The manufacturers standard warranty forms may not comply with the requirements of the Contract Documents. Special warranty terms, conditions, and requirements are often specified and required.

   a. Standard Warranty Form: In the absence od specific written permission by the Owner, provide all warranties including the Contractors comprehensive one year warranty on fully executed copies of the "Standard Warranty Form" included in this Section.

5. Executed Warranties: Furnish original or certified copies of each executed warranty to Owner for warranty and maintenance manuals. Comply with requirements of Section 01 78 39, Project Record Documents.

6. Work Covered by Warranty: Contractor and warrantor shall remove and replace other

work damaged as a result of failure of warranted materials, equipment, or work, and shall remove or replace other work which must be removed and replaced to provide access to and replacement of materials, equipment, or work covered under warranty. Warranties shall include full payment to the Owner for work related to warranty repair or replacement including, without limitation, painting.

7. Pro-Rated Warranties: Unless otherwise specified or approved in writing by Owner, each warranty shall cover full cost of replacement or repair, and shall not be pro-rated on basis of useful service life or warranty period.

8. Warranty Extensions; Work repaired or replaced under warranty shall be provided with a new warranty equal to the full length of the original warranty. The new warranty shall begin on the date of Owner's acceptance and use of the replaced or repaired item.

9. Warranty Effective Starting Date: All warranties shall begin on Date of Final Acceptance of the entire project or Owner's acceptance of the work or item covered by the warranty, whichever is later, and the warranty coverage shall continue for the period specified. If no specific warranty period is specified, the warranty shall extend for one year (365 days).

10. Contractor's Responsibilities for Warranties: The Contractor shall implement and invoke all guarantees and warranties provided by subcontractors, manufactures, material suppliers, and other parties, including warranties longer than one-year duration. The Contractor shall make every effort to facilitate, expedite, and aid the Owner in warranty claims the Owner may have throughout the warranty periods.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

1.02 RECORD DRAWINGS

A. Record Drawings shall consist of all the Contract Drawings.

B. From the sets of electronic drawings furnished by the Owner, the Contractor shall print and reserve one set for record purposes. From this set, the Contractor shall detach and furnish, at no charge to all Subcontractors, the drawings of their portion of the Work for the same purposes.

C. The Contractor and the above Subcontractors shall keep their record set on the site at all times and note on it in colored ink or pencil, neatly and accurately, at the end of each working day, the exact location of their work as actually installed. This shall include the location and dimensions of underground and concealed Work, and any variations from the Contract Drawings. All changes, including those issued by Addendum, Change Order or instructions by the Owner's Representative shall be recorded. Record Drawings shall be prepared for the entire project and include all Work.

D. The Owner's Representative may periodically inspect the Record Drawings at the site. The proper and current maintenance of the information required on these drawings shall be a condition precedent to approval of the monthly requisitions for periodic payment.

E. At Substantial Completion the Contractor shall submit the complete set of Record Drawings to the Owner's Representative. The Owner's Representative will review these drawings and return them to the Contractor with necessary comments.

F. Upon receipt of an AutoCAD compatible disk or electronic file of the original contract drawings from the Owner's Representative, the Contractor and Subcontractors shall transfer the As-Built information shown on the Record Drawings. This electronic drafting shall be done by an experienced CAD operator and match the original Drawings.

G. From the disks, the Contractor shall, at its own expense, prepare five sets of hardcopies on bond and the electronic files on a DVD to the Owner's Representative. Each sheet shall be clearly marked "Record Drawing" and bear the date of printing. Submission of accurate Record Drawings and their approval by the Owner's Representative shall be a condition precedent to final payment.

1.03 AS-BUILT SURVEY

A. Contractor shall provide a third party as-built survey stamped by a licensed land surveyor in the Commonwealth of Massachusetts of the final site conditions. Survey of the new work shall tie into the existing survey to show actual site conditions post-construction.

1. Three (3) original stamped copies will be provided to the Owner as well as a pdf and CAD file for the final as-built survey.

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 02 00 00
EXISTING CONDITIONS

ACTIVITAS

SECTION 02 00 00

SITE REQUIREMENTS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section, whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all under the Contract.

1.02 EXAMINATION OF SITE

A. Prior to bidding the Contractor shall thoroughly examine the site and the Contract Documents to ensure his knowledge of conditions and requirements affecting the work. No claim for extra compensation or extension of time will be allowed for Contractors failure to comply with this requirement nor will any condition at the site, whether or not in agreement with conditions shown or called for on the Bid and Contract Documents, be allowed as a basis for such claims, except as otherwise specifically provided for.

1.03 DISCOVERY

A. If during the demolition, excavation, disposal, or other work, articles of unusual value, or of historical or archeological significance are encountered, the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Landscape Architect/Civil Engineer. If the nature of the article is such that the work can not proceed without danger of damaging same, work in that area shall be immediately discontinued until the Landscape Architect/Civil Engineer and/or Owner has decided the proper procedure to be followed. Any time lost thereby shall be a condition for which the time of the Contract may be extended. All costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.

1.04 COORDINATION WITH EXISTING UTILITIES

A. The Contractor shall give advance notice to public utility companies as required by law, and shall provide proper disposition, subject to Landscape Architect/Civil Engineers and/or Owners approval of all existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that in any way interfere with the work, whether or not they are specifically shown on the Drawings. The Contractor shall immediately notify the Owner and appropriate authorities when coming across unknown utility line, and await decisions as to how to dispose of them. When an existing utility line must be cut and plugged, or capped, moved, or relocated, or has become damaged, he shall notify the Owner and the Utility company involved, and assure the protection, support, or moving of utilities to adjust them to the new work. The Contractor shall be responsible for all damage caused to existing and/or active utilities under the work of this Contract, whether or not such utilities are shown on the Drawings, including resultant damages or injuries to persons or properties.

1. Written notice shall be given by the Contractor to all public service corporations owning or having charge of publicly or privately owned utilities of his intention to commence operations affecting such utilities at least (1) week in advance of the commencement of such operations, and the Contractor shall at that time file a copy

of such notice with the Landscape Architect/Civil Engineer.

2. Before the Contractor begins any work or operations that might damage any subsurface structures, he shall carefully locate all such structures and conduct his operations so as to avoid any damage to them.

B. Agents of various public service agencies, municipal and State departments may be entering on the work site to remove existing facilities, to construct or place new facilities or to make alterations to existing facilities.

C. Prior to starting work or erecting permanent construction signing, the Contractor shall notify the "DIG SAFE" program with a minimum of 72 hours advance warning. Once located and marked, the Contractor shall maintain such marks and access to installations to permit repairs and maintenance of service if interrupted.

D. The Contractor shall perform the work in cooperation with various agencies in a manner that causes the least interference with the operations of the aforementioned agencies and shall have no claim for daily due to said work of these agencies.

E. Written notice shall be given by the Contractor to all public service corporations or municipal and State officials owning or having charge of publicly or privately owned utilities of his intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations. The Contractor shall, at the same time, file a copy of such notice with the Landscape Architect/Civil Engineer.

1.05 FIELD LAYOUT

A. Contractor shall maintain a level and transit on the job, and shall employ personnel for use thereof trained and registered as a Civil Engineer or as a registered Surveyor by the Commonwealth of Massachusetts. The Owner and Landscape Architect/Civil Engineer shall have reasonable use of the instruments at all times.

B. Existing survey information on Drawings is for Contractors use. Contractor shall establish and maintain benchmarks in at least two widely separated locations, and shall establish and maintain grades, lines, levels and other dimensional reference guides as required. The Contractor shall annotate project documents to indicate all modifications of grades, utilities, etc.

C. <u>While the Contractor may use the electronic drawings for layout purposes, it is his responsibility to check all layout in the field to confirm conformity with the project drawings, specifications, and approved shop drawings and submittals. Use of only the electronic drawings without a site check of layout is not acceptable.</u>

1.06 PROTECTION OF PROPERTY AND THE PUBLIC

A. Construct all fences, barricades, and protective facilities required for the protection of the public, in accordance with local and State regulations. Furnish and install all signs, lights, reflectors and all such protection facilities as may be required.

B. Contractor shall save the Owner harmless from all claims arising from the use of public streets and sidewalks and adjoining premises for construction purposes.

C. Keep all access roads and walks clear of debris, materials, construction plans and equipment, during building operation. Repair streets, drives, curbs, sidewalks, fences, poles and the like, where disturbed by construction, and leave them in a good conditions after completion of the work as before operations started. The Contractor shall contact appropriate Town officials concerning hauling of construction materials over Town roads and bridges.

D. Provide ways and means to control the flow of water from every ssource that may cause delay or damage during the construction operation.

E. Protect all planting, landscaping, trees and site improvements as indicated on the Drawings.

F. The Contractor shall be responsible for the maintenance of construction barriers and traffic barriers in order to maintain traffic, over, through, or around the work included in his Contract with the maximum of safety and practicable convenience to such traffic during the life of the Contract, and whether or not work has been suspended temporarily. He shall take all precautions for preventing injuries to persons or damage to property to or about the work.

G. The work shall be carried on and barriers erected in such a manner as to provided safe passage at all times for public travel and with least obstruction to traffic. The Contractor shall provide and maintain, at his own expense, in a safe and passable condition, such temporary by-passes as created by the barriers as may be necessary to accommodate both pedestrian and vehicular traffic.

H. The Contractor shall maintain all legally required means of egress.

I. Where the new construction or repair work coincides with the presently traveled way, the Contractor shall carry on his work so that travel will not be obstructed.

J. Whenever gale or high winds are forecasted, take proper measures to secure all loose material, equipment or other items which could blow about and be damaged or cause damage to other work. No such loose items shall be left unsecured at end of working day.

1.07 POLICE

A. Whenever, in the opinion of the Town or School Department, traffic is sufficiently congested or public safety is endangered the Contractor shall furnish at his expense a uniformed police detail to direct traffic or to keep traffic off the area affected by construction operations. Such officers shall be in addition to flagmen required under other provisions of the Contract. The Contractor shall comply with all necessary notifications and payment schedules as required by the Town of Reading Police Department.

B. The employment of or the presence of special officers or police shall in no way relieve the Contractor of any responsibilities or liability that is his under the terms of the Contract.

1.08 FIRE DEPARTMENT ACCESS

A. The Contractor shall maintain fire lanes as required by the Reading Fire Department throughout the course of construction.

1.09 SPECIAL SECURITY AND CONTRACTOR'S RESPONSIBILITY FOR THE WORK

A. The Owner shall not provide security within the storage, staging, or construction areas nor will the Owner assume responsibility for acts of vandalism, within these areas.

B. Until written acceptance of the physical work by the Landscape Architect and/or Owner, the Contractor shall assume full charge thereof and he shall take every necessary precaution against damage to the work by action of the elements, or from any cause whatever, whether arising from the execution of the Contractor or not.

C. The Contractor shall bear all losses resulting to him on account of vandalism.

D. The Contractor shall rebuild, repair, restore and make good all damages to any portion of the work occasioned by any of the above causes before the completion and written acceptance of the physical work, and shall bear the expanse thereof.

E. Should the Contractor fail to take prompt action whenever conditions make it necessary, the Owner shall make emergency repairs or cause the same to be made, with the stipulation that the costs fir such repairs shall be charged against the Contractor and deducted from monies due to him.

F. In case of suspension of work from any cause whatever, the Contractor shall be responsible for the project and shall take such precautions as may be necessary to prevent damage to the project, provide for normal drainage and shall erect any necessary temporary structures, signs, or other facilities at his expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established plantings and seedlings furnished under his Contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

1.10 TEMPORARY BRACING, SHORING, SHEETING, TIE DOWN

A. Provide all sheeting, shoring, bracing, underpinning, reinforcement and other temporary supports as may be required to maintain the integrity of, and prevent damage to, any structure or finish to be subjected to or adjacent to cutting work. Patch to restore to sufficient final strength, and acceptance appearance, subject to Landscape Architect/Civil Engineer and/or Owner's approval.

1.11 SITE DRAINAGE

A. Contractor shall take over responsibilities for existing site drainage upon entering premises, and maintain such drainage during the life of his Contract in a manner approved by the Landscape Architect/Civil Engineer and so as not to adversely affect adjacent areas.

B. Keep excavations, pits, trenches, and other construction areas free of water at all times, including backing up drains and sewers. Provide hydraulic equipment to control surface and ground water. Pumping equipment shall be adequate to remove all hydrostatic pressure from structures until sufficient strength has been developed by the structure to protect work from displacement or other damage.

C. Maintain ground water level where required sufficiently below excavation level at all times to maintain stable working platform. Ground water shall be controlled so as to avoid adverse effects on established ground water elevation of adjacent sites

1.12 SITE TRENCHING AND EXCAVATION

A. Open excavation adjacent to the traveled way or shoulders shall not remain through the hours of darkness, holiday or periods of shutdown, unless adequately protected and specifically authorized by the Town. The Contractor shall obtain a street opening permit from the Town of Reading Department of Public Works prior to excavating in Town streets or right-of-ways.

B. If live service connections are to be interrupted by excavations of any kind, the Contractor shall not break the service until new services are provided. Abandoned services shall be plugged off or otherwise made secure.

C. Full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all the work involved in protecting or repairing property as specified in this section, shall be considered included in the Contract price, and no additional compensation will be allowed therefore.

D. Before starting any work for this Contract, the Contractor shall prepare and submit to the Landscape Architect/Civil Engineer for approval, a plan that indicates the traffic routing proposed by the Contractor during the various stages and time periods of the work and the temporary barricades, signs, cones, drums, and other safety and traffic control devices to be employed during each stage and time period of the work to maintain traffic and access to abutting properties.

E. Particular care should be taken to establish and maintain methods and procedures, which will not create unnecessary or unusual hazards to public safety. Traffic control and safety devices required only during working hour operations shall be removed at the end of each working day.

F. Signs having messages that are irrelevant to normal traffic conditions shall be removed or properly covered at the end of each work period. Signs shall be kept clean at all times and legends shall be distinctive and unmarred.

G. All trenches with the right-of-way in pavements to remain shall be hot patched at the end of each workday as directed.

H. All existing and other materials not required or needed for use on the project, and not required to be removed and stacked, shall become the property of the Contractor, and shall be removed and stacked, shall become the property of the Contractor and shall be removed from the site and legally disposed of unless otherwise noted. No separate payment will be made for this work and all costs in connection therewith shall be included in the bid price of this Contract.

1.13 COORDINATION

A. Before commencing any work, or any phase of work, the Contractor shall prepare a sequence of operations for all work under the Division and shall submit it for approval by the Landscape Architect/Civil Engineer and the Owner at a Pre-Construction Conference.

B. Before commencing any work, the Contractor shall consult with the Owner regarding any uses of any facility, including, but not limited to, loading docks, parking areas, storage areas, etc., that may be required to prosecute work.

C. If, in the judgment of the Landscape Architect/Civil Engineer, continued work under the approved sequence of operations may interfere with the operations of any other construction projects at any time during the progress of the work, the Landscape Architect/Civil Engineer may direct the Contractor to accelerate, interrupt, or cease work, at particular points. The Contractor shall make reasonable changes in the sequence of operations to accommodate these directions, at no additional cost to the Owner.

D. The Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, Subcontractors, or materials and equipment engaged upon the work. He shall be prepared to guarantee each of his Subcontractors the dimensions which they may require for the fitting of their work to all surrounding work and shall perform or cause the Subcontractors to perform all cutting, fitting, or adjusting and patching necessary to make the several parts of the work come together properly and to fit the work to receive or be received by that of other Contractors.

E. The Contractor shall give his personal supervision to the work or have a competent superintendent on the job at all times during the progress of the work, with the authority to act for him. The Contractor shall also provide an adequate staff for the proper coordination and expedition of his work.

F. The Contractor shall lay out his own work and shall be responsible for all lines, elevations

and measurements of the grading, landscaping and other work executed by him under the Contract. He shall exercise proper precaution to verify the dimensions shown on the Drawings before laying out the work and will be held responsible for any error resulting from his failure to exercise such precaution.

G. The Contractors responsibility for the coordination of all work under the Contract shall be complete, and shall extend to all modifications in the work, whether or not such modifications entail a change in the Contract price. Where the Contract Documents allow an optional material or method, the Contractor shall provide all other coordination and additional work that such change necessitates, without any additional cost to the Owner.

H. The Contractor shall provide all necessary coordination with the Contractor for the Support Building (to be completed simultaneously under separate contract).

1.14 MEASUREMENTS

A. Before ordering any material or doing any work, the Contractor shall verify all measurements and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on the Drawing; any difference which may be found shall be submitted to the Landscape Architect/Civil Engineer, in writing, for consideration before proceeding with the work.

1.15 CONDUCT OF WORK

A. The Contractor shall coordinate with the Owner and Landscape Architect/Civil Engineer, work in connection with adjacent occupied buildings or areas, driveways, walks or other facilities that would prevent access thereto or interrupt, restrict or otherwise infringe upon the Owners use thereof.

B. Damage to existing work, if caused by Contractor's operations under this Contract, shall be repaired at Contractors expense.

C. The Contract Site shall be shown on Drawings and shall include the entire area bounded by the "Contractors Work Area" or "Limit of Work" lines when required for performance of work under the Contract.

D. Any street or other paving, curbs and/or sidewalks damaged as the result of work under this Contract, whether within or outside of the limits of the work, shall be repaired and/or replaced with new matching construction by the Contractor causing such damage, at his expense, and in a manner satisfactory to the Landscape Architect/Civil Engineer and authorities having jurisdiction there over.

E. Where existing curbs or walks are to remain, or after new curbs or walks are constructed and trucking is required over them, they shall be suitably protected in an approved manner

F. The Contractor shall provide continuous, lawful, safe, adequate, and convenient access to the site. Access to the site shall generally be via existing roadways and paved surfaces that the Contractor shall maintain and restore to original condition. Contractor shall construct and maintain in good usable condition temporary roads or appurtenances as required, and when no longer required, remove, temporary construction and restore such areas to their original condition.

1.16 CLEANING UP

A. The following specific cleaning work shall be done:

1. Concrete and masonry shall be cleaned free of all foreign matter. If, in opinion of the Landscape Architect/Civil Engineer, further cleaning of specific areas is required they shall be scrubbed with water or other cleaning agents. Acid cleaners shall not be used, except as ay otherwise specifically be permitted in the trade sections.
2. Surfaces with integral finishes shall be washed with clean water, mild soap and soft rags, thoroughly rinsed, and then wiped with clean, soft rags. Abrasive cleaners shall not be used.
3. Painted surfaces shall be cleaned free of foreign matter, and if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags thoroughly rinsed, and wiped with clean, soft white rags.
4. Metal surfaces, hardware, equipment, and similar items shall be cleaned free of all foreign matter and, if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed and wiped with clean, soft, white rags. Abrasive cleaners shall not be used.
5. All advertising matter and temporary instructional material shall be removed from exposed surfaces throughout.

END OF SECTION

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 03 00 00
CONCRETE

ACTIVITAS

SECTION 03 00 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Cast-in-place concrete foundations.
2. Cast-in-place concrete turf anchor.
3. Foundations for ball netting foundations and goal posts.
4. Other cast-in-place cement concrete site requirements as detailed in the Drawings.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Athletic Equipment
B. Earthwork
C. Site Furnishings
D. Bituminous Concrete Pavement
E. Infilled Synthetic Turf System
F. Loam and Seed
G. Storm Drainage System

1.04 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Society for Testing and Materials (ASTM):

C 67	Brick and Structural Clay Tile
C 91	Masonry Cement
C 144	Aggregate for Masonry Mortar
C 150	Portland Cement
C 207	Hydrated Lime for Masonry Purposes
C 270	Mortar for Unit Masonry

1.05 SUBMITTALS

A. Complete shop drawings for reinforcing steel for each cast-in-place concrete site components shall be submitted.

1. Include placing drawings that detail fabrication, bending, and placement. Indicate bar sizes, lengths, bar schedules, bent bar diagrams, splices, and reinforcement supports as applicable.

B. Manufacturer's Product Data shall be submitted for all proprietary products used in concrete work including, but not limited to, curing compounds, admixtures, and reinforcement accessories.

C. Concrete Mix Design: Submit proposed design mix for the type and strength of concrete specified. Provide separate mix designs for any change in ingredients. Include the following items:

1. Mix proportions for all ingredients of the mix. Designate within the submittal where each mix is proposed to be used. Proportions shall be established by one of the following methods in accordance with ACI 301.
   a. Field experience.
   b. Trial Batch.
   c. Water/cement ratio specified herein.
2. Cement type.
3. Aggregate gradations taken within 3 months from the date of submission. Specify size of coarse aggregate in accordance with ASTM size numbers.
4. Provide data for all proprietary items incorporated into the mix including, but not limited to admixtures.
5. Compressive strength results from an independent testing laboratory for mixes designed in accordance with trial batch or field experience methods.
   a. Trial batches shall be tested within 12 months of the date of submission.
   b. Submit quantity of tests in accordance with ACI 301. Note that mix designs developed in accordance with the field experience method must include a minimum of 30 consecutive tests, with an allowance for 10 to 30 consecutive tests with a higher average strength required.
   c. Slump and air content shall be consistent with specifications for this project within tolerances specified within ACI 301.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer shall be certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities.

C. Testing Agency Qualifications: If the trial batch method is used to design concrete mixes, testing shall be performed by an independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Reference Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete", Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
3. ACI 318, "Building Code Requirements for Structural Concrete".
4. ACI 347R "Guide to Formwork for Concrete".
5. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

1.07 TESTING AND INSPECTION

A. The Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections will include the following:

1. Steel reinforcement placement (if applicable)
2. Concrete placement, including conveying and depositing.
3. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression test specimens: ASTM C 31/C 31M. Cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one laboratory-cured specimen at 7 days two specimens at 28 days. Retain the fourth specimen for testing at 56 days in the event that the 28-day strength tests do not attain the specified strength.
   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
9. Test results shall be reported in writing to the Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work,

design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by the Engineer.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver manufactured products in manufacturer's original, unopened, and undamaged containers with labels intact and legible.

B. Store and handle manufactured products to prevent damage and deterioration.

C. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage

PART 2 – PRODUCTS

2.01 COMPACTED DENSE GRADED CRUSHED STONE BASE

A. Compacted Dense Graded Crushed Stone shall be as specified under Section 31 00 00 – EARTHWORK.

B. The Contractor shall submit to the Landscape Architect a sieve analysis by an independent recognized testing laboratory of the material he intends to utilize. No material shall be placed until approved by the Landscape Architect in writing.

2.02 CAST-IN-PLACE CONCRETE

A. Ready mix concrete shall conform to ASTM C-94, the batch plant shall be certified in compliance with the National Ready Mix Concrete Association standards. Concrete shall have a minimum 28-day compressive strength of 4,000 psi. Prepare design mixture for concrete, proportioned based on laboratory trial mixture, field test data, or default water-cement ratio given below, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
2. When acceptable data is not available for either field experience or trial batch design methods, design mixture based on a maximum water/cement ratio of 0.35.
3. Provide a maximum slump of 4 inches except for concrete containing a high-range water reducer. Concrete containing a high-range water reducer shall have a maximum slump of 8 inches when added to concrete with a maximum slump of 4 inches.

B. Forms shall be steel or wooden forms at the Contractor's option and as approved by the Landscape Architect. Provide forms capable of producing uniform, straight, or curved concrete surfaces. Use only non-staining form release compounds.

C. Reinforcing bars shall be deformed steel bars complying with ASTM A-615, grade 60. Provide miscellaneous bar supports and 18 gauge ASTM A-82 annealed steel wire ties.

D. Portland cement shall conform to ASTM C-150, Type I or Type II. Use only one brand of cement throughout the project. Limit the temperature of the cement to 140 degrees Fahrenheit when delivered to the batching plant.

E. Supplementary Cementitious Materials: The following cementitious materials may be substituted for a portion of the Portland cement in the design mixture. Limit the percentage, by weight, of cementitious materials as follows:

1. Fly Ash: ASTM C 618, Class C or F. Maximum percentage = 25%.
2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120. Maximum percentage = 50%.

F. Aggregates shall conform to ASTM C 33, Class 3S coarse aggregate. Provide aggregates from a single source with a long history of successful use in similar work and conditions.

1. Maximum coarse aggregate size: Comply with size limits in ACI 301.
2. Fine aggregate: Free of materials with deleterious reactivity to alkali in cement.

G. Water: ASTM C 94/C 94M, potable, and clean, potable and free of all impurities that are detrimental to concrete.

H. Air-entraining admixtures shall conform to ASTM C-260; use only admixtures that have been accepted in the mix design. Provide admixture in such quantity to provide the following air entrainment within a tolerance of plus or minus 1.5 percent.

1. 1-1/2 inch maximum aggregate size: 5.5 percent.
2. 1 inch maximum aggregate size: 6.0 percent.
3. ¾ inch maximum aggregate size: 6.0 percent.

I. Water reducing admixtures shall conform to ASTM C-494 Type A or F; use only admixtures that have been accepted in the mix design.

J. Curing/sealing compound shall comply with FS TT-C-800, having at least 30% solids content.

K. Miscellaneous curing materials:

1. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
2. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

L. Form Ties: If required, factory-fabricated, removable or snap-off metal or fiberglass reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 ½" to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in the concrete surface and will permit neat and solid patching at every hole.

M. Miscellaneous ties, if required, shall be hot-dipped galvanized steel straps, bars, rods and similar items which are fabricated from not less than 16 gauge sheet steel or 3/16" diameter steel wire. For precast and stone work, provide stainless steel slot anchors, threaded rods and other anchors as approved on shop drawings.

N. Expansion Joint Filler:

1. Fiber Type: Preformed asphalt impregnated fiber, ASTM D1751, ½ inch thick unless otherwise noted.
2. Cork Type: Preformed cork expansion joint, ASTM D1752. Type II, ½ inch thick unless otherwise noted.

O. Expansion joint Sealant: ASTM C920, Type M, Class 2 5; two part polyurethane traffic grade sealant, color to match concrete wall color and to be approved by the Landscape Architect. Vertical joints shall have Nonsag, Grade NS, Use NT sealant.

2.03 MORTAR

A. Patching Mortar for exposed concrete shall be made of the same material and of approximately the same proportions as used for the site walls, except that coarse aggregate shall be omitted and mortar shall consist of not more than 1 part Portland cement to 2 ½ parts damp loose sand by volume. Color to match concrete site walls.

2.04 CAST-IN-PLACE CONCRETE SYNTHETIC TURF ANCHOR

A. Concrete shall be 4,500 psi. Materials shall comply with paragraph 2.02 except as follows.

B. A slump pour for the turf anchor haunch is acceptable. This haunch is meant to prevent future settlement against the anchor and will not be visible.

C. Curing/sealing compound shall be equivalent to Day-Chem Sil-Cure J13.

D. Expansion materials:

1. Expansion joints shall be located at the end of all curb runs and at a maximum of 60'.
2. Expansion joint filler shall be preformed, non-bituminous type joint filler conforming to ASTM D 1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., Elgin, IL 60120, or approved equal.
3. Premolded filler shall be one piece for the full depth and width of the joint leaving a sealant recess as indicated and shall be an asphaltic material.
4. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.
5. Except as otherwise noted on the Drawing, joint filler shall be ½" thick.
6. Expansion joint shall receive joint backer rod and shall be sealed with approved joint sealer.
7. Control joints shall be tooled in every 20'.

E. FIBROUS REINFORCEMENT

1. All concrete at Infilled Synthetic Turf Anchors shall contain a fibrous reinforcement of 100% virgin polypropylene fibrillated fibers of multi-design gradation as manufactured by Fibermesh, Synthetic Industries, 4019 Industry Drive, Chattanooga, Tennessee 37416 or an equal product approved by the Landscape Architect.

PART 3 – EXECUTION

3.01 COMPACTED DENSE GRADED CRUSHED STONE BASE

A. Refer to Section 31 00 00 – EARTHWORK for preparation of subgrade and dense graded crushed stone base.

B. The Contractor shall submit to the Landscape Architect a sieve analysis by an independent recognized testing laboratory of the material he intends to utilize. No material shall be placed until approved by the Landscape Architect in writing.

3.02 CAST-IN-PLACE CONCRETE

A. Contractor shall excavate area to the lines and grades shown to provide proper footing for all concrete footings.

B. Contractor shall erect proper formwork to pour the concrete footings, and install reinforcing steel where required on Drawings. Formwork shall be free of defects and shall provide a smooth and even finish to the entire wall surface. Place concrete and finish as indicated on the Drawings and as specified. Contractor shall leave forms for a minimum of 48 hours.

1. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
2. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual.
   a. For concrete surfaces to be concealed, provide surface tolerance Class D, allowing surface irregularities of 1" when measured with a 5 foot straight-edge.
   b. For concrete surfaces to be exposed to view, provide surface tolerance Class B, allowing irregularities of ¼" when measured with a 5 foot straight-edge.

C. Contractor shall protect the concrete against injury from the elements and defacement of any nature during construction.

D. Strictly comply with industry standards and recommendations National Concrete Masonry Association except where more restrictive requirements are specified in this Section.

E. Embedded Items: Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

3.04 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete. Width of keys shall be equal to 1/3 of the member thickness unless otherwise noted.
3. Intentionally roughen the concrete surface of construction joints between footings and walls and elsewhere as indicated. Provide a minimum surface roughness amplitude of 1/4 inch.

3.05 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded

items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Maintain a minimum of 2 working vibrators on the jobsite during each concrete placement.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
4. Protection of Footings against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.06 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the

remainder of the curing period.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.07 CONCRETE SURFACE REPAIRS

A. Repair surface imperfections by patching or grinding in accordance with ACI referenced standards. Allow 28 days after placement before performing surface repairs unless otherwise directed.
B. At concealed surfaces, grind projections larger than 1". Patch voids larger than 1-1/2" wide or ½" deep. Finished surface shall comply with Surface Finish 1.0 per ACI 301.
C. At surfaces that will be exposed to view, grind projections larger than ¼". Patch voids larger than ¾" or ½" deep. Patching material shall have color to match adjacent surfaces.
   1. Prepare a patching mock-up for approval before performing patching to surfaces that will be exposed to view. Patch an area that will be inconspicuous and allow for viewing by Activitas before proceeding with successive patching.

END OF SECTION

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 10 00 00
SPECIALTIES

ACTIVITAS

SECTION 10 14 00

EXTERIOR SITE SIGNAGE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Exterior Signage.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Cast-in-Place Cement Concrete
B. Earthwork
C. Bituminous Concrete Pavement
D. Cement Concrete Pavement
E. Loam and Seed

1.04 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

B. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications).

C. Americans with Disabilities Act (ADA) Appendix to Part 1191 Accessibility Guidelines for Building and Facilities.

D. Massachusetts Architectural Access Board (MAAB).

E. Town of Reading Department of Public Works.

1.05 QUALITY ASSURANCE

A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.

B. Codes and Standards: Perform site improvement work in compliance with applicable requirements governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.

C. Work under this section shall conform to the relevant provisions of MHD Specifications Section 828 of the "Supplementary Specifications for Traffic Signs and Supports

1.06 SUBMITTALS

A. Product Data: Provide manufacturer's data for each item showing installation and limitations in use.

B. Shop Drawings: Submit shop drawings at an approved scale indicating size, shape, dimensions, letter style, method of anchoring and spacing.

C. Material Selection and Samples: Submit samples showing the complete range of colors, textures, and finishes available for all components required for construction.

D. Install at project site a mock-up of a typical sign using acceptable materials and installation methods. The mock up shall be approved by the Owner and Landscape Architect in color, texture, materials and workmanship

PART 2 - PRODUCTS

2.01 EXTERIOR SIGNAGE

A. Exterior signage shall be panel sign systems. Sign panels shall be ½" thick vandal/graffiti proof phenolic panel with fire retardant – size as noted on the Drawings. Sign panels shall be mounted as instructed by the manufacturer and as noted on the Drawings.

B. Signage systems shall be equivalent to:

1. Fossil Graphics, Deer Park, NY, (800) 244-9809, or an approved equivalent.
   a. All Signs: refer to Drawings for dimensions and sample copy.
   b. The Landscape Architect shall select post finish and colors.

C. Refer to drawings for sign quantities and size.

D. Upon written request, the Landscape Architect shall provide graphics to the Contractor in electronic format.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Signs shall be installed in locations indicated on drawings and per manufacturer's recommendations.

B. Contractor shall submit mounting methods for all signs to the Landscape Architect for review and approval.

C. Any exposed mounting hardware shall be painted a color to be selected by the Landscape Architect.

D. The height of signs to be installed on chain link fence shall be confirmed in the field with the Landscape Architect and Owner prior to installation.

3.02 FINAL CORRECTION

A. The Landscape Architect reserves the right to inspect the work to determine if adjustments are necessary in grade, alignment, or layout. The Contractor shall make such adjustments without

further compensation.

3.03 CLEANING AND REPAIR

A. The Contractor shall clean all stains from the surface of all site signage. Sign surfaces that cannot be cleaned shall be replaced.

END OF SECTION

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 11 00 00
EQUIPMENT

ACTIVITAS

SECTION 11 68 00

ATHLETIC EQUIPMENT

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. Work Included: Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Pre-cast Concrete Lacrosse (Sport) Wall

1.03 RELATED WORK

A. Site Preparation
B. Earthwork
C. Cast-In-Place Concrete
D. Storm Drainage System
E. Infilled Synthetic Turf System

1.04 REFERENCES

A. ASTM - American Society for Testing Materials
B. ASBA – American Sports Builders Association
C. NFHSA – Nation Federation of High School Athletics Association
D. MIAA – Massachusetts Interscholastic Athletic Association

1.05 LAWS, ORDINANCES, PERMITS AND FEES

A. The Contractor shall:

1. Give necessary notices, obtain all permits and pay all Governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals of the local Building Departments having jurisdiction.
2. Obtain all required certificates of inspection for this work and deliver them to the Landscape Architect/Civil Engineer before request for acceptance and final payment for the work.
3. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on the Drawings and/or specified.

1.06 QUALITY ASSURANCE

A. Source: For each type of product required for the work of this Section, provide products of

one manufacturer and source for consistency.

B. Codes and standards: Perform site improvement work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.

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

D. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades, which adjoin materials of this Section before installing items specified.

1.07 SUBMITTALS

A. Product Information: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation. Work includes but is not limited to the following items:

1. Pre-cast lacrosse (sport) wall

B. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of all parts of the work under this Section including but not limited to the following:

1. Pre-cast concrete lacrosse (sport) wall

PART 2 – PRODUCTS

2.01 PRE-CAST CONCRETE LACROSSE (SPORT) WALL

A. Furnish and install a 16' high pre-cast concrete lacrosse (sport) wall equivalent to the SCP Standard T-Wall as manufactured and provided by Scituate Companies, 120 Clay Pit Road, Marshfield, MA 02050, (800) 440-0009.

B. Refer to the drawings for the proposed width of the wall to determine the number of precast wall units required.

PART 3 – EXECUTION

3.01 GENERAL

A. General: Installation/materials for all items in this section shall meet the applicable requirements of the:

1. American Sports Builders Association
8480 Baltimore National Pike, #307
Ellicott City, MD 21043
(888) 501- 2722

2. National Collegiate Athletic Association
6201 College Boulevard
Overland Park, KS 66211-2422
(913) 339-1906

3. Massachusetts Interscholastic Athletic Association
33 Forge Parkway

Franklin, MA 02038
(508) 541- 7997

4. National Federation of State High School Associations
P.O. Box 690
Indianapolis, IN 46206
(317) 972-6900

3.02 ATHLETIC EQUIPMENT

A. Assemble and install per manufacturer's recommendations and approved shop drawings and submittals.

B. Pick points on the pre-cast wall shall be mortared (in a mortar recommended by the manufacturer and a matching color) and sanded smooth.

END OF SECTION

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 26 00 00
ELECTRICAL

ACTIVITAS

TABLE OF CONTENTS

SECTION 26 00 00

ELECTRICAL

PART 1 - GENERAL 1
1.1 GENERAL PROVISIONS 1
1.2 SCOPE OF WORK 1
1.3 RELATED WORK 1
1.4 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION 2
1.5 DEFINITIONS 2
1.6 CODES, REFERENCES AND PERMITS 3
1.7 GENERAL REQUIREMENTS 4
1.8 MATERIAL AND EQUIPMENT STANDARDS 4
1.9 SUBMITTALS 4
1.10 OPERATION AND MAINTENANCE DATA 8
1.11 RECORD DRAWINGS 9
1.12 WARRANTIES 9
1.13 COORDINATION 10
1.14 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS 10
1.15 INSPECTION OF SITE CONDITIONS 11
1.16 SURVEY AND MEASUREMENTS 11
1.17 DELIVERY, STORAGE AND HANDLING 11
1.18 PROTECTION OF WORK AND PROPERTY 12
1.19 SUPERVISION 12
1.20 SAFETY PRECAUTIONS 12
1.21 SCHEDULE 12
1.22 HOISTING, SCAFFOLDING AND PLANKING 12
1.23 CUTTING AND PATCHING 12
1.24 SLEEVES, INSERTS AND ANCHOR BOLTS 13
1.25 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS 13
1.26 HAZARDOUS MATERIALS 14
1.27 ACCESSIBILITY 14
1.28 PROJECT CLOSEOUT 14
PART 2 - PRODUCTS 17
2.0 NOT USED 17
2.1 IDENTIFICATION 17
2.2 RACEWAYS AND CONDUIT 17

2.3 WIRE AND CABLE (600V) 18
2.4 WIRING DEVICES AND PLATES 19
2.5 OUTLET BOXES 20
2.6 JUNCTION AND PULL BOXES 20
2.7 SAFETY DISCONNECT SWITCHES 22
2.8 PANELBOARDS 22
2.9 DRY TYPE TRANSFORMERS 24
2.10 LIGHTING FIXTURES 25
2.11 HANDHOLES 25
PART 3 - EXECUTION 26
3.0 DEMOLITION 26
3.1 IDENTIFICATION 28
3.2 RACEWAYS AND CONDUIT 28
3.3 WIRE AND CABLE (600V) 30
3.4 WIRING DEVICES AND PLATES 31
3.5 OUTLET BOXES 31
3.6 JUNCTION AND PULL BOXES 31
3.7 SAFETY DISCONNECT SWITCHES 32
3.8 PANELBOARDS 32
3.9 DRY TYPE TRANSFORMERS 33
3.10 HANDHOLES 33
3.11 POWER SYSTEM STUDIES 34
3.12 BASIC ACCEPTANCE TESTS 35

APPENDIX A – READING MUNICIPAL LIGHT DEPARTMENT (RMLD) STANDARDS

SECTION 26 00 00

ELECTRICAL

PART 1 - GENERAL

1.0 GENERAL PROVISIONS

A. The GENERAL REQUIREMENTS, DIVISION 01, and BIDDING AND CONTRACT REQUIREMENTS, DIVISION 00, are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications and requirements and provisions affecting the work of this Section.

1.1 SCOPE OF WORK

A. This project includes new athletic field at the West Running Brook School located in the Town of Derry, New Hampshire.

B. The work under this Section shall include the furnishing of all materials, labor, equipment and supplies and the performance of all operations to provide complete working systems, in general, to include the following items:

1. Identification
2. Raceways and Conduit
3. Wire and Cable (600V)
4. Wiring Devices and Plates
5. Outlet Boxes
6. Junction Boxes, Pull Boxes and Wireways
7. Safety Disconnect Switches
8. Panelboards
9. Dry Type Transformers
10. Fuses
11. Lamps and Light Fixtures
12. Lighting Control System
13. Underground Ductbank / Precast Handholes
14. Sleeving
15. Fire Seal and Fireproof Sealant
16. Supervision and Approval
17. Electrical Connections to Equipment provided under other Sections or by Owner.
18. Short Circuit Protection and Coordination Study
19. Testing
20. Operating and maintenance instructions and manuals
21. Shop drawings
22. Record (as-built) drawings

C. Work of this Section is generally shown on the Electrical Drawings.

1.2 RELATED WORK

A. Principal classes of Work related to the Work of this Section are listed in the Specification Table of Contents, and are specified to be performed under the indicated Sections of the

Specifications. Refer to the indicated Sections for description of the extent and nature of the indicated Work, and for coordination with related trades. This listing may not include all related Work items. It is the responsibility of the Contractor to coordinate and schedule the Work of this Section with that of all other trades.

B. The following work is not included in this section and will be provided under other sections:

1. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing. Refer to Division 01, General Conditions.
2. Excavation and backfill.
3. Concrete work including concrete housekeeping pads and blocks for vibrating and rotating equipment, and ductbank envelopes.
4. Flashing of roof and wall penetrations.
5. Painting, except as specified herein.

1.3 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

A. Furnish the following items for installation under other sections and provide wiring and connections as required:

1. Anchor bolts for poured-in-place light standard bases (furnish templates for placement) for installation under Division 03.
2. Pre-cast handholes for installation under Division 02.
3. Pipe sleeves for placement into formwork by the General Contractor.

1.4 DEFINITIONS

A. As used in this Section, the following items are understood to have the following meaning:

1. "**Contractor or Subcontractor** ", unless otherwise qualified, shall mean the installer of the work specified under this Section.
2. **"Furnish"** shall mean purchase and deliver to the project site, complete with every necessary appurtenance.
3. **"Install"** shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.
4. **"Provide"** shall mean "Furnish" and "Install".
5. **"Work"** shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.
6. **"Concealed"** shall mean hidden from sight in chases, furred-in spaces, shafts, hung ceilings, embedded in construction or in a crawl space. Areas to be concealed as part of tenant alterations to the building shall also be considered in this definition.
7. **"Exposed"** shall mean not installed underground or concealed as defined above.
8. **"Furnished by Others"** shall mean materials or equipment purchased under other sections of the general contract and installed by this section of the specifications by this trade Contractor.
9. **"Owners Representative"** shall be the party responsible to make decisions regarding all contractual obligations in reference to the Scope of Work for the Owner.
10. **"Date of Substantial Completion"** shall indicate the date where the work has been formally accepted as evidenced by completed final punch list or where the work has reached the stage that the Owner obtains beneficial use and commences utilization of the installed systems for business or occupancy purposes. The

GENERAL REQUIREMENTS, DIVISION 01, shall supersede this definition where specifically defined.

1.5 CODES, REFERENCES AND PERMITS

A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with the Department of Public Safety, Department of Environmental Protection, State Building Code and any other Codes and Regulations having jurisdiction including but not limited to:

1. All Applicable NFPA Standards
2. National Electrical Code (NEC)
3. Occupational Safety and Health Administration (OSHA)
4. State and Local Building Codes
5. Underwriters' Laboratories, Inc. (UL)

B. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:

1. American National Standards Institute (ANSI)
2. American Society of Mechanical Engineers (ASME)
3. American Society of Testing and Materials (ASTM)
4. Certified Ballast Manufacturers (CME)
5. Illuminating Engineering Society (IES)
6. Institute of Electrical and Electronics Engineers (IEEE)
7. Insulated Cable Engineers Association (ICEA)
8. National Electrical Contractors Association (NECA)
9. National Electric Manufacturers Association (NEMA)
10. Thermal Insulation Manufacturers Association (TIMA)

C. Codes, laws and standards provide a basis for the minimum installation criteria acceptable. The drawings and specifications illustrate the scope required for this project, which may exceed minimum codes, laws and standards.

D. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by the Owner's Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner's Representative, and without extra cost to the Owner. If work is covered before inspection and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.6 GENERAL REQUIREMENTS

A. Nameplates

1. Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

B. Equipment Guards

1. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be completely enclosed or guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service.

1.7 MATERIAL AND EQUIPMENT STANDARDS

A. Where equipment or materials are specified with the name of a manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for that particular item. No equipment or material shall be used unless previously approved by the Owner's Representative.

B. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified. The request for each substitution must be accompanied by complete specifications together with drawings or samples to properly appraise the materials, equipment or process. The Contractor shall highlight and list all applicable specification requirements which the substituted material deviates from.

C. If a substitution of materials or equipment in whole or in part is made, this Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.

D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.8 SUBMITTALS

A. Conform to the requirements of Division 01, General Conditions, for schedule and form of all submittals unless specifically noted otherwise in this section. Coordinate this submittal with submittals for all other finishes. Shop drawings and design layouts shall be prepared by licensed installing Contractor s and shall note the name(s), license number(s) and license expiration date(s) of the Contractor (s) installing electrical systems.

B. Definitions:

1. Shop Drawings are information prepared by the Contractor to illustrate portions of the work in more detail than indicated in the Contract Documents.
2. Acceptable Manufacturers: The mechanical design for each product is based on the single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications, certain Alternate Manufacturers are listed as being

acceptable. In addition, the MATERIAL AND EQUIPMENT STANDARDS paragraph potentially allows for substitutions as being acceptable. These are acceptable only if, as a minimum, they:

a. Meet all performance criteria listed in the schedules and outlined in the specifications. For example, to be acceptable, an emergency generator must deliver equal kW / kVA at equal or greater efficiency using equal or less fuel as the emergency generator listed in the schedules.
b. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either the space or the product. Clearances to walls, ceilings, and other equipment will be at least equal to those shown on the design drawings. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Engineer has determined that the manufacturer's products will fit within the available space – this determination is solely the responsibility of the Contractor.
c. Products must adhere to all architectural considerations including, but not limited to; being of the same color as the product scheduled or specified, fitting within the architectural enclosures and details, and for lighting – being the same size and of the same physical appearance as scheduled or specified products.

C. Submittal Procedures, Format and Requirements

1. Review submittal packages for compliance with Contract Documents and then submit to Owner's Representative for review. Submit enough sets of shop drawings such that, after review, two sets will be kept by the reviewer, with only the remaining sets returned with reviewer's marks and comments.
2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:

   a. Title
   b. Equipment number
   c. Name and location of project
   d. Names of Owner, Engineer and Seller
   e. Names of manufacturers, suppliers, vendors, etc.
   f. Date of submittal
   g. Whether original submittal or resubmitted

3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional drawings (minimum ¼" – 1' scale) including plans and sections (where physical clearance could be an issue). Provide larger scale details as necessary.
4. Submit accurate and complete description of materials of construction, manufacturer's published performance characteristics, sizes, weights, capacity ratings (performance data, alone, is not acceptable), electrical requirements, starting characteristics, wiring diagrams, and acoustical performance for complete assemblies. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.
5. Provide Shop Drawings showing details of piping connections to all equipment. If connection details are not submitted and connections are found to be installed incorrectly, this Contractor shall reinstall them within the original contract price.
6. Provide complete data for all auxiliary services and utilities required by submitted equipment. This shall include fuel, cooling and exhaust requirements and points of connections.
7. Provide a complete description of all controls and instrumentation required including electrical power connection drawing for all components and

interconnection wiring to starters, detailed information on starters, control diagrams, termination diagrams, and all control interfaces with a central control system.

8. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment.
9. The Owner's Representative shall approve all materials before commitment for materials is made.

D. Specifications and Schedule Compliance Statement

1. The manufacturer shall submit a point by point statement of compliance with each specification criteria listed in each paragraph for those submittals listed in Paragraph E: Product Data that are noted with an asterisk (*).
2. The statement of compliance shall consist of a list of all paragraphs (line by line) identified in Part 2 and applicable Part 3 of the specification for which the submitted product in the opinion of the manufacturer complies, deviates, or does not meet.
3. Where the proposed submittal complies fully, the word "comply" shall be placed opposite the paragraph number.
4. Where the proposed submittal does not comply, or accomplishes the stated function in a manner different from that described, a full description of the deviation shall be provided.
5. Verify each field of the associated schedule where associated technical data is presented on the drawings. Where the submitted material does not 'comply" provide the value the submitted equipment will achieve based upon the specified conditions.
6. Where a full description of a deviation is not provided, it shall be assumed that the proposed system does not comply with the paragraph in question and the product will be rejected.
7. Submissions which do not include a point by point statement of compliance as specified shall be disapproved.

E. Product Data: Submit complete manufacturer's product description and technical information including:

1. Raceways and Conduit
2. Wiring Devices and Plates
3. Safety Disconnect Switches
4. Panelboards
5. Dry Type Transformers
6. Light Fixtures
7. Handholes

F. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

1. Do not submit multiple product information in a single bound manual.
2. Three-ring binders shall not be accepted.

G. Deviations:

1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Owner's Representative.
2. Without letters flagging the deviation to the Owner's Representative, it is possible that the Engineer may not notice such deviation or may not realize its

ramifications. Therefore, if such letters are not submitted to the Owner's Representative, the Seller shall hold the Engineers, his consultants and the Owner harmless for any and all adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Engineer has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.

3. Approval of proposed deviations, if any, will be made at discretion of Engineer.

H. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. This Contractor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project schedule. Allow at least 10 working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted.

I. Responsibility

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. The Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with approved submittals to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer's noting of some errors while overlooking others will not excuse the Contractor from proceeding in error. Contract Documents requirements are not limited, waived nor superseded in any way by review.
2. Inform Contractor, manufacturers, suppliers, etc. of scope and limited nature of review process and enforce compliance with contract documents.

J. In the event that the Contractor fails to provide Shop Drawings for any of the products specified herein:

1. The Contractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.
2. If the Contractor furnishes and installs material and/or equipment that is not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment. He shall also be responsible for the replacement of this material and/or equipment with material and/or equipment that is in complete accordance with these Specifications, at the direction of the Owner's Representative.
3. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall be done at no extra cost to the Owner.
4. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

K. Mark dimensions and values in units to match those specified.

L. Submit Material Safety Data Sheets (MSD) on each applicable product with submittal.

1.9 OPERATION AND MAINTENANCE DATA

A. Commence preparation of the Operating and Maintenance (O&M) manuals immediately upon receipt of "Approved" or "Approved as Noted" shop drawings and submit each section within one month. The final submission shall be no later than two months prior to the projected date of Substantial Completion of the Project.

B. Each O&M document shall include the manufacturer's web address for equipment specific O&M information for Internet access by the Owner.

C. The manual shall consist of three (3) sets of manuals and include three (3) sets of CDs, which shall contain the scanned content of the entire manual. The manual shall highlight the actual equipment used and not be a master catalog of all similar products of the manufacturer. The manual shall be submitted for review prior to creation of the CDs.

D. The Manual shall contain the following:

1. Operations Manual

   a. Systems description including all relevant information needed for day-to-day operations and management including start-up and shut-down instructions.
   b. Wiring diagrams, schematics, logic diagrams and sequence of operations that accurately depict the controls system.
   c. Depiction of each interface screen where programmable logic and visual displays are provided. Descriptors shall be provided to define displayed data, alarms, etc.
   d. A single sheet (for ease of removal) of all access codes and passwords necessary to access all levels of control and programming.
   e. Trouble shooting guide defining common alarms/problems with possible cause and effect.

2. Maintenance Manual

   a. Define all maintenance activities required to ensure system operation within manufacturers specified parameters. Provide table of all required activities plotted vs. interval with adequate fill-in-space for "activity completion date" and "comments". Where multiple instrument readings are required, provide data sheet formatted to accommodate activity.
   b. Define recommended spare parts inventory with part numbers and source defined for ordering by the Owner. Identify lead time on all parts, source location and cost.
   c. Provide copy of all warranty information with associated date of substantial completion (commencement of warranty) and end date of coverage. Define all components/subsystems specifically included and excluded.

3. Provide O&M manuals for each of the following:

   a. Sports Lighting Control System

1.10 RECORD DRAWINGS

A. Refer to DIVISION 01, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Record Drawings (red-line drawings) will be updated by this Contractor daily for review with the monthly requisition. The record drawing shall be an accurate depiction of the systems as completed, including dimensions (vertical/horizontal) of concealed components off fixed building elements.

C. The Electrical Foreman shall maintain complete and separate set of prints of Contract Drawings at job site at all times and shall 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.

D. At completion of work the Electrical Contractor shall prepare a complete set of record drawings on AutoCAD showing all systems as actually installed. The background AutoCAD files will be made available for the Contractor's copying, at his expense, to serve as backgrounds for the drawings. The Electrical Contractor shall transfer changes from field drawings onto AutoCAD drawings and submit copy of files and three sets of prints to Owner's Representative for comments as to compliance with this section. CADD layering as established by the design team shall be maintained with any and all changes done by the Contractor.

E. The Engineer are not granting to the Contractor any ownership or property interest in the CADD Drawings by the delivery of the CADD Disks to the Contractor. The Contractor's rights to use the CADD disks and the CADD Drawings are limited to use for the sole purpose of assisting in the Contractor's performance of its contractual obligations under its contract with respect to the Project. The Engineer are granting no further rights. Any reuse or other use by the Contractor will be at the Contractor's sole risk and without liability to the Engineer. The Contractor hereby waives and releases any losses, claims, damages, liabilities of any nature whatsoever, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor. The Contractor, to the maximum extent permitted by law, hereby agrees to indemnify, defend and hold the Engineer harmless from all loses, claims, damages, liabilities, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor.

F. Record Drawings, shall show "as-built" condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and model numbers of final equipment installation.

G. The Electrical Contractor shall submit the record set for approval by the engineer a minimum of four weeks prior to seeking the permanent certificate of occupancy.

1.11 WARRANTIES

A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the Electrical Contractor may have by law or by provisions of the Contract Documents.

B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one-year (1) commencing with the Date of Substantial Completion. Where individual equipment sections specify longer warranties, provide the longer warranty. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.

C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.

D. Upon receipt of notice from the Owner of the failure of any part of the systems during the warranty period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.12 COORDINATION

A. Refer to Division 01, General Conditions, for coordination requirements applicable to this section, unless specifically noted otherwise in this section.

B. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Owner's Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner's Representative's satisfaction at no expense to the Owner.

D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section may interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

E. Keep fully informed as to the shape, size and position of all openings required for all apparatus, conduit, cable, sleeves, etc., and give information in advance to allow construction of required openings. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the General Contractor for the proper setting of same.

F. Make reasonable modifications in the work as required by structural interferences, or by interference with work of other trades, or for proper execution of the work without extra charge.

1.13 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice-versa, or any incidental accessories necessary to make the work complete in all respects and ready for

operation, even if not particularly specified, shall be provided by this Contractor without additional expense to the Owner.

B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the project and shall have the approval of the Owner's Representative before being installed. This Contractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Owner's Representative before proceeding with the installation. This Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Any requests for information (RFI) for resolving an apparent conflict or unclarity, or a request for additional detail, shall include a sketch or equivalent description of Contractor's proposed solution.

D. Size of conduits, cable trays, raceways and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in an approved workmanlike manner.

1.14 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work has to be performed and send a report, in writing, to the Owner's Representative, noting any conditions which might adversely affect the Work of this Section of the Specifications.

1.15 SURVEY AND MEASUREMENTS

A. Base all required measurements, horizontal and vertical, from referenced points established WITH the Owner's Representative. The Electrical Contractor shall be responsible for correctly laying out the Work required under this Section of the Specifications.

B. In the event of discrepancy between actual measurements and those indicated, notify the Owner's Representative in writing and do not proceed with the related work until instructions have been issued.

1.16 DELIVERY, STORAGE AND HANDLING

A. No materials shall be delivered or stored on site until corresponding Shop Drawings have been approved.

B. All manufactured materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.

C. Protect materials against dampness. Store off floors, under cover and adequately protected from damage.

D. Inspect all equipment and materials, upon receipt at the job site, for damage and conformance to approved shop drawings.

1.17 PROTECTION OF WORK AND PROPERTY

A. This Contractor shall be responsible for the care and protection of all work included under this Section until the completion and final acceptance of this Contract.

B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.18 SUPERVISION

A. Supply the service of a competent Supervisor with a minimum of 5 years of experience in Electrical construction supervision who shall be in charge of the Electrical work at the site.

1.19 SAFETY PRECAUTIONS

A. Life safety and accident prevention shall be a primary consideration. Comply with all of the safety requirements of the Owner and OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards and any other necessary construction required to secure safety of life and/or property.

1.20 SCHEDULE

A. Construct work in sequence under provisions of Division 01 and as coordinated with the Owner's Representative.

1.21 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, cranes, helicopters, scaffolds, staging and planking as required for the work.

1.22 CUTTING AND PATCHING

A. Include all cutting, patching, and fireproofing necessary for the execution of the work of this Section.

B. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the Owner's Representative.

C. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment which is part of this Section of the Specifications.

D. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.

E. Any cost caused by defective or ill-timed work required by this Section of the specifications shall be borne by this Contractor.

F. When, in order to accommodate the work required under this Section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.23 SLEEVES, INSERTS AND ANCHOR BOLTS

A. Coordinate with other trades the location of and maintaining in proper positions, sleeves, inserts and anchor bolts to be supplied and/or set in place under this section of the specifications. In the event of incorrectly located preset sleeves, inserts and anchor bolts, etc., all required cutting and patching of finished work shall be done under this section of the specifications.

B. All pipes passing through floors, walls, ceilings or partitions shall be provided with fire stopping to maintain the fire rating of the structure. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer's listed installation details. Provide sleeves for all penetrations where required by the listed detail, for the penetration of all mechanical room floors and where specifically required on the drawings.

1.24 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Provide all supplementary steel, factory fabricated channels and supports required for the proper installation, mounting and support of all Electrical equipment, piping, etc., required by the Specifications.

B. Supplementary steel and factory fabricated channels shall be firmly connected to building construction in a manner approved by the Owner's Representative as shown on the drawings or herein specified.

C. The type and size of the supporting channels and supplementary steel shall be determined by the Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and factory fabricated channels shall be installed in a neat and workmanlike manner parallel to the walls, floors and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel including factory fabricated channels, supports and fittings shall be galvanized steel, aluminum or stainless steel where exposed or subject to rust producing

atmosphere. Factory fabricated channels shall be manufactured by Unistrut, H-strut, Powerstrut or approved equal.

1.25 HAZARDOUS MATERIALS

A. Removed batteries shall be recycled by a facility approved by the Owner's Representative. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment.

B. Removed HID lamps shall be recycled by a facility approved by the Owner's Representative. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment.

C. All ballasts in lighting fixtures to be disposed shall be verified to be PCB free. All ballasts manufactured prior to 1979 and not labeled as PCB free shall be considered to contain PCB's. Provide written verification to the Owner's Representative that confirms PCB free waste. Where PCB free waste cannot be verified, ballasts shall be recycled by a facility approved by the Owner's Representative, with PCB components eliminated by a high temperature incineration. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment. All handling shall conform to EPA requirements. Provide breakout cost for this scope.

D. Where it has been identified that asbestos-containing material exists within the scope limits, refer to the Asbestos Abatement specification section for requirements.

1.26 ACCESSIBILITY

A. All work provided under this Section of the Specification shall be installed so that parts requiring periodic inspection, maintenance and repair are accessible. Work of this trade shall not infringe upon clearances required by equipment of other trades, especially code required clearances to electrical gear. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner's Representative.

1.27 PROJECT CLOSEOUT

A. Certificates Of Approval

1. Upon completion of all work, provide certificates of inspections from the following equipment manufacturers stating that the authorized factory representatives have inspected and tested the operation of their respective equipment and found the equipment to be in satisfactory operating condition and installed per the manufacturers installation instructions and requirements.

    a. Sports Lighting System

B. Construction Observations By The Engineer

1. The engineer shall make progress site visits during construction and one substantial completion (punch list) site visit for determining substantial completion.
2. The Trade Contractors and the General Contractor are required to inspect their own work and make any corrections to the work to comply with the specifications and the contract documents. It is not the responsibility of the engineer to develop lists of incomplete work items.

3. Progress Site Visits

   a. The purpose of the progress site visit by the engineer is to observe if the work is proceeding in accordance with the contract documents.
   b. The engineer will prepare a field report which will note in general the work completed since the last observation visit, work found not to be in accordance with the contract documents and work not corrected since the previous observation visit.

C. Substantial Completion

1. When the Contractor considers the Work under this Section is substantially complete, the Contractor shall submit written notice, through the General Contractor, with a detailed list of items remaining to be completed or corrected and a schedule of when each remaining work item will be completed. Should the engineer determine the list of remaining work does not constitute substantial completion the engineer will notify the Architect and/or Owner and he will not make a substantial completion site visit.
2. The following items shall be completed prior to the written request for substantial completion site visit:

   a. Certification of successful operation of all systems.
   b. Training of the Owner's personnel in the operation of the systems.
   c. Record Drawings in accordance with the contract specifications.
   d. Operation and Maintenance manuals.
   e. Testing reports.
   f. Manufacturer's certificates of approvals.
   g. Emergency contact list for reporting of malfunctioning equipment during the warrantee period.
   h. Contractors Project Completion certificate.

3. Should the Engineer, during the substantial completion visit, observe that the Work is substantially complete, s/he will provide a written listing of the observed deficiencies referred herein as the Punch List. The Punch List will provide for a place for the Contractor and general Contractor to sign off and date each item individually indicating that the observed deficiency item has been corrected.
4. Should the Engineer, during the substantial completion site visit, observe that the Work is not substantially complete, s/he will provide, a written list of the major deficiencies and a reason for the work not being considered substantially complete.
5. If the work is found not to be substantially complete then the engineer shall be reimbursed for his time to re-observe the work. A re-observation fee shall be charged to the Contractor through the contractual agreement for any further observations by the engineer.
6. The Contractor shall remedy all deficiencies listed in the punch list within the time frame required by the contract.

D. Engineers Construction Completion Certification

1. Where required by the applicable code, the Engineers Construction Completion Certification will be issued by NV5 when all life safety and health related issues are complete, all required functional tests are complete and all reports are complete.

E. Final Completion

1. The following items shall be submitted prior to the written request for Final completion:

a. Revised Substantial Completion items to be resubmitted in accordance with the review process comments.
b. Warranties commencing the date of Substantial completion
c. Individual Signed and dated Punch List acknowledging completion of all punch list items

2. When the Contractor considers all of the punch list work items complete, the Contractor shall submit written notice through the General Contractor that all Punch List items are complete and resolved and the work is ready for final observation site visit. The signature lines for completion of each punch list item shall be signed by the Contractor indicating the work is complete and signed by the General Contractor indicating s/he has inspected the work and found it to be complete. Should the Engineer find the work to be finally complete and all Punch List items are complete the Engineer will make a recommendation to the Architect or Owner. If the Engineer has found the punch list work to be incomplete during final inspection a written listing of the observed deficiencies will be prepared by the Engineer.
3. If the work is not fully complete then the engineer shall be reimbursed for his time to re-observe the work. A re-observation fee shall be charged to the Contractor through the contractual agreement for any re-observations by the engineer.

F. Re-observation Fees

1. The re-observation fee shall be $1200.00 per visit.

G. Contractor's Project Completion Certificate

1. Upon completion of work and prior to request for Certificate of Occupancy, each Trade Contractor and the General Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and all applicable codes. NV5 can furnish a blank Contractor's certificate form upon request. The certificate shall certify:

   a. Execution of all work has been in accordance with the approved construction documents.
   b. Execution and control of all methods of construction was in a safe and satisfactory manner in accordance with all applicable local, state and federal statutes and regulations.

2. The certificate shall include the following information:

   a. Project.
   b. Permit Number.
   c. Location.
   d. Construction Documents.
   e. Date on Plans and Specifications submitted for approval and issuance of the Building Permit.
   f. Addendum(a) and Revision Dates.

3. The certificate shall be signed by the Contractor and include the following:

   a. Signature.
   b. Date.
   c. Company.
   d. License Number.
   e. License Expiration Date.

PART 2 - PRODUCTS

2.0 NOT USED

2.1 IDENTIFICATION

A. Nameplates

1. Nameplates shall be laminated black Bakelite with minimum 1/4" high white recessed letters.
2. Nameplates shall be securely attached to the equipment. Utilize mechanical fasteners such as galvanized steel or brass screws for exterior applications. High strength adhesives or cements may be used for interior applications.

2.2 RACEWAYS AND CONDUIT

A. Rigid Galvanized Steel (RGS) Conduit

1. RGS shall be zinc-coated steel that conforms to ANSI C80.1, UL Specification No. 6 and Federal Specification WW-C-581e by Allied Tube and Conduit, Republic Steel, Wheatland Tube or approved equal.
2. RGS fittings shall be threaded. Split couplings or non-threaded fittings shall not be used.
3. Nipples and Close Nipples shall be RGS, length as noted or as required to conform to field conditions.

B. Polyvinyl Chloride (PVC) Non-metallic Conduit

1. PVC conduit and fittings shall be Schedule 40 or Schedule 80, 90°C. UL Listed equal to Carlon Plus 40 or Plus 80. PVC shall meet NEMA Specification TC-2, TC-3 and UL-651.
2. PVC, fittings and solvent cement shall be by single approved manufacturer.
3. PVC shall be sunlight resistant and listed for exposed or outdoor usage.

C. Fiberglass Reinforced Epoxy (FRE) Conduit Schedule 40 or Schedule 80 UL Listed equal to FRE Composites Inc. Type ID, SW and HW for below ground and above ground applications. FRE shall comply with UL 1684.

D. Miscellaneous Conduit Fittings

1. Elbows shall be standard radius unless noted otherwise. Where Large Radius elbows are specified, provide 48" radius unless noted otherwise.
2. Bushings shall be threaded pressed steel hot dipped galvanized with conduit end stop and integrally molded noncombustible phenolic insulated surface rated for 150°C.
3. Bonding bushings shall be threaded pressed steel hot dipped galvanized with conduit end stop and integrally molded noncombustible phenolic insulated surface rated for 150°C with a lay-in tin plated copper grounding lug.
4. Exposed conduit expansion fittings shall be hot-dipped galvanized malleable iron with external bonding jumper equal to O.Z./Gedney Type EX for RGS or Type TX for EMT (4" maximum expansion).
5. Provide water-tight gland sealing assemblies with pressure bushings equal to OZ/Gedney Type WSK for new cast-in-place installations or Type CSCM for retrofit

(core drilling of existing walls) as required for below grade wall and floor penetrations.

E. Flexible Metallic Conduit

1. Liquidtight Metal Conduit shall be UL Listed fabricated from a spiral wound strip of heavy gauge, corrosion resistant, hot dipped galvanized steel equal to Electri-flex Company Type LA. The jacket shall be flame retardant, sunlight resistant PVC extruded over the spiral wrap. Sizes through 1 ¼" shall have an integral copper bonding strip.
2. Liquidtight fittings shall be UL listed zinc plated insulated throat.
3. Flexible metal conduit shall be UL Listed non-jacketed steel fabricated from a spiral wound strip of heavy gauge, corrosion resistant, hot dipped galvanized steel equal to Electri-flex Company Type BR.

F. Wireways shall be minimum 16-gauge steel with all straight runs having hinged spring-latched covers. Finish shall be painted over a corrosion resistant phosphate pretreatment to protect against corrosion. Interior parts shall be smooth and free of sharp edges and burrs. Provide wireway as identified on the drawings for NEMA 1, 3R or 12 service. Wireways shall be equal to Square D and UL Listed.

2.3 WIRE AND CABLE (600V)

A. Provide single-conductor, annealed copper wire and cable with insulation rated for 600 V, of sizes specified and scheduled on Drawings, by General Electric, Southwire, Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire sizes shown and specified are American Wire Gauge for copper conductors.

B. The use of aluminum conductors is not allowed.

C. Wire #10 and larger shall be stranded; #12 and smaller shall be solid. Wire and cable shall have THWN-THHN or XHHW insulation for branch circuit and feeder conductors.

D. Conductor Color-coding

1. Service entrance, branch circuit and feeder conductors shall be color-coded. Conductors #12 and #10 shall be colored with a factory applied solid or striped compound coating (black, red, blue, brown, orange or yellow). Neutrals and equipment grounds shall have solid compound or solid color coating (white, gray and green), except that neutrals with colored stripe shall be used where required by code. Phase conductors #8 and larger with stripes, bands or hash marks shall have background color other than white, green and gray.
2. Alternative field-applied color coding methods may be used for wire #8 or larger, with color code as specified in other sections of this specification. Coloring shall be applied by the use of flame-retardant vinyl tape, equal to 3M Scotch 35.

E. Splices and Terminations

1. Ampacity and temperature rating of splices and connectors shall be equal to or greater than those of associated wires and cables.
2. Make splices in branch circuit or feeder wiring from #12 to #10 with UL-listed, solderless screw on connectors rated 600 V.
3. Make splices in branch circuit or feeder wiring above #10 with UL-listed 90°C, 600V, compression butt splice barrel equal to Burndy YS-L HYLINK.

4. Conductor terminations shall be standard bolt-on lugs with hex screws listed for attachment of copper wire and cable to panelboards, switchboards, disconnect switches and other electrical equipment.
5. Make terminations for stranded conductors on screw terminals with UL Listed 105°C, 600V PVC insulated barrel compression locking fork tongue terminal equal to Burndy TP-LF VINYLUG.
6. Make bus terminations for conductors #6 and larger with UL-listed 90°C, 600V, compression standard barrel length lugs equal to Burndy YA-L for conductor sizes to #4/0. Connectors for cable 250 KCMil and larger shall be with UL-listed 90°C, 600V, compression long barrel length two hole lugs equal to Burndy YA-2N. Lugs shall be high conductivity seamless copper electro-tin plated for corrosion protection.

F. Wire management shall be provided by self-extinguishing self-locking nylon ties with -65 to 350°F. range for bundling conductors.

G. Arc-proofing

1. Provide flexible, flame-retardant, organic-composition-coated elastomer arc-proofing tape equal to 3M Scotch 77 on power cable in manholes and handholes, suitable to withstand 200 A arc for 30 seconds. Tape shall be self-extinguishing and shall not support combustion. Cover with glass cloth tape equal to 3M Scotch 69 as a binder.
2. Tape shall have been tested with 186-hour distilled water exposure and 3% salt water and shall be ultra-violet and weather resistant.

H. Cable pulling compounds shall be UL Listed and be suitable for use with the specified cable insulation system. The compound shall reduce the coefficient of friction, while not adding any long term issues to the installation such as premature aging of the insulation system, added flammability or drying in such a manner as to stick the cable in place in the raceway.

2.4 WIRING DEVICES AND PLATES

A. Provide wiring devices by single manufacturer. Catalog designations of Cooper are specified, unless noted otherwise, to establish standards of quality for materials and performance. Colors of devices as specified below are White for standard applications. Refer to the drawings for color requirements that vary from White. Equal products by Leviton, Pass & Seymour or Hubbell will be accepted. Provide published manufacturers cross-reference sheet highlighted with the device specified and that being submitted with all device product data for approval.

B. Wall switches shall be of the totally enclosed tumbler type. Wiring terminals shall be spring loaded terminal screws for back or side wiring. Switches shall be rated 20-ampere 277 volt for use on alternating current only. The yoke shall have a grounding terminal with a green hex head screw. Pilot lights indicated shall consist of red lighted handle, illuminated when the switch is on.

C. Switches shall be heavy duty, UL listed, specification grade as follows:

1. Toggle Switches - Single-pole shall be No. 2221W
2. Occupancy Sensors

a. Provide occupancy sensors equal to Leviton ODS10-ID-W for single switching applications.

D. Receptacles:

1. Receptacles shall be nylon faced with rigid, glass reinforced nylon bodies. Wiring terminals shall be spring loaded terminal screws for back or side wiring. Receptacles shall be rated 20-ampere 125 volt. The yoke shall have a grounding terminal with a green hex head screw.
2. Duplex receptacles shall be UL Federal Specification WC-596 Specification Grade Extra Hard Duty 125V, 20A, 2 pole, 3 wire as follows:

   a. General Use shall be No. 5362W (White)
   b. GFCI Exterior shall be GF20BK (Black) UL listed Weather Resistant

E. Wiring Device Plates:

1. Provide heavy-duty cast aluminum horizontally mounted weatherproof covers for GFCI receptacles where weatherproof devices are specified equal to Hubbell No. WP26MH. Cover shall be attached to FS box with 4 screws and spring back to the closed position upon removal of the cord set. Fasteners chrome-plated brass.
2. Provide all device plates for receptacles and switches with engraving. Engraving shall indicate associated panelboard name and circuit number.

2.5 OUTLET BOXES

A. Outlet and switch boxes on concealed work shall be at least 4" square, galvanized pressed steel conforming to UL 514A. Outlet boxes shall be by Steel City Electric Company, Appleton Electric Company, or approved equal.

B. Outlet boxes for interior surface mounted locations where RGS is specified where exposed to moisture and where indicated as weatherproof on Drawings shall be cast malleable iron with an aluminum polymer enamel coating equal to Appleton Type FD. Conduit entries shall be threaded cast hubs. Device covers shall be coated malleable iron with moisture sealing gasket and stainless steel fasteners.

C. Outlet boxes for exterior surface mounting shall be cast aluminum alloy with an aluminum polymer enamel coating equal to Appleton Type FD. Conduit entries shall be threaded cast hubs. Device covers shall be cast aluminum alloy with moisture sealing gasket and stainless steel fasteners.

D. All boxes shall have at least one tapped and threaded grounding hole for connection of a 10-32 grounding screw.

E. Box depth shall accommodate code required volume for the specified installation. Through wall boxes shall not be used.

F. Outlet boxes for various systems shall be cast where exposed to physical damage or installed in an exposed exterior location.

2.6 JUNCTION AND PULL BOXES

A. Provide galvanized steel junction and pull boxes where indicated and as necessary to facilitate installation. Steel shall be minimum 16 gauge. Junction and pull boxes shall be of code required dimensions. Cover shall be of the same type and thickness material as the box construction.

B. Junction and pull boxes intended for dry interior locations shall be NEMA 1 enclosures with accessible, removable screw-on covers. Covers shall be secured with corrosion-resistant screws with keyhole slots to accommodate easy removal.

C. Junction and pull boxes intended for wet or exterior locations shall be NEMA 3R enclosures with hinged gasketed covers. Interior and exterior shall be finished with a gray enamel powder coat over the galvanized metal. Hinge shall be galvanized steel with stainless steel pin. Covers shall be secured with corrosion-resistant zinc plated lockable pull catches.

D. Custom fabricated medium to large junction and pull boxes shall have internal structural steel bracing welded to form a rigid assembly adequate to maintain alignment and shape in shipment and installation.

2.7 SAFETY DISCONNECT SWITCHES

A. Switches shall be three-pole heavy-duty type rated for 600V in NEMA 1 (interior dry applications) and NEMA 3R (exterior applications) enclosures unless noted otherwise on the drawings. All switches shall be horsepower rated and suitable for service entrance use. Provide with solid neutral where four wire circuits are indicated and with 200% solid neutral where neutrals are sized for 200% full load ampacity.

1. Operating mechanisms shall be quick-make/quick-break. Current-carrying parts shall be high-conductivity copper. Contacts shall be silver-tungsten or plated. Provide positive pressure fuse clips and switch operating mechanism suitable for continuous use at rated capacity without auxiliary springs in current path. Switches shall withstand available fault current or let-through current before operating, without damage or rating change.
2. Terminations shall be suitable for copper or aluminum conductors 60°/75° C rated. Clear shielding shall prevent accidental contact with energized line terminals.
3. The cover shall be mechanically interlocked to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one to three padlocks with the door open or closed.
4. The enclosure shall be given a phosphatizing pretreatment. The paint finish shall be manufacturer's standard color and shall pass 600 hours of corrosion resistance testing per ASTM B 117.

B. Fused switches shall have short circuit ratings no less than 100,000 amperes RMS, with capabilities to 200,000 amperes when used with Class J, L or R fuses at 480V from 400A to 1200A.

2.8 PANELBOARDS

A. General

1. Provide dead-front lighting and power panelboards where shown on drawings and as scheduled.
2. Panelboards shall meet or exceed requirements of NEMA Standard Publication PB-1, and UL-50 and 67. Panelboards shall be UL-listed.
3. Where panelboards are used as service entrance equipment, they shall comply with all NEC and UL requirements for service. The panelboard shall include a UL service entrance label, incoming line isolation barriers and a removable neutral bond to ground for solidly grounded wye systems.
4. Enclosures shall be at least 20 inches wide made of galvanized steel. Gutter space shall be in accordance with NEC requirements for the specified combination of devices and accessories. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable. Where two section panels are required, bolt boxes together to form one unit. Trim shall be two-piece construction with doors of equal size over each section. Trims shall be cleaned, primed and painted gray ANSI 61.
5. For panelboards up to 400 amps, provide cabinets with flush hinges and combination catch and lock to cover circuit breaker handles. Provide a directory card with a clear plastic cover mounted inside the door. Power and lighting

panels shall have heavy-duty, continuous, section vertical-hinged to box section for access to wiring gutters in addition to trim door. All locks shall be keyed alike. Panelboards greater than 400 amps shall be provided with a four-piece front to cover wiring gutter and wiring access areas.

6. Nameplates shall be in accordance with other sections of this specification.
7. The manufacturer shall warrant equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.
8. Panels shall be equal to Eaton- Pow-R-Line 2a for 400 A and below unless more than (1) 125 amp or larger branch breaker and/or space is specified. Eaton Pow-R-Line 4 or 5P (or equal) panelboards shall be provided for all applications greater than 400 amps and to accommodate multiple branch breakers greater than 125 amps. Approved equal panelboards by GE, Siemens or Square D will be considered.
9. Where specifically indicated on the drawings for Selective Coordination, provide fused panelboards equal to Eaton Pow-R-Line 2aF. All fuses in the system where selective coordination is required shall be manufactured by the same manufacturer.

B. Bussing

1. Main bus bars of panels shall be copper, rated to carry at least full rating of the panel as identified on the schedules.
2. Split solid neutral bus, with rated capacity equal to the phase bus, shall be plated and located in main compartment for all incoming neutral cables to be same length. Neutral bus shall be 200% rated where double sized neutrals are indicated and/or where the panel is supplied via a K-rated transformer.
3. Provide separate equipment ground bus for each panelboard. Where an isolated ground is specified, provide an additional isolated ground bus, which shall be insulated from the panel enclosure and equipment ground.
4. Panelboards shall have a short circuit current rating equal to or greater than circuit breaker AIC ratings schedule on the Drawings. Where series ratings are allowed, as per the schedule on the Drawings, a label shall be affixed to the panel stating the conditions of the UL Series rating including:

    a. Size and type of upstream device
    b. Branch devices that are acceptable
    c. UL Series short-circuit rating

5. All lugs shall be UL listed tin-plated aluminum suitable for copper or aluminum cable for sizes indicated on the drawings. Provide oversized lugs to accommodate designed cable sizes or increase gutter space to allow use of solid stud compression lugs where necessary. All terminations shall be suitable for 75 degree C cable.
6. Provide bus connections for future overcurrent devices with suitable insulation and bracing to maintain proper short circuit rating and voltage clearances. All required hardware shall be installed and be in place for ready insertion of future breaker without the need to relocate adjacent units. Future spaces shall accommodate frame sizes up to 50% of the main bus ampacity.

C. Overcurrent Devices

1. Molded case circuit breakers shall be bolt-on devices. Multi-pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
2. Trip units shall be:

    a. Thermal magnetic below 400A frame unless solid state sensing specifically indicated on the drawings.

b. Solid state trip units shall be provided on all molded case breakers at 400A frame and above. Trip units shall be equal to Eaton Digitrip 310.

3. All breakers shall have handle trip indication and a trip indicator in the window of the circuit breaker housing.
4. Internal accessories shall be UL Listed for field installation without removing the circuit breaker cover. Internal accessories shall be common to all frame sizes. Shunt trips, auxiliary contacts, and other accessories shall be factory installed.

D. Submittals

1. The manufacturer shall provide copies of the following documents for review and evaluation in accordance with general requirements of Division 01 and Division 26:

a. Product Data on specified product
b. Shop Drawings on specified product
c. Certified trip curves for each specified product
d. Nameplate list
e. Short circuit and coordination study shall be submitted with the equipment shop drawings to ensure rating conformity to study conclusions. Submittals made without the study shall be rejected.

2.9 DRY TYPE TRANSFORMERS

A. Provide dry type general purpose transformers no greater than 600 volts as shown on Drawings. Design, manufacture and testing of transformers shall meet requirements of NEMA No. ST 20 , and list and label as complying with UL 1561.

B. Power transformers shall be two winding dry type for general power and lighting applications. Transformers rated 1000 kVA or below shall be UL listed and bear required Listing Mark.

C. Transformer minimum efficiencies shall comply with 2016 DOE Energy Efficiency Standards unless specifically noted otherwise. Transformers shall use properly classified UL approved temperature ratings. Insulation ratings shall be 220 degrees C based upon a 150°C rise. Transformers supplied to this specification shall be able to operate continuously at 100 percent nameplate rating at ambient temperatures not exceeding 40°C. Maximum temperature at top of enclosure shall not exceed 50°C rise above 40°C ambient. Transformers 5 KVA and above shall be able to meet ANSI/IEEE C57.96 daily overload requirements listed in drawings. Transformers loaded in accordance with this paragraph shall be capable of long service life under thermal conditions specified with no need for derating.

D. Transformer cores shall be constructed of high grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below core saturation point. Transformers shall have aluminum windings, continuous wound construction with vacuum impregnated insulation using non-moisture-absorbing varnish. There shall be no metal-to-metal contact between core and coil and enclosure.

E. Primary winding of transformers rated less than 30 kVA shall have at least two taps, each providing 5% increment below full rated voltage. Each primary winding of each transformer 30 kVA and larger shall have six taps, two of which shall provide 2-1/2% increments above full rated voltage and four of which shall provide 2-1/2% increments below full rated voltage.

F. Enclosures shall be of heavy gauge steel and meet UL 506 requirements for the following characteristics:

1. Ventilation Openings
2. Cable Bending Space
3. Surface Temperature Rise
4. Wiring Compartment Temperature Rise
5. Terminations

G. Transformers shall have sound levels equal to or lower than those established in latest revision of ANSI/IEEE C89.2.

H. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

I. Submittals

1. The manufacturer shall provide copies of the following documents for review and evaluation in accordance with general requirements of Division 01 and Division 26:

a. Product Data on specified product
b. Shop Drawings on specified product
c. Certified copies of all Type (Design) and Verification Test Reports

2.10 LIGHTING FIXTURES

A. Provide lighting fixtures, equipment and components where shown on Drawings, as listed in fixture schedules and as specified, wired and assembled. Provide approved aligned canopies, hangers and other appurtenances as required, for a complete and functional system.

B. Refer to the lighting fixture schedule for specific ballast requirement. In general:

1. LED luminaires shall have a luminous efficacy of at least 90 lumens/watt, a color temperature of 3500 K (unless noted otherwise on the plans), a CRI of at least 80, an estimated life of at least 50,000 hours at 70% lumen maintenance, and shall include a minimum 5-year warranty on the entire luminaire including drivers. The luminaire and LEDs shall have been tested in accordance with LM-79 and LM-80

2.11 HANDHOLES

A. Handholes

1. Handholes and associated covers shall be constructed of polymer concrete consisting of aggregate matrix bound together with a polymer resin. Internal reinforcement may be provided by means of steel and/or fiberglass.
2. Material shall have the following properties:

a. Compressive strength: 9000 psi
b. Flexural strength: 6000 psi
c. Tensile strength: 800 psi

3. The installed enclosure shall be rated for a minimum test load of 8000 pounds distributed over a 10" x 10" area, and intended for non-deliberate vehicular traffic only unless specifically noted otherwise on the drawings.

4. The boxes and covers shall be gray. Covers shall be provided with stainless steel bolts at each corner. The logo shall specifically identify the service inside, "Electrical", "Communications", "Lighting", etc. The logo shall be permanently recessed in the cover. Non-metallic covers shall be provided with electronic markers encased in the polymer concrete for ease in locating buried handholes.
5. Precast handholes shall be equal to Quazite composolite. Equal construction in precast or cast in place concrete will be accepted

PART 3 - EXECUTION

3.0 DEMOLITION

A. General

1. The Electrical Contractor shall visit the site before submitting his bid to familiarize himself with the existing conditions and the extent of the work. No extra compensation will be allowed for work required to be performed or to overcome existing conditions, by failure to visit the site.
2. The Electrical demolition work shall be performed by the Electrical Contractor in cooperation with the other trades and as scheduled and approved by the Owner's Representative.
3. The locations of existing equipment to remain including piping, ductwork, conduits, etc., are shown in an approximate way only. The Contractor shall determine the exact location of all existing equipment before commencing work.
4. Power outages caused by demolition that affect other areas shall be held to a minimum. Shutdowns shall be coordinated with the users and the Owner. Night, weekend and/or Holiday time required to perform electrical demolition work or new electrical work shall be carried as part of the Contract Cost.

B. Scope

1. The drawings illustrate the full extent of the scope of demolition. Disconnect and make safe all electrical equipment identified for removal on the plans. The electrical scope may extend beyond the area defined by the architectural demolition limits to fully comply with various requirements of these specifications.
2. The electrical demolition plans and details indicate the general scope and are not intended to show all items to be removed or retained. Devices and equipment located on walls and/or ceilings to be removed shall be disconnected and made safe. The Electrical Contractor shall notify the Owner's Representative of any unanticipated hidden conditions encountered during demolition.
3. The Electrical Contractor shall circuit trace and label all existing branch circuits and feeders within the area of demolition scope prior to de-energizing and disconnection. All circuits within panelboards identified for removal shall be traced and labeled to ensure that no area outside the demolition scope limit is affected.
4. The Electrical Contractor shall identify all branch circuits, feeders and system components, which are to remain within the area of demolition scope. There shall be no interruption of service to any area outside the scope limits without approval from the Owner's Representative. Existing equipment to remain shall be left in a code compliant manner.
5. The Electrical Contractor shall de-energize and remove all conductors and raceways to their points of origin within the area of demolition scope. Items identified for demolition shall not be abandoned in place.
6. The Electrical Contractor shall be responsible for the repair of all systems or building components damaged during the execution of the work. Damage shall include but not be limited to destruction or disposal of items intended to remain or to be salvaged.

7. The Electrical Contractor shall temporarily support all items to remain that are affected by the demolition of building structural components (walls, ceilings, etc.). Temporarily supported items shall be permanently supported and installed when finalized structures are in place.
8. All demolition scope associated with low voltage systems including but not limited to telephone, data, security, etc. shall be included.

C. Disposal

1. All removed items shall be legally disposed of unless identified for reuse. Refer to Part 1 of this specification for requirements for Hazardous Material disposal.
2. The Owner's Representative shall inspect all retained items prior to placement in the identified storage location by the Electrical Contractor . Selected items will be disposed at no additional cost to the project.

3.1 IDENTIFICATION

A. Nameplates

1. Provide nameplates on all equipment listed in other sections of this specification including but not limited to switchboards, substations, panelboards, transformers, junction and pull boxes, disconnect switches, motor starters and motor control centers, contactors, time clocks, remote control stations, fire alarm panels, smoke detector remote test/alarm stations and fire alarm annunciators.
2. Nameplates shall designate equipment tag number as defined on the drawings, system voltage where applicable, circuit number, device controlled and system function. Refer to typical nameplate detail on the drawings for additional requirements.
3. Submit a complete list of proposed nameplates prior to order to ensure conformance to design criteria. Submittal shall include nomenclature, size and layout of each tag.
4. Samples of stickers together with color schedules shall be submitted during the submittal phase of this project.

B. Equipment Identification

1. Equipment identification designations shall be taken from equipment schedules and coordinated with the Owner's facility group to assure designations match up with Owner's maintenance management system identification database.

3.2 RACEWAYS AND CONDUIT

A. General

1. Unless specified or shown on Drawings otherwise, install raceways and conduits concealed. Raceways and conduits may be run exposed on unfinished walls and ceilings with exposed structure.
2. Run concealed raceways and conduits in as direct lines as possible with minimum number of bends of longest possible radius. Install exposed raceways and conduits parallel to or at right angles to building lines.
3. Raceway and conduit runs shall be mechanically and electrically continuous from supply to outlet. Conduit shall enter and be secured to metallic enclosures with lock nut and bushing inside. Provide additional exterior lock nut for RGS connections. Bushings shall be the bonding type for conduit connections to metallic enclosures with concentric or eccentric knockouts. Lock nuts and bushings will not be required where conduits are screwed into threaded hubs.
4. Size raceways and conduits as required by NEC unless oversized raceways and conduits are shown on the Drawings. Raceways and conduits shall be ¾" minimum.
5. Install conduit systems complete before installation of conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.

6. Raceways and conduits supports shall be rigidly attached to the building structure utilizing corrosion resistant components suitable for use with the selected raceway or conduit. Refer to the seismic restraint sections of this specification for any additional requirements.
7. Field bending, cutting and threading shall be executed with the proper tools, resulting in bends and shortened conduits and raceways that are equivalent to factory fabricated and purchased components.
8. Provide standoff clips for conduits on exterior and wet location walls.
9. Protect all vertical conduit runs from the entrance of foreign material before installation of conductors and the final closure of the raceway system. All spare conduits (vertical and horizontal runs) shall be sealed with a bushing and appropriate insert to prohibit entrance of debris or vermin. Affix a label that indicates "Spare Conduit to _____" at each seal. Label shall be in accordance with the labeling section of this specification.

B. Rigid Galvanized Steel (RGS) Conduit

1. RGS may be used for all raceway applications outlined for EMT and PVC. RGS shall be used in locations where subject to accidental damage or abuse and for all above grade exterior applications unless other wiring methods are specified on the drawings. All circuit conductors in excess of 600 V shall be installed in RGS.
2. RGS shall not be used in corrosive environments.
3. All RGS fittings shall be threaded. Utilize Erickson couplings where joining two threaded conduits that cannot be rotated.

C. Polyvinyl Chloride (PVC) Non-metallic Conduit

1. PVC may be used for installation in concrete or direct burial applications where not subject to damage. PVC may be used in corrosive environments where specifically allowed on the drawings.
2. PVC shall not be used for penetrations from concrete slabs. Transition to RGS shall be made a minimum of 2" below the slab finished surface, prior to penetration.
3. All connections shall utilize solvent and glue in accordance with the recommendations of the conduit manufacturer.

D. Fiberglass Reinforced Epoxy (FRE) Conduit shall be used in corrosive environments and where specified on the drawings, to replace PVC conduit.

E. Miscellaneous Conduit Fittings

1. Expansion/Deflection Fittings: Raceways and conduit buried or secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to expansion and contraction due to variations in temperature shall have expansion fittings. Raceways and conduit shall cross building expansion joints at right angles. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting. Fittings shall safely deflect and/or expand/contract to twice the distance of potential movement.
2. Penetrations of all below grade exterior walls and flooring shall require approval by the Engineer and Architect. Submit proposed penetration points, size openings and penetration methods to Engineer and Architect. Penetrations shall utilize sealing fittings appropriately sized for the application. Duct bank penetrations are excluded from this requirement.
3. Sealing Fittings shall be installed wherever conduits pass from warm to cold locations to minimize condensation within the conduit. Sealing fittings shall be installed with RGS penetration of the wall and terminate in a suitably sized junction box.
4. Refer to other specification sections for requirements pertaining to sealing for hazardous atmospheres.

F. Wireways shall be provided where specifically shown on the drawings or where the group mounting of controllers, disconnects, enclosures, etc warrant the use for elimination of multiple short conduit runs. Wireways shall be provided complete with all required appurtenances necessary to have a totally enclosed system rated for the environment. Wireways shall not be installed in any location where subject to accidental damage or abuse.

3.3 WIRE AND CABLE (600V)

A. Homerun designations on the drawings are diagrammatic only. Install branch circuits and feeders from the power source to the attachment point as required for a complete system. Provide slack wire for connections to equipment installed by others. Refer to schedules and risers where specific conductor and associated raceway sizes are not indicated on the floor plans.

B. Connect branch circuit homerun with two or three circuits and common neutral only where specifically shown on the drawings. Circuits with common neutrals shall not be connected to the same phase to ensure cancellation of the return current in the neutral conductor.

C. Install wires and cable in raceways as specified. All conductor sizing is based upon no greater than three current carrying conductors in a conduit. Installation of up to six circuits (no greater than twelve current carrying conductors) in a single conduit will be allowed if the conductor sizing is increased to the required ampacity to accommodate de-rating factors required by the NEC and NFPA 70.

D. The minimum wire size shall be #12 unless #14 specifically allowed on the drawings for wiring of controls. Branch circuits longer than 75' for 120 V and 175' for 277 V from panel to last outlet shall be increased a minimum of one size above that shown on the drawings to minimize voltage drop to less than 3%.

E. Conductors shall be identified at all accessible locations in the following manner:

1. Color code secondary service, feeders and branch circuit conductors as follows:

208/120 Volts	**Phase**	**480/277 Volts**
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray
Green	Ground	Green

2. Provide nonferrous wire markers, embossed or printed to correspond with the Drawings. Labels shall be permanently marked so that the source of the branch circuit or feeder may be readily identified. Hand written labels are not acceptable. Embossed tag equal to 3M Scotch Code STL-TAG or SCS-TM shall be applied with two miniature cable ties or slipped through both end holes. Heat bonded tag equal to 3M Scotch Code SCS-HB shall be permanently affixed with a heat gun.

F. Splices and Terminations

1. No more than twelve splices of current carrying conductors or six circuits, whichever is greater, shall be allowed in a single enclosure or junction box.
2. Splices and terminations shall be sized to the specified conductor. The insulation shall be cut back with the appropriate tools such that the conductors are not nicked or damaged.

3. The compression tool shall be appropriate for the installation of the provided lug or butt splice to ensure pressure necessary for a proper connection is applied.
4. Terminations shall not be stacked or bent unless specifically listed for the application.

G. Arc-proofing shall be applied to all feeders greater than 100 Amperes where multiple circuits are installed in common enclosures such as handholes, and junction boxes. Apply tape in single, half-lapped layer as required by manufacturer's recommendations. Secure with strips of red plastic film tape on 208Y/120V conductors and yellow plastic film tape on 408Y/277V conductors.

H. Cable Pulling

1. Pull cables that share conduit at same time into completely installed raceway. Conductors shall not be pulled in raceways with existing wiring.
2. Submit cable pulling calculations for engineers' approval prior to all mechanically assisted pulls. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Provide means to measure tension during entire pull. Utilize pulling compounds to lessen friction in accordance with the manufacturer's recommendations.
3. Mechanically assisted pulls shall utilize equipment specifically designed for the purpose such as ropes, electric wench, pulleys, etc. The use of a motorized vehicle to assist in a cable pull is prohibited.

3.4 WIRING DEVICES AND PLATES

A. Branch circuitry shall be attached to all devices using the attachment screw or utilizing back wiring chambers that utilize screws for compressing the connection on the wire. Quick stab features that do not require a positive screw on attachment for the conductor are not acceptable.

B. Receptacle devices for other than 20 amp, 120 volt, 2-wire, circuits shall be provided with tags indicating voltage characteristics and circuit number of outlet that match the nameplate or engraving required on the faceplate.

3.5 OUTLET BOXES

A. Outlet and switch boxes shall be securely fastened to metal studs with a minimum of two self-tapping screws. Boxes three gang and greater shall be securely fastened to studs on both sides of the box.

B. Fasteners for mounting boxes in damp or wet locations shall be stainless steel.

C. Pressed steel boxes shall not be used for exposed surface mounted locations below 8'0" AFF.

3.6 JUNCTION AND PULL BOXES

A. Junction box covers shall be accessible.

B. Pull boxes connected to concealed conduits shall be mounted with covers flush with finished wall or ceiling.

C. Pull boxes exposed to rain or in damp/wet locations shall be weatherproof NEMA 3R unless noted otherwise on the drawings.

D. No pull box shall be within 2 feet of another.

E. Provide clamps, grids, cable ties and other non-conductive or combustible appurtenances to secure cables. No cable shall be unsupported for more than 30". Cables shall not touch or be unsupported within 1" of the box cover.

F. Each junction and pull box shall have a suitable laminated plastic nameplate with white cut letters identifying power source, voltage and driven load of the associated branch circuits or feeders.

G. Submit box sizing calculations to confirm all box dimensions are in accordance with code requirements with product data prior to installation.

3.7 SAFETY DISCONNECT SWITCHES

A. Provide safety disconnects as required and indicated on the drawings. Each motor shall be provided with a local disconnecting means in accordance with code requirements.

B. Disconnect switches for all applications with available fault current in excess of 10,000 amperes RMS symmetrical shall be fusible. Fuses shall be Class J, L or R and rejection clips shall be installed in the fuse holders to prohibit the installation of non-current limiting fuses.

C. Each disconnect switch shall have a suitable laminated plastic nameplate with white cut letters identifying power source, voltage and driven load.

3.8 PANELBOARDS

A. Storage

1. Contractor shall store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation.
2. Low voltage panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between -30 ºC and +25 ºC. Indoor locations shall be protected to prevent moisture from entering enclosure.

B. Installation

1. Provide 1/2" spacers for panelboards mounted at exterior walls below grade to establish 1/2" air space behind panel.
2. Inspect installed panelboard(s) for anchoring, alignment, grounding and physical damage. Clean interiors to remove construction debris, dirt and shipping materials.

3. Check tightness of all electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.
4. Adjust all circuit breakers and doors for free mechanical operation as described in manufacturer's instructions.
5. Adjust circuit breaker trip and time delay settings to values determined by the short circuit and coordination study.
6. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering.

C. Circuit breakers used as a motor disconnecting means, and not in sight of the motor and the driven machinery location, shall be capable of being locked in the open position.

D. Circuit breakers supplying fire alarm equipment and any others loads noted on the schedules shall be capable of being locked in the ON position. The locking means shall not inhibit the ability of the circuit breaker from performing its protective function.

3.9 DRY TYPE TRANSFORMERS

A. Installation

1. Inspect installed dry type transformers for anchoring, alignment, grounding and physical damage. Clean interiors to remove construction debris, dirt and shipping materials.
2. Check tightness of all mechanical and electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.
3. Connection of feeder to transformer shall be made with flexible metal conduit, no less than 18" and not exceeding 36".
4. Provide vibration-dampening mounts for all installations.
5. Connect secondary X_o to ground in accordance with NEC for separately derived systems.

B. Testing

1. Measure and record the primary and secondary voltages at the:
   a. Primary overcurrent device line terminals
   b. Transformer primary terminals
   c. Transformer secondary terminals
   d. Secondary overcurrent device line terminals
2. Adjust taps to required setting to maintain nominal voltage output.

3.10 HANDHOLES

A. Handholes

1. Do not construct or set manholes until final conduit grading has been determined, including field changes required by underground interferences. Set frames and covers to final grade.
2. Commercial precast assemblies shall be set on six (6) inches of level, 90 percent compacted granular fill, ¾ inch to one (1) inch size, extending twelve (12) inches beyond the manhole on each side. Granular fill shall be compacted by a minimum of four passes with a plate type vibrator.
3. Cast-iron frames and covers not buried in masonry shall be cleaned of mortar, rust, grease, dirt and other contaminants, and given a coat of bituminous paint. Steel

frames not buried in masonry and steel covers shall be cleaned of mortar, dirt and grease by an approved blasting process. Surfaces that cannot be cleaned satisfactorily by blasting shall be cleaned to bare metal by wire brushing or other mechanical means. Surfaces contaminated with rust, dirt, oil, grease, or other contaminants shall be washed with solvents until thoroughly cleaned. Immediately after cleaning, surfaces shall be coated with a pretreatment coating or be given a crystalline phosphate coating. As soon as practicable after the pretreatment coating has dried, treated surfaces shall be primed with a coat of primer and one coat of synthetic exterior gloss enamel.

3.11 POWER SYSTEM STUDIES

A. Scope of Services

1. Provide a complete short-circuit study, equipment-interrupting or withstand evaluation, a protective-device coordination study and an arc-flash hazard analysis for the electrical distribution system.

   The studies shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating methods, alternate operation, and operations which could result in maximum-fault conditions shall be thoroughly covered in the study.

2. A licensed professional engineer shall be in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

B. Short-Circuit Study

1. The study shall be in accordance with applicable ANSI and IEEE standards.
2. The study input data shall include the utility company's short-circuit single and three phase contribution with the X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.
3. Short-momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.
4. An equipment evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the maximum short-circuit momentary and interrupting duties. Evaluation study should be submitted prior to final approval of equipment submittals.

C. Protective-Device Coordination Study

1. A protective-device coordination study shall be performed to select or to verify the selection of power fuse ratings, protective-relay characteristics and settings, ratios, and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and settings.
2. The coordination study shall include all voltage classes of equipment from the utility's incoming line protective device down to and including each motor control center and/or panelboard. The phase and ground overcurrent protection shall be included as well as settings for all other adjustable protective devices.

3. Coordination shall be in accordance with requirements of the NEC and the recommendations of the IEEE Standard 399. TC curves shall be provided for each typical branch scenario from source to largest branch circuit device.
4. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system. Discrepancies, problem areas, or inadequacies shall be promptly brought to the Owner's attention.

D. Arc Flash Study

1. Determine arc flash levels based upon minimum and maximum available utility fault and protective device settings as determined in the Protective Device Coordination Study.
2. Label all switchboards, panelboards, disconnects, starters, VFD's and any other electrical equipment likely to require maintenance or adjustment while energized.
3. Identify the current appropriate ratings of personal protective equipment (PPE).
4. Establish the Flash Protection Boundary (approach limit distance) as required by NFPA 70E.
5. Provide equipment specific environment and chemical arc-flash hazard warning labels per NEC® Section 110.16 requirements.
6. Label shall identify the level of arc flash hazard and the required PPE level.
7. Identify the risk of personal injury as a result of exposure to incident energy released during an arc flash event for each electrical distribution component (switchboard, switchgear, MCC, starter, panelboard, disconnect).

E. Study Report

1. The results of the power system studies shall be summarized in a final report.
2. The report shall include the following sections:
    a. Description, purposes, basis, and scope of the study and a single-line diagram of the portion of the power system which is included within the scope of study.
    b. Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties and commentary regarding same.
    c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
    d. Fault-current tabulations including a definition of terms and a guide for interpretation.

F. Implementation

1. Engage an independent testing firm for the purpose of inspecting, setting, testing, and calibrating the protective relays, circuit breakers and other applicable devices as recommended in the power-system study report.
2. Affix arc-flash hazard warning labels to each electrical distribution component.

3.12 BASIC ACCEPTANCE TESTS

A. General Scope

1. This section covers the required field tests and inspections to assess the suitability for initial energization of electrical power distribution equipment and systems.

Failed components shall be replaced and retested for no additional cost to the project.

2. The purpose of this specification is to assure that all tested electrical equipment and systems are operational and within applicable standards and manufacturer's tolerances and that the equipment and systems are installed in accordance with design specifications.
3. All testing shall be performed by the Contractor responsible for the installation of the systems or by an independent testing organization under contract with the Contractor.
4. All equipment utilized for testing shall have a valid calibration sticker. All test reports shall indicate the equipment utilized and its associated calibration due date.
5. Coordinate all required shutdowns with the Owner. Any and all testing required after the Owner has taken occupancy (temporary or permanent) shall be assumed to be conducted during premium time.
6. A written record of all tests and a final report summarizing the findings shall be submitted for approval prior to energizing any electrical power distribution equipment and systems. All equipment shall be left in clean operational condition.

B. Inspection and Test Procedures

The following tests shall be conducted using the noted section of the latest edition of NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment Systems as a reference:

1. Panelboard Assemblies – Visually inspect the equipment inside and out, check attachment to wall or floor, verify bus joint tightness, exercise all active components and perform continuity testing and megger phase to phase, neutral and ground. Minimum resistance shall be 100 megohms when 480V equipment tested at 1000VDC or 25 megohms when 208V equipment tested at 500VDC. Tabulate readings for each test. NETA ATS-7.1
2. Dry Type Transformers – Visually inspect the transformer inside and out, verify vibration isolation installation, verify installation of the grounding bonding jumper, verify termination joint tightness, measure no load and partially loaded voltage and adjust taps as necessary. NETA ATS-7.2
3. Low Voltage Cables - All feeders illustrated on the one line diagram shall be inspected and tested in accordance with the referenced standard. Visually inspect cables for physical damage, color code and proper termination. Check continuity for proper labeling and megger for insulation resistance. Megger test voltage shall be 1000VDC for 1 minute with no values less than 50 megohms. Tabulate readings for each feeder. NETA ATS-7.3
4. Low Voltage, Molded and Insulated Case Circuit Breakers with frame size greater than 225 amperes and/or with adjustable trip units shall be tested and adjustable settings dialed to match the coordination study criteria. Perform an insulation resistance test at 1000VDC (thermal magnetic) or 500VDC (solid state) for 1 minute from pole to pole and pole to ground, resistance values shall not be less than 100 megohms. Perform resistance test across open and closed breaker contacts of each phase. Test trip settings tolerance with primary current injection. Tabulate readings for each breaker. NETA ATS-7.6
5. Disconnect the main bonding jumper at the service and at each separately derived system and verify single connection between the grounded and grounding conductor. Reconnect all disconnected bonding connections. Test the grounding electrode system for resistance to earth to verify a maximum of 25 ohms. NETA ATS-7.13

END OF SECTION

APPENDIX A
READING MUNICIPAL LIGHT DEPARTMENT (RMLD)DESIGN STANDARD

THE OKONITE COMPANY

Product Data Sheet

Authorized Stock

141-23-9460

MADE in USA
Quality Cables Since 1878

1/C, 15kV Rated, 133% Insulation Level, URO-J

A. CONDUCTOR: #2 AWG Compact Round Class B Strand Copper

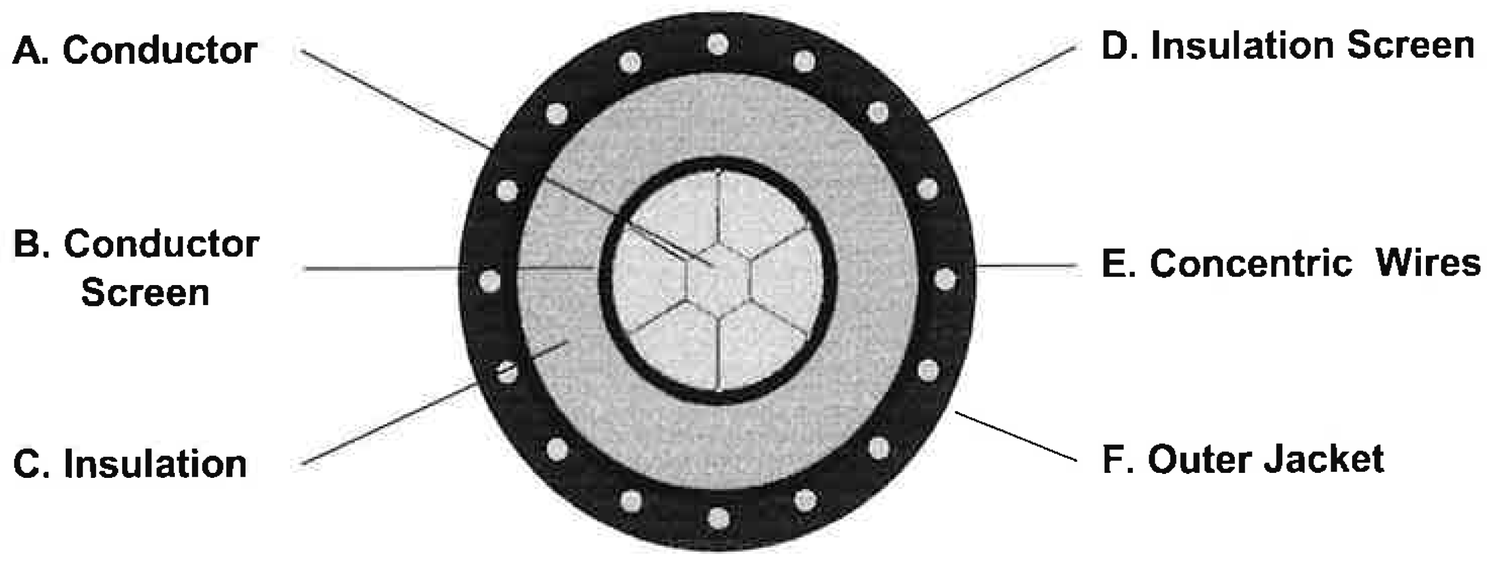
B. CONDUCTOR SCREEN: Extruded Semiconducting (SC-EPR)

C. INSULATION: 220 Extruded Ethylene Propylene Rubber OKOGUARD®

D. INSULATION SCREEN: Extruded Semiconducting (SC-EPR)

E. CONCENTRIC WIRES: 16 x #14 AWG Bare Copper Concentric Wires (Full Neutral)

F. JACKET: 050 Encapsulated OKOLENE® LLDPE (Linear Low Density Polyethylene) with 3-ERS



Dimensions	Thickness (in.)			Diameter (in.)		Cable Description 141-23-9460
	Nominal	Minimum Point		Nominal		
Conductor	N/A			0.271		1/C #2 CLASS B COPPER C-RD -SS- 220 OKOGUARD EPR - 030 SC EPR - 16 X #14 COPPER CONC WIRI (FULL NEUTRAL) - 050 OKOLENE PE W/3 RED STRIPES - SEQ. PRINT - 15KV
Cond. Screen	0.015	0.012		0.301		
Insulation	0.220	0.210		0.757		
Insul. Screen	0.034	0.030		0.831		
Conc. Neutral	0.0641			0.958		
Outer Jacket	0.050	0.045		1.068		
	Cable Weight (lbs./M'):			792		

TEMPERATURE RATINGS
105°C - Continuous, 140°C - Emergency
250°C - Short Circuit

OKONITE AUTHORIZED STOCK

Industry Standards: **AEIC CS8-13 and ICEA S-94-649.**
CSA Listed to C68.5 as SR, LTGG (-40C).

APPROVED BY:	Okonite Product Code 141-23-9460			Date: 02/11/19
PREP. BY RWP 03/18/15 RWP	SCALE None	Catalog Page Section 2: Sheet 42	SERIAL NO. 76755	DRAWING NO. T - 22694
PRINT LEGEND: OKONITE (PLT) #2 AWG CPT CU OKOGUARD EPR 15KV 133% INSUL LEVEL 220 MILS 105C UROJ PE INSUL JKT OR CSA LL39606 LTGG SR (LIGHTING BOLT) (YEAR) (SEQUENTIAL NUMBER)				

http://www.okonite.com/media/catalog/product/files/2-42.pdf

Cable Dimensions are Subject to Normal Manufacturing Tolerances.

Cable Image is representative and meant to display individual cable components and is not to scale.

RMLD

Reading Municipal Light Department

RELIABLE POWER FOR GENERATIONS

3 Phase Meter Sockets

All installations requiring conduit for wiring from the CT cabinet to the meter socket shall use 2" or larger.

All current transformer cabinets shall have provisions for locking devices. Locking devices will be installed by the RMLD.

The Electrician shall install the current transformers provided by the RMLD, with the dot on the current transformer facing the line side.

The current transformers shall be installed hot sequence.

The current transformers provided by the RMLD are twelve-inch bar type unless otherwise specified.

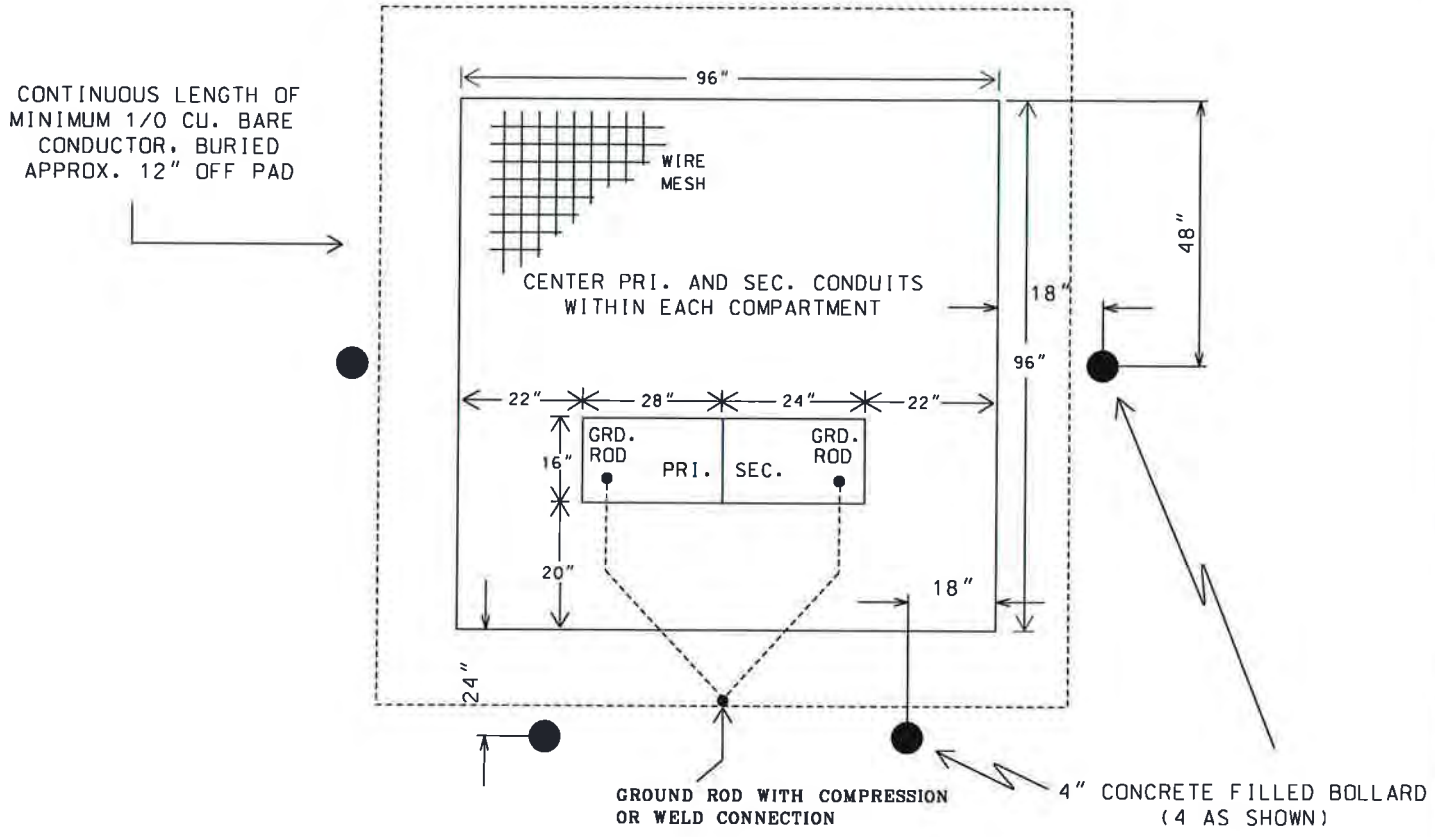
Control cable connections from CT's to meter socket **cannot** be longer than 100'.

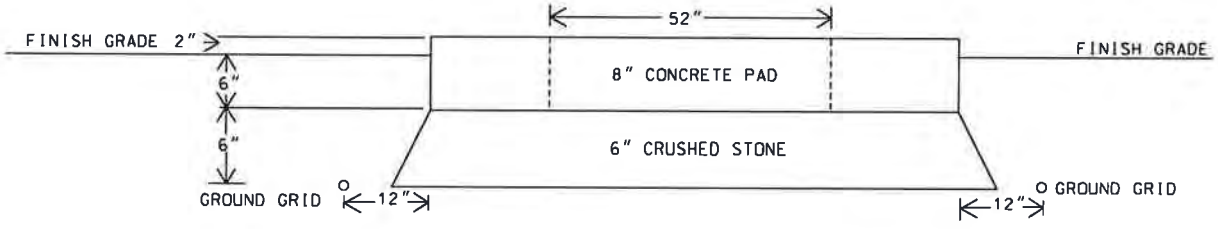
The following catalog numbers are for Milbank sockets. Any manufacturer's socket may be used as long as it is the equivalent to the Milbank numbers provided and are UL approved. *All transformer rated sockets must have provisions for a test switch.*

Transformer Rated Sockets	Catalog No.	No. of Terminals
3 Wire, Single Phase	UC7532-XL	6
3 Wire, 3 Phase	UC7448-XL	8
4 Wire, 3 Phase	UC7449-XL	13
Trans-sockets; (400 amp or less)		
3 Wire, Single Phase	U2228-XT	6
3 Wire, 3 Phase	U2229-XT	8
4 Wire, 3 Phase	U2161-XT	13
Self Contained		
4 wire, 3 phase **200 amp**, self contained meter socket w/bypass	U9701-XL	7
4 wire, 3 phase, **class 320**, self contained meter socket w/bypass	U2594-X	7

Revised: 4-8-10

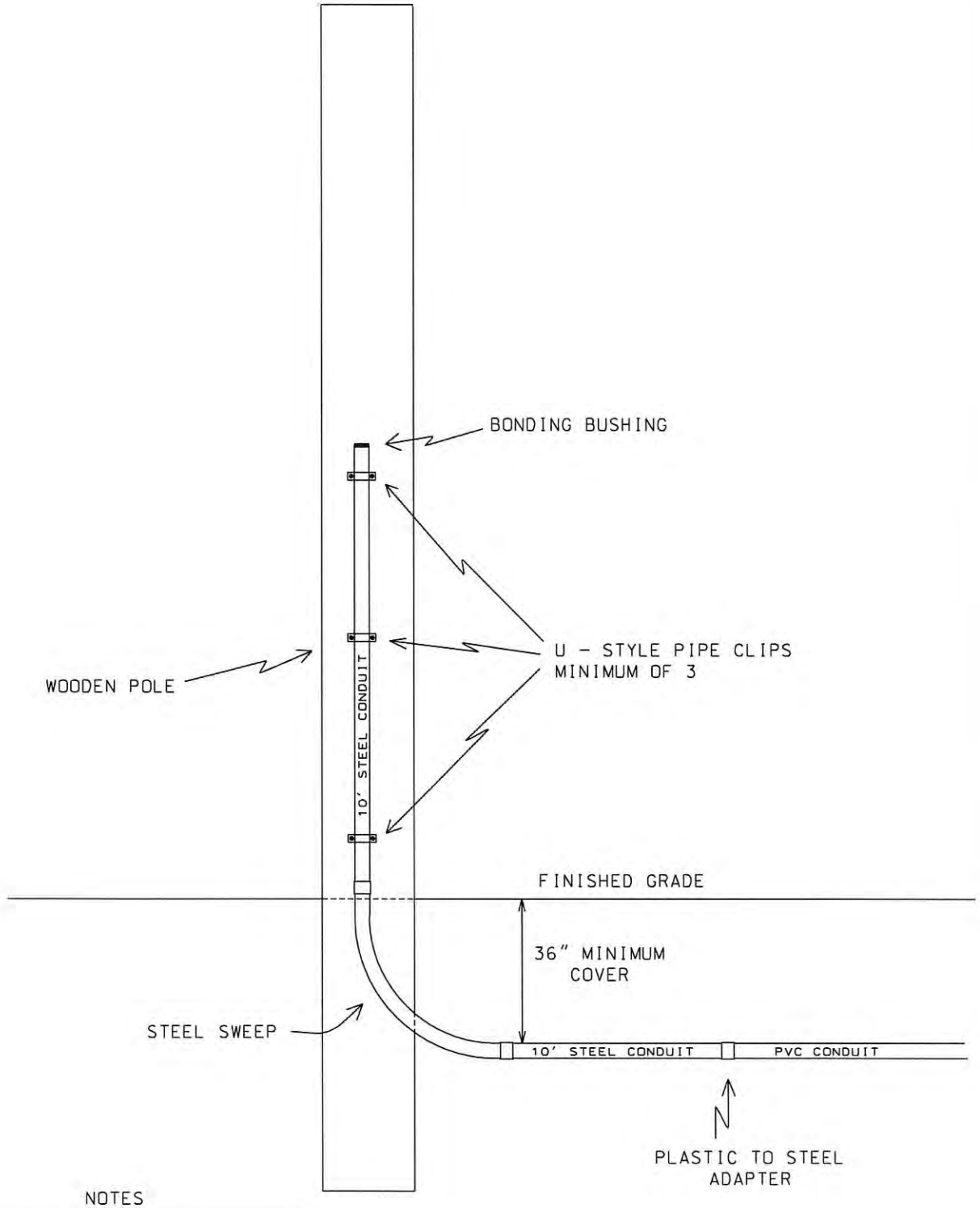
150 - 500 KVA TRANSFORMER PAD DIAGRAM
WITH GROUND WIRE CONSTRUCTION





READING MUNICIPAL LIGHT DEPARTMENT TYPICAL PAD DESIGN FOR PADMOUNT INSTALLATION	
REVISED: 1/9/19 BY: PRICE	FILED: SCALE: NONE

STANDARD PRIMARY RISER AND CONDUIT CONSTRUCTION



NOTES

MAXIMUM OF 3 RISER PIPES PER POLE
ALL RISER CONDUITS WILL BE A MINIMUM OF 4" STEEL
RISER PIPE LOCATIONS ON POLE TO BE DETERMINED BY RMLD

READING MUNICIPAL LIGHT DEPARTMENT
STANDARD COMMERCIAL RISER CONSTRUCTION

DRAWN BY : PRICE SCALE : NONE

REVISED : 11/19/03

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 31 00 00
EARTHWORK

ACTIVITAS

SECTION 31 10 00

SITE PREPARATION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. Work Included: Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Contractor shall review the Site Preparation Plans for erosion control measures and associated Order of Condition requirements. Information on these plans and within the Town of Reading Conservation Commission of Conditions shall override other information found on other plans and specifications.
2. Contractor shall review the Site Preparation Plan for erosion control.
3. Protection of existing utilities.
4. Protection of existing vegetation and trees to remain.
5. Stripping and stockpiling of existing materials for reuse on-site.
6. Installation and maintenance of temporary construction fencing and erosion control.
7. Installation and maintenance of temporary construction fencing.

1.03 JOB CONDITIONS

A. General: The Contractor shall visit and accept the site as he finds it, and shall inform himself of the character and the type of site items to be removed. The Contractor shall walk the site with the Landscape Architect/Civil Engineer and Owner prior to commencing work to review the full scope of demolition and items to remain. The Owner assumes no responsibility for the actual condition or structural adequacy of any existing construction to be demolished.

B. Damage or loss to site improvements shall be at the risk of the Contactor from and after the date of Contract execution, and no such damage or loss shall relieve the Contractor from any obligation under the Contract.

C. Disposal: Dispose of cleared, grubbed, and removed materials off the site. Burning of materials on the job site will not be permitted. All items must be disposed of in a safe and legal manner.

D. Traffic: Conduct operations and removal of debris to ensure minimum interference with the normal use of corridors, public ways and other adjacent facilities. Do not close or obstruct traffic ways, corridors, streets, walks or other used facilities without the written permission of the Owner and authorities having jurisdiction.

E. Protection: Prevent injury to persons and damage to property. Immediately repair collapse

or damage to existing structures or utilities.

F. Shoring and Bracing: Provide adequate shoring and bracing to prevent uncontrolled collapse or damage to existing structures and utilities.

G. Dust and Noise Control: Take effective measures to prevent windblown dust and to control noise to avoid creating a nuisance. Avoid creating ice hazards in freezing weather.

H. Utilities: Maintain all utilities except those requiring removal or relocation. Keep utilities in service and protect from damage. No not interrupt utilities serving use areas without first obtaining permission from the utility company and the Owner. Provide temporary services as required.

PART 2 – PRODUCTS

2.01 TEMPORARY CONSTRUCTION FENCE

A. Construction fence shall be equivalent to temporary construction fence on blocks and post driven as provided by Steelco Fence, 19 Brook Road, Needham Heights, MA 02494.

B. Temporary construction fence on blocks shall be used on existing pavement that is to remain and post driven fence in landscape areas.

2.02 TEMPORARY CONSTRUCTION ENTRANCE

A. Refer to drawings for construction entrance materials and detailed requirements.

2.03 EXISTING TREE PROTECTION

A. Reference drawings for existing tree protection materials and detailed requirements.

PART 3 – EXECUTION

3.01 ORDER OF CONDITIONS AND SITE PREPARATION PLANS

A. Attention is called to the Site Preparation Plans in the Project Documents and the Town of Reading Order of Conditions found within the Project Manual. Information in those documents shall override conflicting information found within other plans or specifications.

3.02 TEMPORARY CONSTRUCTION FENCE

A. Erect temporary construction fencing as needed in areas as shown on the construction documents.

B. Contractor must remain a secure site at all times.

3.03 DEMOLITION

A. General: Demolish completely and legally remove from site and dispose of properly. Proceed with demolition systematically.

B. Demolish all existing above and below grade improvements except as indicated in the drawings. Wherever areas of new construction area shown to go over or encompass existing construction or improvements, the Contractor shall notify the Landscape Architect/Civil Engineer immediately for a determination on the conflict.

3.04 SALVAGE

A. Salvage indicated material or materials determined to be suitable and required for reuse, including: grates, frames or other metal castings and miscellaneous parts of inlets and manholes: metal fences; and other miscellaneous site items as indicated on the Drawings. Stockpile items to be salvaged in off-site location, as designated by Owner and Landscape Architect/Civil Engineer.

B. Protect (metallic) coatings on salvaged items. Remove adhering concrete from salvaged items.

C. Items to be Packaged and Stored Off-Site: Items to be packaged and stored off-site shall be carefully packaged in a substantial manner with all related components, accessories, and fasteners, clearly tagged for reassembly. Photocopies of reassembly documents shall be included in each package of each group of related components.

1. Type of label components with identifying code to provide proper reassembly.
2. Packaging shall be suitable for material, and shall be secure.
3. Dry components thoroughly: coat components susceptible to corrosion and all threaded areas with anti-corrosion coating.

3.05 STRIPPING, SCREENING AND STOCKPILING TOPSOIL AND FILL MATERIALS

A. Following the install sedimentation and erosion control measures, construction fencing and entrances as indicated on the Drawings, the Contractor shall proceed with stripping operations per the Drawings.

B. Do not strip without clear understanding of existing soil, planting and site conditions to be preserved.

C. Once all topsoil has been stripped, all other stripped material which can be classified as fill under other Sections, shall be used or stockpiled for re-use in rough grading or backfill.

D. All stripped topsoil and/or loam to be re-used as topsoil in landscape areas shall be screened in accordance with Section 32 92 19, LOAM AND SEED.

3.06 BACKFILL

A. Backfill trenches and excavations resulting from work under this Section in accordance with Section 31 00 00, EARTHWORK.

3.07 SAWCUTTING

A. Contractor to use mechanical equipment that produces a clean, straight edge.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.
B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this Section whether or not such work is specifically mentioned in this Section.
C. This Section contains information that applies to all work performed under the Contract and is hereby made a part of each specification section.

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Stripping of all existing topsoil within the proposed locations of athletic fields, walkways, and other site improvements.

2. Excavating for the athletic fields and site improvements.

3. Filling, grading and subgrade preparation.

4. On-site management of all excavated materials.

5. Furnishing, placement and compaction of all fill materials specified herein or shown on the Drawings.

6. Protecting stockpiles of excavated fill material and natural soils intended for on-site reuse against increases in moisture content, and freezing temperatures.

7. Frost protection.

8. Rock excavation as may be required to attain the specified grades.

9. Off-site disposal of all unsuitable and excess excavated materials, including any chemical analysis that may be required for off-site disposal.

10. Pumping and other dewatering procedures necessary to maintain excavated areas free of water from any source whatsoever and to avoid disturbance of the subgrade.

11. Storm water control.

12. Rough grading.

13. Dust control.

B. Special Conditions For Site Preparation and Earthwork Operation: The Contractor shall adhere to normal haul times allowed by the local authorities having jurisdiction.

1.03 EXAMINATION OF SITE AND DOCUMENTS

A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation at the Site.

B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found except as otherwise provided herein.

1.04 STANDARDS AND DEFINITIONS

A. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications).

B. American Society for Testing and Materials (ASTM)

C. American Association of State Highway and Transportation Officials (AASHTO).

D. Occupational Safety and Health Administration (OSHA).

E. MCP: Massachusetts Contingency Plan, 310 CMR 40.0000

F. Massachusetts Solid Waste Management Facility Regulations 310 CMR 19.00.

G. Massachusetts Site Assignment Regulations for Solid Waste Facility Regulations 310 CMR 16.000.

H. Unsuitable Soil: Soils which, due to their consolidation properties, degree of saturation, gradation, or other deleterious characteristics will not provide a stable subgrade, or cannot be used as backfill, or do not conform to the requirements of these specifications, shall be considered unsuitable. The Landscape Architect, Civil Engineer and Owner shall be the sole and final judges as to the suitability of soils at the site.

I. Trench Excavation: Excavations of any length where the width is less than twice the depth and where the shortest distance between payment lines does not exceed ten (10') feet.

J. Open Excavation: All excavations not conforming to the definition of Trench Excavation shall be defined as Open Excavation.

K. Rock Excavation: For payment purposes shall be defined naturally-occurring, intact material that cannot be broken and removed by a CAT 235 or equivalent excavator and requires use of hoe rams, systematic drilling and blasting or other mechanical means to fracture and remove. Boulders over three cubic yards in volume located within soil in open excavation or one cubic yard in volume within soil in trenches, requiring the use of hoe rams, drills, or explosives for removal are also defined as rock excavation.

L. Invert or Invert Elevation: The elevation at the inside bottom surface of the pipe or channel.

M. Bottom of pipe: The base of the pipe at its outer surface.

1.05 SUBSURFACE CONDITIONS

A. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

B. The Contractor may, at his own expense, conduct additional subsurface testing as required for his own information after approval by the Owner.

1.06 SUBMITTALS

A. Issue submittals in accordance with Division 1. Submittals under this Section shall include the following:

1. Proposed schedule, sequence, and procedures for all earthwork operations. Proposed earthwork sequencing and procedures shall include detailed descriptions of all methods, operations and equipment proposed for soil excavation, subgrade preparation, and backfilling.

2. Details of compaction equipment, including descriptions, product literature, specifications and ratings, proposed for use in compacting fill and backfill materials.

3. Plan for control of surface water runoff during site work.

4. Plan for control of dust during site work.

1.07 SAMPLES AND TESTING

A. Fill materials shall be subject to quality control testing. A Soils Engineer may be employed by the Owner to perform tests on materials. Test results and laboratory recommendations will be available to the Contractor.

B. A 50 lb. sample of each off-site material proposed for use, and of any on-site, shall be submitted to the Landscape Architect or Soils Engineer for review and testing at least ten (10) days prior to first use on-site.

1. Samples shall be delivered to office of the Landscape Architect/Soils Engineer, as directed.

2. The Contractor shall provide the location and name of material source, including on-site sources.

3. The Contractor shall indicate the proposed on-site use of each material submitted.

4. Product Data: Submit location of pits for all borrow material and source site usage.

C. The Landscape Architect will be the sole and final judge of suitability of all materials.

D. If retained, the Soils Engineer will determine maximum dry density and optimum water content in accordance with ASTM D1557, Method C, and in-place density in accordance with ASTM D1556 or ASTM D2167.

E. Tests of materials as delivered may be made from time to time. Materials in question may not be used, pending test results. Remove rejected materials and replace with new, whether in stockpiles or in place.

F. It is anticipated that chemical testing would not be required for commercial, natural bank-run borrow source, or materials provided through the crushing and processing of pure rock from a quarry.

1.08 COORDINATION

A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

B. Prior to the start of earthwork, the Contractor shall arrange an on-site meeting with the Landscape Architect, Civil Engineer and Soils Engineer for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.

C. As construction proceeds, the Contractor shall be responsible for notifying the Landscape Architect prior to start of earthwork operations requiring inspection and/or testing.

1.09 SPECIAL SITE CONSIDERATIONS

A. It is the responsibility of the Contractor under this Contract to do the excavation, filling, grading and rough grading to bring the existing grades to subgrade and parallel to finished grades as specified herein and as shown on the Drawings for this Work. The Contractor shall visit the site prior to submitting a bid to become familiar with the extent of the work to be done under this Contract. The Contractor shall be responsible for determining the quantities of earth materials necessary to complete the work under this Section. All earth materials shall be included in the Contractor's base bid.

1.10 QUALITY ASSURANCE

A. The Owner may retain a Soils Engineer to perform on-site observations and testing during the following phases of the construction operations. The services of the Soils Engineer may include, but not be limited to the following:

1. Observation of activities during excavation and subgrade preparation.

2. Observation and testing during placement and compaction of fills.

3. Laboratory testing and analysis of fill and bedding materials specified, as required.

4. Observation, construction and performance of water content, gradation, and compaction tests at a frequency and at locations to assure conformance of this Specification. The results of these tests will be submitted to the Landscape Architect, copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the Soils Engineer will advise the Landscape Architect, in writing, with copy to Contractor if, at any time, in his opinion, the work is not in substantial conformity with the Contract Documents.

B. The Contractor shall allow the Soils Engineer sufficient time to make the necessary observations and tests and shall provide safe access to the work area at all times.

C. The Soils Engineer's presence does not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Soils Engineer, nor any observations and testing performed by him, nor any notice or failure to give notice shall excuse the Contractor from defects discovered in his work.

1.11 PERMITS, CODES AND SAFETY REQUIREMENTS

A. All work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations.

B. Comply with the rules, regulations, laws and ordinances of the Local authorities having jurisdiction, appropriate agencies of the Commonwealth of Massachusetts and all other

authorities having jurisdiction. Coordinate all work done within Town and State rights of way with the appropriate agencies. Provide all required traffic control and safety measures, including uniformed police officers per Town and State requirements. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided without additional cost to the Owner.

C. Comply with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc., the Commonwealth of Massachusetts Rules and Regulations For the Prevention of Accidents in Construction Operations, and the requirements of the Occupational Safety and Health Administration (OSHA), United States Department of Labor.

D. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herein and shown on the Drawings.

E. The Contractor shall not close or obstruct any street, sidewalk, or passageway unless authorized in writing by the Landscape Architect. The Contractor shall so conduct his operations as to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks or other facilities near enough to the work to be affected hereby. The Contractor shall comply with the time limits established by the terms for trucking onto and off of the site.

F. Any apparent conflict between the Drawings and Specifications and the applicable codes and regulations shall be referred to the Landscape Architect in writing, for resolution before the work is started.

1.12 LAYOUTS AND GRADES

A. The Contractor shall maintain and/or reestablish benchmarks and survey monuments shown on the Drawings or found to exist on the site to provide a base reference for the construction. Replace any which may become destroyed or disturbed. The Contractor shall employ and pay all costs for a registered Civil Engineer or Land Surveyor who is licensed within the jurisdiction of the project site to lay out all lines and grades in accordance with the Drawings and Specifications, and as necessary or required for the construction. The selection of the Civil Engineer or Land Surveyor shall be subject to the Owner Representative's approval.

B. The words "finished grades" as used herein shall mean final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas outside of the building shall be given uniform slopes between points for which finished grades are indicated or between such points and existing grades.

C. The word "subgrade" as used herein, means the required surface of subsoil, natural glacial till, fill material or compacted ordinary fill prior to placement of the engineered sports surface, pavement or concrete walkways. This surface is immediately beneath the site improvements, specially dimensioned fill, paving, loaming or other surfacing material, as dimensioned on the Drawings.

1.13 DISPOSITION OF EXISTING UTILITIES

A. Active utilities existing on the site and work areas shall be carefully protected from damage and relocated or removed as required by the work. When an active utility line is exposed during construction, its location and elevation shall be plotted on the record drawings as described in this Section and both Landscape Architect and Utility Owner notified in writing.

B. Inactive or abandoned utilities encountered during construction shall be removed if within the area of site improvement or grouted, plugged or capped. The location of such utilities shall be noted on the record drawings and reported in writing to the Landscape Architect.

C. The Contractor shall notify "Dig Safe" and local utility companies prior to the start of construction. The "Dig Safe" number shall be submitted by the Contractor in writing to the Landscape Architect prior to construction.

D. In case of any damage or injury caused in the performance of the work, the Contractor shall at his own expense make good such damage or injury to the satisfaction of, and without cost to the Owner. Existing streets, sidewalks and curbs damaged during the project work shall be repaired or replaced to their condition prior to commencement of earthwork operations, at no additional cost to the Owner.

1.14 TEMPORARY DRAINAGE AND DEWATERING

A. The Contractor shall control the grading in areas under construction on the site so that the surface of the ground will properly slope to prevent accumulation of water in excavated areas and adjacent properties.

B. Should surface, rain or ground water be encountered during the operations, the Contractor shall furnish and operate pumps or other equipment, and provide all necessary piping to keep all excavations clear of water at all times and shall be responsible for any damage to work or adjacent properties for such water. All piping exposed above surface for this use, shall be properly covered to allow foot traffic and vehicles to pass without obstruction.

C. Presence of ground water in soil will not constitute a condition for which an increase in the contract price may be made. Under no circumstances place concrete fill, soil fill, lay piping or install appurtenances in excavation containing free standing water. Keep utility trenches free of water until pipe joint material has hardened and new utility backfilled to prevent flotation.

D. It is anticipated that minimal dewatering will be necessary to remove ponded surface water and can be accomplished using on-site sumps and pumps.

E. If discharge is necessary, the Contractor shall discharge all pumped water away from the work area, and in accordance with all applicable local codes and laws. Requirements specified herein for Erosion and Siltation Control shall be met during this process.

F. All fill material shall be placed and compacted in-the-dry. The Contractor shall dewater excavated areas as required to perform the work and in such a manner as to preserve the undisturbed state of the natural inorganic or other subgrade soils.

G. For further information refer to paragraphs on SPECIAL REQUIREMENTS FOR SEQUENCE OF CONSTRUCTION OPERATIONS AND DRAINAGE AND EROSION CONTROL as specified herein.

1.15 FROST PROTECTION

A. Do not excavate to full indicated depth when freezing temperatures may be expected, unless work can be completed to subgrade or piping can be installed and backfilled the same day. Protect the excavation from frost if placing of concrete or piping is delayed.

B. The Contractor, at no additional cost to the Owner, shall keep the operations under this Contract clear and free of accumulation of snow within the limits of Contract Lines as required to carry out the work.

C. No work shall be installed on frozen ground.

D. Should protection fail, remove frozen materials and replace with suitable fill material as directed and approved by the Landscape Architect at no cost to the Owner.

1.16 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION

A. The Contractor shall take the necessary steps to avoid disturbance of underlying fill material, natural subsoil, natural glacial till and compacted ordinary fill during excavation and filling operations. Methods of excavation and filling operations shall be revised as necessary to avoid disturbance of the subgrade and underlying natural soils/compacted fill, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials. The Contractor shall coordinate with the Landscape Architect and Soils Engineer to modify his operations as necessary to minimize disturbance and protect bearing soils.

1.17 PROTECTION OF BEARING SUBGRADES

A. The Contractor shall be required to maintain stable, dewatered, and frost fee subgrades for pavement areas, utility trenches, and other areas as directed by the Landscape Architect or Soils Engineer.

B. The Contractor shall take precautions to reduce subgrade disturbance. Such precautions may include diverting storm water runoff away from prepared subgrades, reducing traffic in sensitive areas, thermal protection during cold weather periods, and subgrade stabilization such as placement of filter fabric and crushed stone or compacted gravel fill.

C. Soils exhibiting weaving/instability or which become frozen, as determined by the Soils Engineer, shall be over-excavated (removed) to competent bearing material and replaced with compacted gravel fill or lean concrete at no additional cost to the Owner.

1.18 SPECIAL REQUIREMENTS FOR SEQUENCE OF CONSTRUCTION OPERATIONS AND DRAINAGE AND EROSION CONTROL

A. An initial procedure for sequencing of construction operations is specified under Section 31 10 00, SITE PREPARATION. This procedure shall be extended through Earthwork operations as follows:

1. Perform initial procedures as specified under Section 31 10 00, SITE PREPARATION.

2. Repair any broken or damaged sections of haybales or siltation fencing installed during site preparation and install any additional sections necessary for proper erosion control.

3. Throughout earthwork operations, in addition to drainage swales, check dams, siltation sumps, and other items shown on the Drawings, the Contractor shall take other necessary precautions, including installation of temporary drainage swales, siltation sumps, check dams, haybales, silt fencing and temporary pipe to direct and control drainage from disturbed areas on the site so that erosion and siltation is minimal. In addition, no erosion or discharge of silt or larger particles shall occur in water bodies or wetland areas to remain undisturbed or onto adjacent properties or parcels of land.

4. Damaged or loose hay bales and siltation fence shall be replaced as necessary to maintain their function of controlled erosion and siltation. Damaged or broken down check dams and filtration dams shall be replaced immediately.

5. Throughout construction, remove any accumulation of silt or soil build-up behind hay bales, silt fences, check dams and filtration dams as it occurs. Remove

accumulations of silt and soil build-up from the siltation sumps and silt traps when it is approximately 18 inches deep.

6. Replace the gravel layer on the inside of all siltation sumps as necessary to permit adequate flow through the gravel and to maintain their function as a filter of silt and larger particles. Excavate silt and other material from the basins of all siltation sumps as it accumulates.

7. Remove temporary drainage swales, check dams, siltation sumps, haybales and other temporary drainage, erosion and siltation control measures when permanent drainage control measures have been installed, and grass is established in drainage areas leading to the siltation sumps. Do not remove the above items without approval of the Landscape Architect. If, in the Landscape Architect's opinion, these measures are still necessary, they shall stay in place.

1.19 MEASUREMENT AND PAYMENT

A. Payment for removal of all material as shown on the Contract Drawings or as specified herein, shall be included in the contract price on an unclassified basis. This includes management and on-site reuse of existing topsoil to the fullest extent possible, chemical analysis and off-site disposal of excess topsoil if it has been determined by the Landscape Architect that a surplus of topsoil exists at the site, excavation for all materials necessary to construct the athletic fields, drainage lines and parking area as well as all site grading and improvements outside of the general excavation indicated on the drawings and specified herein.

B. The Contractor shall include in his lump sum all costs associated with excavating all existing topsoil and subsoil to a minimum of 2 feet below finished grade for the athletic fields, paved walkways and other site improvements, as indicated on the Drawings or specified herein.

C. If any part of the excavation is carried through error beyond the depth directed by the Landscape Architect and the dimensions indicated on the Drawings, or called for in the Specifications, the Contractor, at his own expense, shall furnish and install compacted fill material, as directed by the Landscape Architect up to the required level and/or dimensions.

D. Excavation, removal, and/or disposal of unsuitable materials below the grades called for on the Drawings and as specified herein shall be paid for after removal of such materials has been authorized by the Landscape Architect. The quantities of excavation, removal, disposal and backfilling involving an adjustment of the Contract Price shall be subject to measurement verification and approval by the Landscape Architect, prior to the removal of such materials.

E. Payment Lines: The following payment lines shall be used for purposes of Contract Price adjustment to determine volume of materials to be excavated, removed and backfilled.

1. Surfaced areas outside the building: Twelve inches below required subgrade as shown on the details.

2. Utility structures: One foot outside of the outer walls and six inches below the bottom of the structures.

3. Utility trenches: Width shall be the outside diameter of the pipe plus two feet. Maximum depth shall not exceed 1-foot below the bottom of the pipes, etc. For purposes of measurement and payment, Banks of trenches shall be vertical.

F. Compensation for all work required under this Section and not specifically covered elsewhere, shall be included in the Contract Lump Sum Price for earthwork. All Unit Prices shall be measured based upon in-place measure unless otherwise noted. For purposes of adjusting the scope of construction, the Unit Price Schedule in the Bid Form may be utilized.

G. All unit prices shall be based upon volumes measured in-place and shall include all costs associated with furnishing, transporting, placement and compaction of fill materials.

PART 2 – PRODUCTS

2.01 GENERAL

A. Fill material shall be obtained from required on-site cut to the extent suitable material is available and off-site to the extent suitable material is not available from on-site cuts.

B. Fill materials shall conform to the following material descriptions. Gradation requirements shall be determined by ASTM D422 unless otherwise specified.

2.02 MATERIALS

A. Aggregate:

1. GRANULAR FILL, also referred to as structural fill, from off-site sources shall consist of inert material that is hard, durable stone and coarse sand, free from loam, organics and clay, surface coatings, and other deleterious and/or compressable materials. Maximum size of stone in gravel shall be three inches (3") largest dimension.

Sieve	% Passing by Weight	
(ASTM D422)	Minimum	Maximum
3 in.	100	
No. 4	30	90
No. 40	10	50
No. 200	0	8

2. AGGREGATE BASE COURSE, GRAVEL BASE COURSE, or DENSE-GRADED CRUSHED STONE shall consist of a combination of crusher-run coarse aggregates of crushed stone and fine aggregates of natural sand or stone screenings. Coarse aggregate shall consist of a hard, durable particles of fragments of stone. Fine aggregate shall consist of natural or crushed sand. The composite material shall be free from loam and clay, and deleterious materials. Gradation shall conform to MDPW Specification Designation, M2.01.7, and the following:

Sieve	% Passing by Weight	
(ASTM D422)	Minimum	Maximum
2 in.	100	
1 ½ in.	70	100
3/4 in.	50	85
No. 4	30	55
No. 50	8	24
No. 200	3	10

3. COMMON or ORDINARY FILL shall be retained from on-site sources and shall consist of mineral soil, free of organic materials, loam, trash, wood, trash, snow, ice, frozen soil, plastic clay and other compressible or deleterious materials. It shall have physical properties such that it may be readily spread and compacted for the formation of compacted fills without excessive weaving or instability, as judged by the Soils Engineer. It shall be free of highly plastic clays, of all materials subject to decay, decomposition or dissolution, and of cinders or other materials which will corrode piping or other metal.

   a. Fill material, subsoil and glacial till from excavation on the site shall be used as Ordinary Fill. The contractor shall take precautions to maintain suitability of excavated on-site fill, subsoil and glacial till for re-use, particularly in regard to moisture maintenance and prevention of freezing.

   b. The Contractor shall bear all costs associated with the off-site disposal of soils that have become unsuitable after excavation and stockpiling of these soils due to the Contractor's failure to protect the stockpiled soils from moisture and/or freezing.

   Note: The maximum particle size shall be 3 inches for backfill placed within 2 feet of utilities and 6 inches elsewhere.

4. SAND BEDDING shall consist of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from loam or clay, surface coatings and deleterious materials, and shall conform to the following gradation requirements:

Sieve Designation	% Passing by Weight	
	Minimum	Maximum
1/4 in.	100	
No. 200	0	10

B. UNSUITABLE MATERIAL

1. Material containing organic matter, frozen materials, debris, materials subject to decomposition, silts and silty materials which are too wet to be stabilized and existing fill which, in the opinion of the Soils Engineer, do not satisfy the design requirements, shall be unsuitable material.

2. Suitable Soil that is allowed to become frozen, saturated, or unstable because of the Contractor's failure to employ appropriate dewatering, excavation methods, or weather protection is considered unsuitable material.

3. Unsuitable material shall be legally disposed off-site by the Contractor at no additional cost to the Owner.

2.03 EQUIPMENT

A. Provide sufficient equipment units of suitable types to spread, level, and compact fills promptly upon delivery of materials.

B. Contractor may use any compaction equipment or device which he finds convenient or economical, but the Landscape Architect retains the right to disapprove equipment which, in his opinion, is of inadequate capacity or unsuited to the character of material being compacted.

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS

A. Stripping: Prior to starting general excavation, all existing topsoil within the Limit of Work as shown on the Contract Drawings shall be stripped to its full depth, screened and stockpiled in approved locations for later on-site reuse. All stockpiled topsoil shall be screened under the work of this Section and as specified in Section Lawns. All stockpiled topsoil shall be tested for suitability as loam as specified in Sections Planting Soils. If topsoil does not meet the specifications for loam, it may be reused as ordinary fill, beneath lawn and planting areas only, if it meets the requirements as specified, or removed from the site and disposed of in a legal manner. Stockpiled topsoil for re-use as loam shall be free from trash, brush, stones over three-quarter inch (3/4") in diameter and other extraneous matter. All excess loam quantities shall be removed from the site at no additional cost to the Owner after Landscape Architect is satisfied that there is enough existing screened and acceptable material stockpiled on site to complete the project. The Contractor shall perform all chemical analysis that may be required for off-site disposal of the excess topsoil, at no additional cost to the Owner. Do not strip without a clear understanding of existing soil, planting and site conditions to be preserved. Contractor shall supply additional quantities of loam if there is not enough on-site material to complete the work at no additional cost to the Owner.

B. All topsoil containing excessive amounts of stones or organics shall be stockpiled separately and removed from the site at no additional cost to the Owner.

C. The Contractor shall perform all work necessary to strip, store, stockpile, transport, clean and re-spread existing topsoil, and to furnish any additional topsoil required to complete the work.

3.02 EXCAVATION

A. Excavate all materials, on an unclassified basis, encountered to allow construction of the proposed athletic fields, site improvements, utilities and site work as shown on the Drawings and as specified herein.

B. Excavate to levels shown for site improvements, as required to provide working clearance and to allow adequate inspection.

C. All excavation shall be performed in the dry. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils.

D. Excess excavated material shall be reused on site to the fullest extent possible. No off-site removal of soil will be permitted unless directed by the Landscape Architect.

E. In planting areas, remove boulders and other obstructions to a depth of at least two feet below finished grade.

F. When excavations have reached the prescribed depths, the Landscape Architect shall be notified and will make an inspection of the conditions. After inspection, the Contractor will receive approval to proceed if conditions meet design requirements.

G. Should an excavation be carried beyond the depth indicated on the drawings or as specified herein as a result of Contractor's error, the Contractor shall provide and place compacted ordinary fill, as directed by the Landscape Architect, to the required elevation at no additional cost to the Owner.

H. Localized sumps and temporary ditches shall be made as needed to drain off surface water and groundwater to avoid damage to areas of cut or fill. Such ditches shall be

maintained as required for efficient operation, at no additional cost to the Owner. Water shall be recharged on-site.

I. Prior to placing subbase and base course materials required beneath the athletic fields and for support of pavements and concrete walkways, specifically in areas in which building demolition was recently performed including removal of the below grade remains of former structures utilities and foundations, proof compact subgrades consisting of existing fill material with a minimum of 5 passes of a vibratory roller exerting a minimum of 20,000 foot-pounds of energy to the soil and weighing a minimum of 5-tons. Specific attention should be paid to those areas of the site in which former structures that were recently demolished and removed. Any soft or spongy areas revealed by the proof-compacting process shall be removed and replaced with compacted Ordinary Fill as directed by the Landscape Architect, at no additional cost to the Owner.

3.03 TRENCH EXCAVATION

A. Excavate as necessary for all drainage pipes, utilities and related structures and appurtenances, and for any other trenching necessary to complete the work.

B. In general, machine excavation of trenches will be permitted with the exception of preparation of pipe beds which will be hand work. Excavate by hand or machine methods at least six inches below the bottom of all utilities.

C. Trench excavation shall include the removal of all materials encountered. During excavation, materials determined to be suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or unsuitable for backfill shall be reused on site. The banks of trenches shall be cut as near vertical as practicable to the extent allowed by OSHA.

D. The Contractor shall provide, at his own expense, suitable bridges over trenches where required for accommodation and safety of the traveling public and as necessary to satisfy the required permits and codes.

E. Trenches shall be excavated to the necessary width and depth for proper laying of pipe or other utility and shall have vertical sides or slopes as required by codes. Minimum width of trenches shall provide clearance between the sides of the trench and the outside face of the utility. Maximum trench sizes are as shown on the Drawings or as specified herein. The depth of the trench shall be six inches below the bottom of the pipe barrel or respective utility.

F. Coordinate all utility and trench backfilling with the trades involved.

3.04 FILLING AND GRADING

A. Placing Fills:

1. Provide all specified fill materials.

2. Areas to be filled shall be natural undisturbed soil or existing fill material that has been proof compacted as specified herein, and shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place fill when subgrade or layers below it are unsuitable.

3. Notify the Landscape Architect when excavations are ready for inspection. Filling shall not be started until conditions have been approved by the Landscape Architect.

4. Furnish approved materials. Place fill in layers not exceeding 6 inches compacted thickness and compact as specified below for various fill conditions.

5. All fill is to be placed "in the dry", to which end dewatering may be required. Spreading and drying of each layer may also be required. The Contractor shall dewater excavated areas as required to perform the work and in such a manner as to preserve the undisturbed state of the existing subgrade.

6. Conversely, if the Geotechnical Engineer determines that the fill material is too dry for proper compaction, water shall be added to provide the specified optimum moisture content, as necessary for proper compaction.

7. At the completion of excavation and before placing any fills, proof-roll excavated subgrades.

8. All fill within the new athletic field and paved parking areas shall be placed and compacted under continuous monitoring by the Geotechnical Engineer.

    a. Place all specialized fill materials, as specified herein or as shown on the Drawings, within the new sports surface areas, paved parking area and pedestrian walkways in uniform lifts not exceeding 6 inches compacted thickness) and compact to 95 percent of maximum modified Proctor density.

    b. Place Ordinary Fill in uniform lifts not exceeding 6 inches (compacted thickness) and compact to 92 percent of maximum dry Proctor density.

9. Within lawns and planting areas: All fills shall be compacted to between 88 and 90 percent of its maximum modified dry Proctor density.

10. In the case of lawn and planting areas, compaction requirements for subgrades and fills shall be considered minimums and maximums within the density percentages called for, and any overcompaction of subgrades or fills which would be detrimental to lawn or planting objectives shall be corrected by loosening subgrades or fills through tilling or other means and recompacting to specified compaction limits.

11. The Contractor shall notify the Landscape Architect three (3) days in advance when the rough grades are established and ready for formal inspection.

B. Backfilling of Trenches and Structures:

1. Areas to be backfilled shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place fill when fill materials or layers below it are frozen unless specifically approved by the Soils Engineer.

2. Gravel shall be used as Backfill around manholes and other structures. Excavated material may be used if approved by the Landscape Architect or Soils Engineer.

3. Do not commence backfilling operations of utility trenches until all piping, conduits, etc. have been installed, tested and approved and the locations of all pipe and appurtenances have been recorded. Backfill carefully by hand around pipe to depth of one foot above top of pipe using material specified herein, and tamping firmly in layers not exceeding six inch layers, compacting by hand rammers or mechanical tampers. When a manufacturer of utility line materials suggests backfill materials and methods other than those specified herein, such requirements shall govern providing the finished work equals or exceeds the result obtained by the materials and methods specified herein. Water mains shall be

hand backfilled to a minimum cover of 18 inches before mechanical equipment can be used to backfill trench.

4. Sand Bedding will be required below all pipe unless otherwise shown on the Drawings or specified herein. Crushed Stone is required under utility structures where shown on the Drawings. Granular Fill, Sand Bedding or Crushed Stone shall be placed to the full width of the trench and under utility structure foundations as indicated on the Drawings. After a pipe is bedded, the trench shall be filled to the centerline of the pipe with Granular Fill or Sand Bedding except at the joint. After the joint is inspected, that portion shall be filled in with Sand Bedding. Material under and around the pipe shall be carefully and thoroughly tamped.

5. From the centerline of the pipe to a point 12 inches above the top of the pipe the backfill shall be crushed stone or Sand Fill placed by hand and hand tamped. Above this point, backfill shall be placed in layers six inches deep and each layer shall be compacted with mechanical tampers to not less than 95% of maximum density at optimum moisture of the material. This backfill shall be carried up to the bottom of materials specified to be placed for surfacing requirements.

6. Utilities shall not be laid directly on boulders or other hard material. This material shall be removed as specified herein within trench limits, and within vertical planes one foot outside of structure walls. Backfill will be placed in eight inch lifts and thoroughly compacted. If hand guided compaction equipment is used, fill shall be placed in six inch lifts. Ordinary Fill may be used as backfill in areas as specified herein.

7. Coordinate all utility and trench backfilling with the trades involved.

C. Moisture Control:

1. Variation of moisture content in fill and backfill materials shall be limited to Optimum Moisture (-l% to +2%). Moisture content shall be as uniformly distributed as practicable within each lift, and shall be adjusted as necessary to obtain the specified compaction.

2. Material which does not contain sufficient moisture to be compacted to the specified densities shall be moisture conditioned by sprinkling, discing, windrowing, or other method approved by the Soils Engineer.

   a. Material conditioned by sprinkling shall have water added before compaction. Uniformly apply water to surface of subgrade or layer of soil material to obtain sufficient moisture content. The Contractor shall maintain sufficient hoses and/or water distributing equipment at the site for this purpose.

3. Material containing excess moisture shall be dried to required Optimum Moisture before it is placed and compacted. Excessively moist soils shall be removed and replaced and shall be scarified by use of plows, discs, or other approved methods, and air-dried to meet the above requirements.

4. Materials which are within the moisture requirements specified above, but which display pronounced elasticity or deformation under the action of earthmoving and compaction equipment, shall be reduced to Optimum Moisture Content, or below, to secure stability.

5. In the event of sudden downpours or other inclement weather, exposed subgrades and fills which, in the opinion of the Soils Engineer become inundated

or excessively moistened shall have excess water removed and soil dried as specified above.

3.05 ROUGH GRADING

A. Rough grading shall include the shaping, trimming, rolling and finishing the surface of the sub-base, shoulders, and earth slopes, and the preparation of the sub-base for loam, seeding and paved surfaces. The grading of shoulders and sloped areas may be done by machine methods. All ruts shall be eliminated. Grading of subgrades for sports surface and roadway and parking areas shall be finished at the required depth below and parallel to the proposed surface.

1. If, during the progress of rough grading work, water pipe, sewer conduit, drain, or other construction is damaged due to operations under this Contract, the Contractor shall repair all such damage at no additional cost to the Owner and restore damaged areas to their original condition.

2. Do all other cutting, filling and grading to the lines and limits indicated on the Drawings. Grade evenly to within the dimensions required for grades shown on Drawings and specified herein. No stones larger than four inches (4") in largest diameter shall be placed in upper six inches (6") of fill. Fill shall be left in a compacted state at the end of the work day and sloped to drain.

3. The Contractor shall bring all areas to grades as shown on the Drawings and in the details. The Landscape Architect, however, may make such adjustments in grades and alignments as are found necessary to avoid special conditions encountered.

4. No rubbish of any description shall be allowed to enter fill material. Such material shall be removed from the site.

5. Complete the grading operations after the utilities installed, site improvements constructed, and all materials, rubbish and debris removed from the site. Leave subgrade for lawns clean at required grades. There must be sufficient grade staking to provide correct lines and grades.

6. Wherever streets, lawns, sidewalks, or other items contained within or outside of Limits of Contract lines have been excavated in fulfilling the work required under this Contract, this Contractor shall furnish and install all materials necessary to bring finished surfaces level with the existing adjacent surfaces. All work shall be installed to match the existing conditions in accordance with the governing authority. Notify the proper authorities prior to restoring surfaces outside the Contract Limit Lines.

3.06 DUST CONTROL

A. The Contractor shall take all necessary measures and provide equipment and/or materials to minimize dust from rising and blowing across the site and from impacting neighboring residential property. In addition, the Contractor shall control all dust created by construction operations and movement of construction vehicles, both on the site and paved ways at all times using sprinklered water, or other approved means.

B. Dust control is required off-site due to work under this Contract, in addition to watering, sweeping and other methods, the Contractor shall apply calcium chloride in the required amounts to properly control dust. These amounts shall be reviewed by the Landscape Architect prior to application. The Contractor shall maintain and clean public roadways from soil and mud resulting from work under this Contract by use of street sweepers or other approved methods.

C. Do not use oil or similar penetrants. Chemical materials may not be used on subgrades of areas to be seeded or planted.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. This Section specifies equipment and materials for an erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The erosion and sediment control provisions, including but not limited to wire backed silt fence, straw wattle, silt sacks, and other items detailed on the Drawings and specified herein are the minimum requirements for an erosion control program. The Contractor shall provide additional erosion and sediment control materials and methods as required to affect the erosion and siltation control principles specified herein.

B. Contractor shall be responsible for applying for a NPDES Permit with the EPA. The Contractor will also need to prepare the SWPPP and shall coordinate the submission with the Landscape Architect/Civil Engineer.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Site Preparation
B. Earthwork
C. Bituminous Concrete Pavement
D. Cement Concrete Pavement
E. Loam and Seed
F. Storm Drainage System

1.04 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

B. Commonwealth of Massachusetts Highway Department "Standard Specifications for Highways and Bridges" (MHD Specifications).

1.05 SUBMITTALS

A. Proposed methods, materials to be employed, and schedule for effecting erosion and siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:

1. Proposed methods for effecting erosion control including 1" = 30' scale plans (or other appropriate scale as approved by the Landscape Architect/Civil Engineer) indicating location of erosion control devices and siltation basins.

2. List of proposed materials including manufacturer's product data.
3. Schedule of erosion control program indicating specific dates from implementing programs in each major area of work.
4. Copy of SWPPP.

1.06 EROSION CONTROL PRINCIPLES

A. The Contractor shall implement all soil erosion and sediment control devices prior to excavation within the site.

B. The following erosion control principles shall apply to the land grading and construction phases:

1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner that will minimize soil erosion.
2. Whenever feasible, natural vegetation shall be retained and protected.
3. Extent of area, which is exposed and free of vegetation, and duration of its exposure shall be kept within practical limits.
4. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance.
5. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.
6. Sediment shall be retained on-site.
7. Erosion control devices shall be installed as early as possible in the construction sequence prior to start of clearing and grubbing operations and excavation work.

C. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to six months, and temporary erosion protection when erosion exposure period is expected to be less than six months.

1. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.
2. Temporary erosion protection shall be accomplished by covering with an erosion protection material appropriate for prevailing conditions.
3. Except where specified slope is indicated on Drawings, fill slopes shall be limited to a grade of 3:1 (horizontal: vertical) cut slopes shall be limited to a grade of 2:1.

PART 2 - PRODUCTS

2.01 EROSION CONTROL MULCH SILT SOCK

A. Elongated tubes of mulch that shall have a minimum diameter of twelve (12") inches and shall be installed with wooden stakes.

2.02 SILT SACK

A. Silt sack shall be manufactured from a specially designed woven polypropylene geotextile and sewn by a double needle machine, using a high strength nylon thread, and manufactured by ACF Environmental, Inc., 2831 Cardwell Road, Richmond, VA 23234 (800) 448-3636, or approved equal.

PART 3 - EXECUTION

3.01 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

A. Drainage swales adjacent to construction activities shall be monitored twice each month for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.

B. Culverts and drainage ditches shall be kept clean and clear of obstructions during construction period.

C. Erosion Control Devices

1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep.
2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.
3. Hay bales shall be inspected frequently and maintained or replaced as required to maintain both their effectiveness and essentially their original condition. Underside of bales shall be kept in close contact with the earth below at all times, as required to prevent water from washing beneath bales.
4. Sediment shall be removed from the retention ponds at the completion of the Project and periodically during construction. Sediment deposits shall be removed when sediment has accumulated to a depth of 12 in. or as directed.
5. Sediment deposits shall be disposed of off- site, in a location and manner which will not cause sediment nuisance elsewhere.

D. Removal of Erosion Control Devices

1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.
2. Erosion control netting shall be kept securely anchored until start of permanent turf construction.
3. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire Project, whichever is later.

3.02 EROSION CONTROL MULCH SILT SOCK

A. Mulch sock shall be furnished and installed as indicated on the Drawings prior to the start of clearing and grubbing operations.

B. Mulch sock shall be installed as indicated in the Drawings and shall be with stakes at a maximum 4' on center.

C. Mulch sock shall remain in working order until the site is stabilized. Additional erosion controls shall be installed, as needed to prevent silt from leaving the site, at no additional cost to the Owner.

3.03 SILT SACK

A. Silt sack shall be installed per the manufacturer's recommendations.

B. Silt sack shall be emptied when full and is reusable.

END OF SECTION

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 32 00 00
EXTERIOR IMPROVEMENTS

ACTIVITAS

SECTION 32 12 16

BITUMINOUS CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. Work Included: Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Construction of dense graded crushed stone base course for all new paved areas.
2. Rough grading and compaction of base material.
3. New bituminous concrete paved areas as shown on the plans.
4. Bituminous concrete (asphalt) berm curbing as shown on the plans.

1.03 RELATED WORK

A. Cast-In-Place Concrete
B. Site Preparation
C. Earthwork
D. Cement Concrete Pavement
E. Pavement Markings
F. Loam and Seed
G. Storm Drainage System

1.04 REFERENCES

A. Work shall conform to codes and standards of the following:

1. ASTM – American Society of Testing Materials
2. AASHTO – American Association of State Highway and Transportation Officials
3. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications).
4. Americans with Disabilities Act (ADA) Appendix to Part 1191 Accessibility Guidelines for Building and Facilities.
5. Massachusetts Architectural Access Board (MAAB).

1.05 QUALITY ASSURANCE

A. Codes and standards: Perform site improvement work in compliance with applicable requirements of governing authorities having jurisdiction.

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

C. Layout and Grading: After staking and layout out the work, and before beginning final construction, obtain the Landscape Architect's/Civil Engineer's approval of layout and grades. Contactor shall make minor adjustments as determined by the Landscape Architect/Civil Engineer.

D. The Contactor and his Subcontractors shall inspect all subbases for unstable, unsuitable or improperly prepared areas. Do not begin work over unacceptable areas. Beginning work means the Contractor and his Subcontractors accept the subbase, previous work and conditions and shall be held responsible for any corrections required to properly implement the Construction Documents.

E. Prior to bituminous concrete pavement operations, the Contractor shall perform 3rd party nuclear density gauge in-place compaction tests. Contractor shall perform a minimum of twenty (20) tests at the proposed parking lot and along the proposed walkways. Test results shall be submitted to the Owner's Representative prior to paving the bituminous concrete pavement. Additional tests may be ordered at no additional cost to the Owner.

1.06 SUBMITTALS

A. Product Information: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation. Work includes but is not limited to the following items.

1. Bituminous concrete pavement – mix data for binder course and surface course
2. Bituminous concrete berm – mix data
3. Resumes paving foreman and crew

1.07 JOB CONDITIONS

A. Environmental Requirements: The Subcontractor shall verify site conditions to assure that the requirements for installation procedures conform to the following:

1. Paving shall not be placed when the ambient temperature is below 40 degrees Fahrenheit or when there is frost in the base course or any other time when weather conditions are unsuitable for the type of material being placed.
2. After final rolling of bituminous concrete pavement, no vehicular traffic of any kind shall be permitted until it has cooled for 24-hours.

B. Site Information: Data on indicated grades, utilities and other existing conditions are not intended as representations or warranties of accuracy.

C. Existing Utilities: Locate existing utilities in areas of work. If utilities are to remain in place, provide adequate means of protection during installation of site improvements.

D. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Landscape Architect/Civil Engineer and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing fencing, existing plant materials, and adjoining properties.

E. The Contractor shall remove all debris, construction equipment and scrap material from areas within the limit of work prior to inspection for acceptance.

F. The Drawings indicate, in general, the alignment and finished grade elevations. The Landscape Architect/Civil Engineer, however, may make minor adjustments to grades and alignments as are found necessary.

1.06 ADA AND UNIVERSAL ACCESSIBILITY COMPLIANCE

A. Special attention is to be given to compliance with the Americans with Disabilities Act (ADA) and the requirements of the Massachusetts Architectural Access Board (MAAB).

1. Walkway Slopes: The cross pitch (perpendicular to travel) for all pedestrian walkways of travel shall be constructed at 1.5% (2% maximum, 1% minimum). The longitudinal slope (parallel to travel) for all pedestrian walkways shall not exceed 4.5%. The slope of all handicapped curb cuts shall be constructed at 7.14% (8.3% maximum).

2. The Contractor is to assume that all sidewalk grades shall be verified/checked with a 2-foot electronic "Smart Level". Pedestrian pavements that do not meet these requirements shall be replaced at the Contractor's expense.

B. The above requirements shall supersede the grades shown on the grading plan. If the requirements cannot be met with the grades shown on the plans, the Contractor shall notify the Landscape Architect/Civil Engineer immediately.

C. The location and construction of all handicapped curb cuts shall be reviewed and approved by the Town Engineer prior to construction.

PART 2 - PRODUCTS

2.01 DENSE GRADED CRUSHED STONE (AGGREGATE BASE COURSE)

A. Dense Graded Crushed Stone shall be as specified under Section 31 20 00, Earthwork.

B. The Contractor shall submit to the Landscape Architect/Civil Engineer a sieve analysis by an independent recognized testing laboratory of the material he intends to utilize. No material shall be placed until approved by the Landscape Architect/Civil Engineer in writing.

C. Dense Graded Crushed Stone for all new pavement shall consist of two (2) lifts with a minimum finished depth after rolling and compaction of twelve (12") inches.

2.02 BITUMINOUS CONCRETE PRODUCT MIX REQUIREMENTS:

A. As noted below, materials shall conform with the following:

Sieve Designation	Binder Course	Surface Course	Curb (Dense Mix)
1 in.	100		
3/4 in.	80-100		
5/8 in.		100	
1/2 in.	55-75	95-100	100
3/8 in.		80-100	80-100
No. 4	28-50	50-76	55-80
No. 8	20-38	37-54	48-63
No. 16		26-40	36-49
No. 30	8-22	17-29	24-38
No. 50	5-15	10-21	14-27
No. 100		5-16	6-18
No. 200	0-5	2-7	4-8
Bitumen	4.5-5.5	5.5-7	7-8

*Percentages shown in table above for aggregate sizes are stated as proportional percentages of total aggregate for the mix.

B. Reclaimed Asphalt Pavement (RAP) may be used in Class I Bituminous Concrete. The proportion of RAP to virgin aggregate shall be limited to a maximum of 20% for drum mix plants and 10% for modified batch plants, or as approved by the Landscape Architect/Civil

Engineer. The maximum amount of RAP for surface courses shall be 5% (except in Open Graded Friction Course in which RAP is not allowed) or as approved by the Landscape Architect/Civil Engineer.

2.04 PARKING AREAS, DRIVES ANDWALKWAYS

A. Bituminous concrete for walkways shall be Class I, Type I-1 hot plant mix, conforming to Section 2.02 A above and shall consist of two (2) courses of bituminous concrete with a minimum finished pavement depth after rolling of three (3") inches.

1. Binder Course shall be two (2") inches in thickness consisting of one (1) lift of Binder Course Bituminous Concrete.
2. Surface Course shall be one (1") inch in thickness consisting of one (1) lift of Surface Course Bituminous Concrete.

2.05 BITUMINOUS CONCRETE CURB

A. The bituminous concrete for curbing shall be Class I conforming to the applicable requirements for Dense Mix (see Table as part of 2.02).

2.06 BITUMINOUS MATERIALS

A. Bituminous material for prime coat shall be one of the following:

1. Cut-back asphalt (rapid-curing type) conforming to AASHTO M81, Grade RC-70 or
2. Emulsified asphalt rapid-setting type conforming to AASHTO M140, Grade RS-1.

B. Bitumen shall be a rapid-setting type emulsified asphalt conforming to AASHTO M140, Grade RS-1.

C. Bituminous crack sealer shall be a hot-applied bituminous sealer conforming to Fed. Spec. SS-S-1401.

PART 3 - EXECUTION

3.01 GRADING AND PREPARATION OF EXISTING BASE COURSE (SUBGRADE)

A. Areas to be paved will be compacted and brought approximately to subgrade elevation before work of this Section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to be paved shall be re-compacted as required to bring top 8 inches of material immediately below bituminous concrete pavement to a compaction of at least 95% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 foot beyond pavement edge.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Landscape Architect/Civil Engineer. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction.

Ruts greater than or equal to 2 inches deep in subgrade, shall be graded out, reshaped as required, and re-compacted before placing dense graded crushed stone base course materials and pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated and/or stripped under this Section, and material unsuitable for or in excess of requirements for completing work of this Section shall be legally disposed off-site, unless otherwise directed by the Landscape Architect/Civil Engineer or Owner.

H. Prepared subgrade will be inspected by the Landscape Architect/Civil Engineer. Subgrade shall be approved by the Landscape Architect/Civil Engineer before installation of bituminous concrete pavement. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.

3.02 DENSE GRADED CRUSHED STONE BASE COURSE

A. Dense graded crushed stone base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following: MHD Specifications Section 402, "Dense Graded Crushed Stone for Sub-Base."

B. Compaction of dense graded crushed stone base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 inches shall be excluded from aggregate base course materials.

C. Width of dense graded crushed stone base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

D. Dense graded crushed stone material shall be applied in lifts less than or equal to 6 inches thick, compacted measure. Each lift shall be compacted to project specified density with compaction verified by performance of on-site field density testing.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
3. Surface irregularities which exceed ½ inch measured by means of a 10-foot long straightedge shall be replaced and properly compacted.

E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with dense graded crushed stone base course. Materials spilled outside pavement lines shall be removed and area repaired.

F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.03 BITUMINOUS PAVING

A. Bituminous paving mixture, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base, etc., shall conform to MHD Specifications Section 460 Class I Bituminous Concrete Pavement for roadway and parking areas and Section 701 Sidewalks, Wheelchair ramps, and Driveways for sidewalks.

B. Bituminous binder and surface courses shall each be applied individually, in single lifts of full thickness as indicated on the Drawings.

C. Work shall not be performed during rainy weather or when temperature is less than 40 degrees Fahrenheit.

D. Adjacent concrete work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original condition.

E. Deliveries shall be timed to permit spreading and rolling all material during daylight hours, unless artificial light, satisfactory to Landscape Architect/Civil Engineer, is provided. Loads which have been wet by rain or otherwise will not be accepted. Hauling over freshly load or rolled material will not be permitted.

F. Placing and rolling of mixture shall be as nearly continuous as possible. Rolling shall begin as soon after placing as mixture will bear the operation without undue displacement. Delays in rolling freshly spread mixture will not be permitted. Rolling shall proceed longitudinally, starting at edge of newly placed material and proceeding toward previously rolled areas. Rolling overlap on successive strips shall be greater than or equal to ½ width of roller rear wheel. Alternate trips of roller shall be of slightly different lengths. Corrections required in surface shall be made by removing or adding materials before rolling is complete. Skin patching of areas where rolling has been complete will not be permitted. Course shall be subjected to diagonal rolling, crossing lines of the first rolling while mixture is hot and in compactable condition. Displacement of mixture or other fault shall be corrected at once by use of rakes and application of fresh mixture or removal of mixture, as required. Rolling of each course shall be continued until roller marks are eliminated. Roller shall pass over unprotected edge of course only when paving is to be discontinued for sufficient time to permit mixture to become cold.

G. In places not accessible to roller, mixture shall be compacted with hand tampers. Hand tampers shall weigh at least 50 lbs. and shall have a tamping face less than or equal to 100 square inches. Mechanical tampers capable of equal compaction will be acceptable in areas, which they can be employed in the work.

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

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

J. Contact surfaces of previously constructed pavement (if greater than or equal to seven days since binder placed), manholes, and similar structures shall be thoroughly cleaned and painted with a thin uniform coating of bitumen immediately before fresh mixture is placed. Tack coat shall be applied at rate which will leave asphaltic residue of 5 to 7 gal./100 sq. yd. after evaporation of vehicle. Base surface shall be dry and clean tack coat is applied. Bituminous paving material shall not be placed until vehicle has completely evaporated from tack coat. Adjoining new paving shall be placed before tack coat has dried or dusted over.

K. Earth or other approved material shall be placed along pavement edges in such quantity as will compact to thickness of course being constructed, allowing at least 1 foot of shoulder width to be rolled and compacted simultaneously with rolling and compacting surface.

Pavement edge shall be trimmed neatly to line before placing earth or other approved material along edge.

L. After final rolling, vehicular traffic shall not be permitted on pavement until it has cooled and hardened, and in no case less than six hours.

M. Variations in smoothness of finished surface shall be less than or equal to the following tolerances when tested with a 10 foot straightedge, applied both parallel to and at right angles to centerline of paved area.

1. For walkway, drive and parking pavement surface courses – ¼ inch in 10 feet.
2. At joint with existing pavement, and at other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed 0.01 feet.
3. At other areas pavement elevation tolerance shall not exceed ± 0.05 feet.
4. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this Specification.

N. The Contractor shall check the final surface for depressions by applying water in the presences of the Landscape Architect/Civil Engineer. Minor depressions (less than 1/8" in depth) need not be corrected, however, in cases where the variation in the surface course exceeds 1/8", the entire area affected shall be removed and replaced with new surface course at the expense of the Contractor.

3.04 BITUMINOUS CONCRETE CURB

A. All bituminous concrete curbs shall conform with MHD Construction Standards.

3.05 REPAIRS TO EXISTING PAVEMENT

A. Subgrade shall be done in strict accordance with Paragraph 3.01, above.

B. Dense Graded Crushed Stone shall be replaced in strict conformance with Paragraph 3.02, above.

C. Bituminous concrete paving mixture, equipment, and methods of mixing and placing shall conform to MHD Specifications Section 472 for Bituminous Concrete for Patching, and Paragraph 3.03, above.

END OF SECTION

SECTION 32 13 13

CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Cement concrete pavement at walkways, site furnishing pads, and all other areas as indicated in the Drawings.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Site Furnishings
B. Electrical
C. Earthwork
D. Bituminous Concrete Pavement
E. Vertical Granite Curb
F. Loam and Seed
G. Storm Drainage System

1.04 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern

B. American Society for Testing and Materials (ASTM):

A 185 Welded Steel Wire Fabric for Concrete Reinforcement
C 33 Concrete Aggregates
C 91 Masonry Cement
C 94 Ready-Mix Concrete
C 143 Slump of Cement Concrete
C 150 Portland Cement
C 171 Sheet Materials for Curing Concrete
C 231 Air Content of Freshly Mixed Concrete by the Pressure Method
C 260 Air Entraining Admixtures for Concrete
C 309 Liquid Membrane-Forming Compounds for Curing Concrete
C 494 Chemical Admixtures for Concrete
D 1557 Moisture – Density Relations of Soils and Soil Aggregate Mixtures Using 10 lbs. (4.54-kg) Rammer and 18-in. (457 mm) Drop.
D 1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

C. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications).

D. Americans with Disabilities Act (ADA) Appendix to Part 1191 Accessibility Guidelines for Building and Facilities.

E. Massachusetts Architectural Access Board (MAAB)

1.05 QUALITY ASSURANCE

A. Unless otherwise specified, work and materials for construction of the cast-in-place concrete paving shall conform to ACI 316R.

B. Paving work, base course, etc., shall be done only after excavation and construction work, which might injure them, has been completed. Damage caused during construction shall be repaired before acceptance.

C. Existing paving areas shall, if damaged or removed during course of the project, be repaired or replaced under this Section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.

D. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade.

E. The Owner reserves the right to retain an independent testing laboratory to perform inspection and testing of paving and associated work.

1.06 SUBMITTALS

A. Concrete mix design

1.07 ADA AND UNIVERSAL ACCESSIBILITY CODE

A. Special attention is to be given to compliance with the American with Disabilities Act (ADA) and the requirements of the Universal Accessibility Code.

1. Walkway Slopes: The cross pitch (perpendicular to travel) for all pedestrian walkways of travel shall be constructed at 1.5% (2% maximum, 1% minimum). The longitudinal slope (parallel to travel) for all pedestrian walkways shall not exceed 4.5%. The slope of all handicapped curb cuts shall be constructed at 7.14% (8.3% maximum).
2. Very slopes with a 2-foot electronic "Smart Level". Pedestrian pavements that do not meet these requirements shall be replaced at the Contractor's expense.

B. The above requirements shall supersede the grades shown on the grading plan. If the requirements cannot be met with the grades shown on the plans, the Contractor shall notify the Landscape Architect/Civil Engineer immediately.

1.08 TESTING AND INSPECTION

A. The Owner reserves the right to have tests made on cement concrete and associated materials, at his option, as the job progresses. A recognized Testing Laboratory, selected by the Landscape Architect/Civil Engineer, with all costs paid by the Owner, will perform tests. The Contractor shall agree to abide by the results of the tests; he shall make all adjustments and changes to mortar and materials to meet the specification requirements at no additional cost to the Owner.

B. Notwithstanding, Contractor to perform his own testing and results to be provided to Landscape Architect/Civil Engineer and Owner.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver manufactured products in manufacturer's original, unopened, and undamaged containers with labels intact and legible.

B. Store and handle manufactured products to prevent damage and deterioration

PART 2 - PRODUCTS

2.01 DENSE GRADED CRUSHED STONE BASE COURSE

A. Dense Graded Crushed Stone shall be as specified under Section 31 20 00, EARTHWORK.

B. The Contractor shall submit to the Landscape Architect/Civil Engineer a sieve analysis by an independent recognized testing laboratory of the material he intends to utilize. No material shall be placed until approved by the Landscape Architect/Civil Engineer in writing.

C. Dense Graded Crushed Stone for all new pavement areas shall consist of two (2) lifts with a minimum finished depth after rolling and compaction of eight (8") inches.

2.02 STEEL REINFORCEMENT

A. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A 185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

2.03 PORTLAND CEMENT CONCRETE

A. Portland cement concrete for pavements and slabs shall be air-entrained type with a maximum water-cement ratio of 5.0 conforming to ACI 316R. Minimum compressive strengths at 28 days shall be as follows: Flexural strength with third point loading - 650 psi; compressive strength – 4,000 psi.

1. Concrete shall be air-entrained type, conforming to ASTM C 94. Air content by volume shall be 6% +/-□ 1%, and shall be tested in accordance with ASTM C 231.
2. Concrete slump shall be no less than 2 in. nor greater than 4 in., determined in accordance with ASTM C 143.
3. Cement shall be Portland cement, conforming to ASTM C 150, Type I or II. Only one color of cement, all of the same manufacturer, shall be used for the work. Type III cement shall be used only with the prior approval of the Landscape Architect/Civil Engineer.
4. Fine and coarse aggregates shall conform to ASTM C 33.
5. Concrete shall contain a water reducing agent to minimize cement and water content of the concrete mix at the specified slump. Water reducing agent shall conform to ASTM C 494.
6. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of the Landscape Architect/Civil Engineer in each case.

2.04 CURING MATERIALS

A. Curing shall be by moist curing or by use of curing compound.

B. Curing paper shall be non-staining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.

C. Curing compound shall be a resin-base, white pigmented compound conforming to ASTM C 309, Type 2.

2.05 EXPANSION JOINTS

A. Unless otherwise indicated on the Drawings, expansion joints shall be located 30' on center, maximum. Contractor shall review proposed expansion joint layout with the Landscape Architect/Civil Engineer prior to paving operations. Contractor shall not install pavement without the Owner Representative's approval of proposed expansion joint layout.

B. Expansion joint filler shall be preformed, non-bituminous type joint filler conforming to ASTM D 1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., Elgin, IL 60120, or approved equal.

1. Premolded filler shall be one piece for the full depth and width of the joint leaving a sealant recess as recommended by the manufacturer.
2. Use of multiple pieces of lesser dimensions to make up required depth and width of joints will not be permitted.
3. Except as otherwise noted on the Drawings, joint filler shall be ½" thick.

C. Expansion joints shall receive joint backer rod and shall be sealed with an approved self-leveling joint sealant.

2.06 CONTROL JOINTS

A. Control joints shall be installed per the Drawings. Contractor shall coordinate, review, and receive approval of proposed control joint layout from the Landscape Architect/Civil Engineer prior to commencing paving operations.

2.07 CONSTRUCTION JOINTS

A. Transverse construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.
1. Butt joint with dowels or thickened edge joint shall be used if construction joints occur at a location of a control joint.
2. Keyed joints with tie bars shall be used if the construction joint occurs at any other location.

2.08 GROUT

A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.

B. Nonshrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRDC 621 (558). Grout permanently exposed to view shall be nonoxidizing; metallic grout may be used in other locations.

1. Nonshrink grout shall be one of the following, or approved equal:

Manufacturer	Product
Gifford-Hill Co.	Supreme
Master Builders Co.	Embeco
U.S. Grout Corporation	Five Star Grout

2.09 BOND BREAKER

A. Bond breaker shall be asphalt felt conforming to ASTM D 226, Type I or 6 mil polyethylene sheeting.

2.10 DETECTABLE WARNING PLATES

A. Detectable warning plates shall be equivalent to cast iron plates as manufactured by Duralast/EJ Group, 301 Spring Street, PO Box 439, East Jordan, MI 49727, (800) 626-4653.

B. Detectable warning plates shall be compliant with Section 4.29 of the ADA Accessibility Guidelines and Section 705 of the 2010 ADA Standards for Accessible Design.

C. Truncated domes shall have a minimum base diameter of 0.9 inches and maximum base diameter of 1.4 inches, a minimum top diameter of 50% of the base diameter and a maximum of 65% of the base diameter, height shall be 0.2 inches.

D. Detectable warning plates shall be 24" deep and equal to the width of the pavement they are located in.

E. Sizes and quantity: refer to Drawings and submit for approval.

F. Color shall be selected from manufacturers list of standard colors.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Areas to be paved will be compacted and brought to subgrade elevation under Section 31 20 00, EARTHWORK before work of this section is performed. Final fine grading, filling, and compaction of areas to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material, which will not readily compact as required, shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to be paved shall be re-compacted as required to bring top 8 in. of material immediately below gravel base course to a compaction at optimum moisture of at least 95% of maximum density, as determined by ASTM D 1557. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, subbase, base, or pavement, subsequent backfill and compaction shall be performed as directed by the Landscape Architect/Civil Engineer as specified in Section 31 20 00 - EARTHWORK. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 inches deep in subgrade, shall be graded out, reshaped as required, and re-compacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.

H. Prepared subgrade will be observed by the Landscape Architect/Civil Engineer prior to installation of compacted dense graded crushed stone base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this section of the specification.

3.02 DENSE GRADED CRUSHED STONE BASE COURSE

A. Dense graded crushed stone base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following: MHD Specifications Section 402, "Dense Graded Crushed Stone for Sub-Base."

B. Compaction of dense graded crushed stone base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 inches shall be excluded from aggregate base course materials.

C. Width of dense graded crushed stone base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

D. Dense graded crushed stone material shall be applied in lifts less than or equal to 6 inches thick, compacted measure. Each lift shall be compacted to project specified density with compaction verified by performance of on-site field density testing.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
3. Surface irregularities which exceed ½ inch measured by means of a 10-foot long straightedge shall be replaced and properly compacted.

E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with dense graded crushed stone base course. Materials spilled outside pavement lines shall be removed and area repaired.

F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.03 STEEL REINFORCEMENT

A. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material that may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be re-inspected and cleaned when necessary.

B. Unless otherwise indicated on the Drawings, reinforcing shall extend within 2 in. of formwork and expansion joints. Reinforcing shall continue through control joints.

C. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Landscape Architect/Civil Engineer.

3.04 PORTLAND CEMENT CONCRETE PAVING

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to

weather, condition of base etc., shall meet the requirements of ACI 316R. Pavement shall be constructed in accordance with the Drawings.

B. The Landscape Architect/Civil Engineer shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade, forms, and reinforcing steel, if used.

C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the jobsite so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the Landscape Architect/Civil Engineer must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.

D. Work shall not be performed during rainy weather or when temperature is less than 40°F. (4.4°C).

E. Adjacent work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.

F. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.

G. Concrete that has set or partially set before placing shall not be employed. Re-tempering of concrete will not be permitted.

H. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

f

I. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.05 FINISHING

A. Concrete flatwork surfaces shall be screeded off and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.

1. Finished concrete surface for concrete pads shall be wood-floated and steel troweled to a smooth surface. Surface shall not deviate more than 1/8 in. in 10 ft.

B. Unless otherwise indicated, horizontal surfaces of concrete surfaces that will be exposed shall be given a light broomed finish, with direction of grooves in concrete surface perpendicular to length of concrete band, slab, or pad. After concrete has set sufficiently to prevent coarse aggregate from being torn from surface, but before it has completely set, brooms shall be drawn across it to produce a pattern of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Brooming operations shall not dislodge coarse aggregate.

C. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.06 CURING

A. It is essential that concrete be kept continuously damp from time of placement until end of

specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.

B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.

1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.
2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 sq. ft. per gallon, in two applications perpendicular to each other.
3. Curing period shall be seven days minimum.

3.07 COLD WEATHER CONCRETING

A. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40 degrees F. or is expected to fall to below 40 degrees F. within 72 hours, and the concrete after placing shall be protected by covering, heat, or both.

B. Details of handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Landscape Architect/Civil Engineer. Procedures shall be in accordance with provisions of ACI 306R.

3.08 HOT WEATHER CONCRETING

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (95 degrees F, or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95 degrees F, when ready for placement will not be acceptable, and will be rejected.

C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

3.09 PROTECTION OF CONCRETE SURFACES

A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary 1/2 in. thick plywood sheets shall be used to protect the exposed surface.

3.10 DETECTABLE WARNING PLATES

A. Install per manufacturer recommendations and in accordance with the Drawings.

END OF SECTION

SECTION 32 15 40

STONE DUST PAVING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section, whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all under the Contract.

1.02 WORK INCLUDED

A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Provide stabilized crushed aggregate screenings/stone dust (CAS) paving, complete as shown for the walkway south of the proposed parking.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Earthwork
B. Bituminous Concrete Pavement
C. Cement Concrete Pavement
D. Loam and Seed

1.04 REFERENCES

A. Work shall conform to codes and standards of the following:

1. ASTM - American Society for Testing and Materials
2. Mass. Specs. - Massachusetts Highway Department Standard Specifications for Highways and Bridges.
3. AASHTO - American Association of State Highway and Transportation Officials
4. Americans with Disabilities Act (ADA).
5. Massachusetts Architectural Access Board (MAAB).

1.05 QUALITY ASSURANCE

A. Unless otherwise specified, work and materials for construction of the stone dust paving shall conform to the applicable portions of the following:

1. MHD Specifications Section M2 for Aggregates and Related Materials and M2.05.0 for Stone Screenings

B. Codes and standards: Perform site improvement work in compliance with applicable requirements of governing authorities having jurisdiction.

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

D. Layout and Grading: After staking and laying out the work, and before beginning final construction, obtain the Landscape Architect's/Civil Engineer's approval of layout and grades. Contractor shall make minor adjustments as determined by the Landscape Architect/Civil Engineer.

E. The Contractor and his Subcontractors shall inspect all subbases for unstable, unsuitable or improperly prepared areas. Do not begin work over unacceptable areas. Beginning work means the Contractor and his Subcontractors accept the subbase, previous work and conditions and shall be held responsible for any corrections required to properly implement the Construction Documents.

F. Submit certified documentation of successful experience of no less than three (3) years in the installation of similar crushed stone paving in comparable scale projects.

G. Testing Agency: Selected by Owner and paid for by the Contractor.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect crushed stone from contamination with foreign materials. Isolate stockpiles to prevent mixing of different aggregate grades. Prevent contamination with organic materials.

1.07 SEQUENCING AND SCHEDULING

A. Acceptance: Do not install work under this section prior to acceptance of the subgrade preparation under another section.

B. Coordination: Coordinate with other trades to insure a proper installation schedule.

1.08 MAINTENANCE

A. Service: Immediately repair all damage to the work as the result of weather or traffic conditions. Report all damage resulting from work of other trades after acceptance of work. Repair to match adjacent undisturbed work.

1.09 SUBMITTALS

A. Product Data: Manufacturer's current catalog cuts and specifications for decomposed granite (crushed aggregate screenings, CAS).

B. Samples: Half (1/2) a pound for each size and color range of decomposed granite/crushed aggregate screenings.

C. Provide product information on stabilizing solution.

PART 2 - PRODUCTS

2.01 CRUSHED AGGREGATE SCREENINGS (CAS)

A. Crushed Aggregate Screening, or Stone Dust, shall meet the requirements of Section M2.05.0 Stone Screenings of the Standard Specification For Highways and Bridges per the Massachusetts Highway Department.

B. Furnish and install a stabilizing solution in the stone pack to provide a firmer, more stable surface. The solution shall be equal to Stabilizer as provided by Stabilizer Solutions of Phoenix, AZ.

2.02 EQUIPMENT

A. Compaction Equipment: Power roller weighing not less than five (5) tons.

2.03 ACCESSORIES

A. Water: Fresh, clean, potable water as available from the Owner or transported as required.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that the adjacent paving or surfacing has been installed and accepted under another Section prior to commencement of work.

B. Confirm elevation of throwing circles so that final CAS grade matches that elevation.

3.02 PREPARATION

A. Compaction: Compact subgrade to a minimum of 95% compaction.

3.03 INSTALLATION

A. Stone Dust Paving

1. If the dump truck delivering the CAS is able to back-up to the prepared base, it is advisable to dump the first load at the entrance, spread by grading the CAS onto the base in a pushing mode and continue in this manner so the delivery vehicles reverse over the graded CAS to dump but do not actually travel directly onto prepared base

2. Lines and Levels: Install all crushed aggregate screenings work true to grade, properly coinciding with adjacent work and elevations. Provide a finished surface uniform in texture and appearance. Do not permit finished work to vary more than 1/8" in 10' from true profile and cross section.

3. Moisture Content: Add water to provide a uniformly distributed moisture to obtain the required compaction.

4. Apply stabilizing solution per manufacturer's recommendations.

5. Compacting: Thoroughly compact each lift to a minimum of 95% Compact each area with at least four (4) passes of compacting equipment. After compacting, screed smooth.

6. Grading: When surface areas have been rolled and it becomes necessary to add a thin layer of material to bring the surface to grade, the previously rolled or compacted area shall be raked to provide a bond with the added material.

7. Damaged or Defective Installation: Repair and replace in accordance with these Specifications at no additional cost to the Owner.

3.04 PROTECTION

A. Protect the paving against traffic, injury or defacement, or damage and subsequent construction operations until Final Acceptance.

END OF SECTION

SECTION 32 16 13

VERTICAL GRANITE CURB

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDTIIONS and all Sections within DIVISON 01 00 00 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SUMMARY

A. Provide all labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Vertical, Flush, and Transition Granite Curbs

1.03 REFERENCES

A. Work shall conform to codes and standards of the following:

1. ASTM - American Society for Testing and Materials.
2. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications).

1.04 SUBMITTALS

A. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of all parts of the work under this section including but not limited to the following items:

1. Granite Curb

1.05 QUALITY ASSURANCE

A. Unless otherwise indicated, granite curb materials and construction shall conform to the applicable portions of the following:

1. MHD Specification Section 500, "Curb and Edging".

B. Curb Layout: After staking and performing layout for the curb work, and before beginning curb installation, obtain the Landscape Architect's/Civil Engineer's approval of layout. Contractor shall make minor adjustments as determined by the Landscape Architect/Civil Engineer.

C. Suitability of Sub-base: The Contractor and his Subcontractors shall inspect all subbases for unstable, unsuitable or improperly prepared areas. Do not begin work over unacceptable areas. Beginning work means the Contractor and his Subcontractors accept the subbase, previous work and conditions and shall be held responsible for any corrections required to properly implement the Construction Documents.

D. Suitability of Existing Granite Curb: The Contractor, his Subcontractors, the Landscape Architect/Civil Engineer shall inspect existing granite curbs for suitability for resetting. Broken, chipped, or otherwise damaged curbs shall be replaced with new granite curb unless otherwise directed by the Landscape Architect/Civil Engineer.

1.06 PROJECT CONDITIONS

A. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Landscape Architect/Civil Engineer and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.

B. The Contractor shall remove all debris, construction equipment and waste material from areas within the limit of work prior to inspection for acceptance.

C. The Drawings indicate, in general, the alignment and finished grade elevations. The Landscape Architect/Civil Engineer, however, may make minor adjustments in grades and alignment as are found necessary.

D. Salvage Existing Curb: Maximum reuse shall be made in the new work of existing granite curbing which is removed and stockpiled. Additional granite curbing shall be provided by the Contractor. Coordination and use of additional granite curbing to be responsibility of the Contractor. Existing curb to be reused shall be reset in accordance with the requirements of this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products and supplies to the job adequately protected from damage during transit.

B. Store products and supplies off the ground with wood cribbing between each unit. Curb shall be protected against staining, chipping, and other damage. Cracked, badly chipped, or stained units will be rejected and shall not be employed in the work.

PART 2 - PRODUCTS

2.01 GRANITE CURBING

A. Granite shall be a structural granite conforming to ASTM C 615, Class I Engineering Grade, suitable for curbstone use.

1. Curb shall be light grey, free from seams which impair structural integrity, and with percentage of wear less than 32%, as determined by ASTM C 131.

B. Curb materials shall conform to MHD Specifications Section M9.04.0 and shall meet requirements specified in the following subsection of Division III, Materials of the MHD Specifications:

Item	Section	Type
Granite Curb	M9.04.1	VA4
Granite Curb Corners	M9.04.6	

C. Curb shall be installed on a radii of 250' or less shall be custom cut to the specific radius. Straight, faceted sections will not be accepted.

2.02 CEMENT MORTAR

A. Mortar for pointing joints between curbstones shall be a cement mortar composed of one part Portland cement and two parts sand, by volume with sufficient water to form a workable, stiff mixture.

2.03 CONCRETE

A. Concrete for foundation at granite curb shall conform to MHD Specifications Section M4.00.0, 4,000 psi, 1-1/2 in., 565 (Class A).

PART 3 - EXECUTION

3.01 SETTING CURB

A. Set curb in accordance with MHD Specifications Section 501 and approved Shop Drawings.

B. Set curb with continuous concrete setting bed.

C. Vertical face of vertical curb shall be plumb, with curb top parallel to adjacent surface.

D. Set curb accurately to line and grade. Fit curb units together as closely as possible. Do not field cut curbs.

E. Joints between curb units shall be carefully filled with a cement mortar, and neatly pointed on the top and front exposed portions. After pointing excess mortar shall be cleaned from curb surface.

F. Backfill material on each side of curb shall be as specified for adjacent surface and shall be thoroughly compacted by means of power tampers. Extreme care shall be taken not to destroy alignment. Curb sections disturbed during backfilling or otherwise shall be reset to line and grade, and properly backfilled.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 010000 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Installing reflectorized pavement markings including parking lines, striping, crosswalks, and traffic arrows as indicated on the drawings.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Bituminous Concrete Paving

1.04 REFERENCES

A. Work shall conform to codes and standards of the following:

1. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications), 1988 Edition.
2. U.S. Department of Transportation Federal Highway Administration "Manual on Uniform Traffic Control Devices", 1988 Edition.
3. AAB and ADA Regulations for all handicap parking.

1.05 SUBMITTALS

A. Product Data: Submit suppliers certificate of conformance.
B. Test Reports: Submit test reports for required performance.
C. Layout: Furnish layout computations.

1.06 QUALITY ASSURANCE

A. Source: Provide the products of one manufacturer and source for consistency.

B. Standards: Conform to all requirements of the U.S. Department of Transportation Federal Highway Administration "Manual on Uniform Traffic Control Devices", 1988 Edition (herein after referred to as MUTCD), together with all issued errata, addenda, additions, revisions and supplemental specifications. Conform to all requirements of the latest ADA standards for handicap parking.

1.07 LAYOUT OF WORK

A. The Contractor shall furnish to the Landscape Architect for approval a schedule of pavement marking operations in accordance with MHD Specifications Section 860.61.

1.08 TRAFFIC CONTROL

A. Suitable warning signs shall be placed near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions.

B. Place traffic cones along newly painted lines to control traffic and prevent damage to newly painted surfaces. Remove when paint has dried fully.

C. Painting equipment shall be marked with large warning signs indicating slow moving painting equipment in operation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials for pavement markings shall conform to MHD Specifications Section 860.40 as applicable.

B. Reflectorized White Pavement Markings: Provide white paint conforming to the requirements of Section M7.01.5 in Reference (1) of the Standard Specifications for white thermoplastic reflectorized pavement markings conforming with the requirements for Section M7.01.03 in Reference (1) of the Standard Specifications. Provide glass beads conforming to the requirements of Sections M7.01.07 in Reference (1) of the Standard Specifications.

C. Glass Beads: Provide glass beads conforming to the requirements of Section M7.01.07 in Reference (1) of the Standard Specifications.

D. Paint shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions, all of which shall be plainly legible at time of use.

E. Paint shall be homogeneous, easily mixed to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of six months.

2.02 MARKING EQUIPMENT

A. Machines, tools and equipment used in the application of pavement markings shall conform to MHD Specifications Section 860.60 and shall be approved and maintained in satisfactory operating condition.

B. Push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking roadway and parking areas. Applicator machine shall have the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

C. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required. Compressor shall be capable of furnishing not less than 150 cfm of air at a pressure of not less than 90 psi at the nozzle for each nozzle used.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. New pavement surfaces shall be allowed to cure for a period of not less than 48 hours before application of marking materials.

B. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods, as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed using scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion, as directed.

C. Where oil or grease are present on old pavements to be marked, affected areas shall be scrubbed with several applications of tri-sodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint.

3.02 APPLICATION

A. Marking materials shall be applied to clean, dry surfaces in accordance with the requirements of MHD Specifications Section 860.62.

B. Paint shall be applied pneumatically with approved equipment.

C. Pavement marking materials shall be applied evenly to the pavement surface to be coated at a rate specified in MHD Specifications Section 860.62.

D. Guidelines and templates shall be employed as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols.

E. Edges of markings shall be sharply outlined.

F. Maximum drying time requirements of the paint manufacturer shall be enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by vehicle tires.

G. If markings require more drying time than stated by the paint manufacturer, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.03 PROTECTION OF MARKINGS

A. Markings shall remain protected in accordance with MHD Specifications Section 860.63.

3.04 GUARANTEE

A. Contractor is to furnish the Owner with a one (1) year unconditional guarantee against fading, chipping, peeling, wearing, etc. The Contractor is to provide said guarantee in writing, in a form acceptable to the Landscape Architect. If said guarantee is not in an acceptable form, the Contractor will have (10) days after receipt of notice from the Landscape Architect to correct the form.

END OF SECTION

SECTION 32 18 23.29

INFILLED SYNTHETIC TURF SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. It is the intent of this Section to specify an Infilled Synthetic Turf System that provides a high-quality training surface for multi-purpose uses. The finished surface shall be immediately firm, consistent and stable while providing long-term durability, safety and shock attenuation. The Infilled Synthetic Turf System Vendor's attention is called to the testing requirements related to G-Max rating per ASTM F355-A and HIC per EN-1177. A G-Max rating of less than 85 or in excess of 150 at any time from acceptance through the end of the Warranty Period is unacceptable.

1. It should be noted that trapped fibers in seams and/or beneath carpet fibers within the general carpet will not be accepted. The Contractor shall provide the appropriate amount of time to infill the carpet while brushing up fibers and laying infill in thin lifts to ensure all fibers are upright to the surface and are not caught beneath infill or other fibers.
2. Infill materials shall be uniformly filled to a depth which leaves no more than 1/2" of exposed pile after settlement. If the results of the infill depth test show an infill with more than ½" exposed, additional infill must be installed to meet the specified infill heights. Additional G-Max may be required once the installed infill heights meet the specified heights at no additional cost to the Owner.

C. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

D. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DEFINITIONS

A. General Contractor: the entity who holds the project contract with the Town of Carver. The General Contractor is responsible for all coordination of the work within this specification. If problems arise during construction, the General Contractor will be responsible for construction and monetary implications in regards to the Project Contract.

B. The Base Contractor is assumed to be a site contractor or specialty athletic field contractor meeting the listed experience criteria.

C. The Infilled Synthetic Turf Vendor is assumed to be the entity that procures and is responsible for the installation of all Infilled Synthetic Turf System components. The Infilled Synthetic Turf Vendor also provides and services the warranty.

D. The Infilled Synthetic Turf Installer is assumed to be a specialty athletic synthetic turf installation contractor meeting the listed experience criteria.

1. If the Infilled Synthetic Turf Installer is not a direct employee of the Infilled Synthetic Turf Vendor, it is assumed that the Infilled Synthetic Turf Installer is under contract to

the Infilled Synthetic Turf Vendor and that the Infilled Synthetic Turf Vendor is responsible for all work undertaken by the Infilled Synthetic Turf Installer.

2. If the Infilled Synthetic Turf Installer is not a direct employee of the Infilled Synthetic Turf Vendor, the Infilled Synthetic Turf Vendor is required to have a qualified technical advisor on site at all times to supervise the Infilled Synthetic Turf Installer.

E. Independent Testing Company: a specialty testing company focusing on testing of athletic surfaces. Acceptable companies include, but may not be limited to:

1. Firefly Sports Testing, Jeff Gentile, 603-715-5453
2. Sports Laboratories, Kieran O'Donnell, 423-617-6928
3. Labosport US Inc., 706-529-9474

1.03 WORK INCLUDED

A. Base Contractor shall:

1. Furnish and install Free Draining Infilled Synthetic Turf Base and Drainage Materials as specified within.
2. Provide all inspections and certifications of subgrade and subsequent layers as specified within.
3. Provide drainage testing by means of a Dual Ring Infiltrometer (DRI) (or other pre-approved method) at a minimum of two (2) locations after installation of the Infilled Synthetic Turf Base is complete.
4. Provide/complete other items as specified within.

B. Infilled Synthetic Turf Vendor shall:

1. Furnish and install a multi-purpose Infilled Synthetic Turf System.
   a. Pricing shall be provided for a polyethylene, parallel slit film and monofilament fibers tufted into a high quality fabric backing system and infilled with silica sand and SBR rubber infill to meet requirements of infilled synthetic turf system as specified.
2. Provide all attachments and penetrations as required to complete the work as shown on the Drawings and approved Shop Drawings.
3. Provide an eight (8) year standard, non-prorated warranty for all Infilled Synthetic Turf components and installation.
4. All testing requirements during and following installation as specified herein.
5. Provide a Third Party Insured Warranty.

1.04 RELATED WORK UNDER OTHER SECTIONS

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

1. Site Preparation
2. Cast-In-Place Concrete
3. Earthwork
4. Bituminous Concrete Pavement
5. Cement Concrete Pavement
6. Storm Drainage System

1.05 REFERENCES

A. References herein to any technical society, organization, group or body are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable:

1. American Society for Testing and Materials (ASTM).
2. American Sports Builders Association (ASBA).
3. Consumer Products Safety Commission (CPSC).
4. National Federation of High School Athletics Association (NFHS).
5. Massachusetts Interscholastic Athletic Association (MIAA).
6. Synthetic Turf Council (STC).

1.06 QUALITY CONTROL

A. Experience:

1. Base Contractor: Shall have successfully (quality and timely) installed Free Draining Stone Base and drainage systems for at least nine (9) outdoor synthetic turf athletic field bases of 50,000 s.f. or greater of the type and installation process herein specified within the last 3-year period.
   a. The Base Contractor's Site Foreman shall have installed at least five (5) outdoor synthetic turf athletic field bases and drainage systems in the last 3-year period.
2. Infilled Synthetic Turf Vendor: Shall have successfully (quality and timely) supplied at least forty (40) outdoor athletic field systems of 50,000 s.f. or greater of similar type and installation process herein specified within the last 3-year period.
   a. All installation operations shall occur under the full-time on-site direction and supervision of a qualified technical supervisor directly employed by the Infilled Synthetic Turf Vendor. Installation supervisors shall have a minimum of five (5) years experience in the installation of Infilled Synthetic Turf Systems and shall have supervised the installation of at least ten (10) outdoor athletic field systems of 50,000 s.f. or greater of similar type and installation process herein specified within the last 3-year period.
3. Infilled Synthetic Turf Installer: Shall have successfully (quality and timely) laid at least fifteen (15) outdoor athletic field systems of 50,000 s.f. or greater of similar type and installation process herein specified within the last 3-year period. References shall be provided with bids so that the installer's experience record can be verified.
   a. Per 1.06.A.2.a. above, all installation operations shall occur under the full-time on-site direction and supervision of a qualified technical supervisor directly employed by the Infilled Synthetic Turf Vendor.
   b. All installation operations shall be performed by personnel fully familiar with the materials and their application. Installation Foreman shall have installed at least ten (10) outdoor athletic field systems of 50,000 s.f. or greater of similar type and installation process herein specified within the last 3-year period.

B. Source Limitations:

1. Obtain Infilled Synthetic Turf System including tufted synthetic turf yarn and carpet backings from a single Tufted Synthetic Turf Manufacturer. Provide additional system components including anchoring materials, seaming products, binders and adhesives and infill materials meeting the criteria of this Specification Section from single sources.

C. Inspection and Acceptance:

1. All inspections and acceptance shall be provided in writing to the Landscape Architect/Civil Engineer.
   a. Subgrade - Both the Base Contractor and the Infilled Synthetic Turf Installer (if the Turf Installer is not a direct employee of the Turf Vendor, then a representative of the Turf Vendor shall also be present) shall inspect the subgrade to verify their acceptance of installation and condition. Commencement of subsequent installation in a given work area indicates acceptance of underlying substrates and systems. Refer to Section 31 20 00, EARTHWORK, for requirements of subgrade preparation.
   b. Drainage System - Both the Base Contractor and the Infilled Synthetic Turf Installer (if the Turf Installer is not a direct employee of the Turf Vendor, then a representative of the Turf Vendor shall also be present) shall inspect the drainage system to verify their acceptance of installation and condition. Commencement of subsequent installation in a given work area indicates acceptance of underlying substrates and systems.
   c. Free Draining Base Stone - Both the Base Contractor and the Infilled Synthetic Turf Installer (if the Turf Installer is not a direct employee of the Turf Vendor, then a representative of the Turf Vendor shall also be present) shall inspect the free draining base stone layer to verify their acceptance of installation and condition. Commencement of subsequent installation in a given work area indicates acceptance of underlying substrates and systems.
   d. Free Draining Finishing Stone – Both the Base Contractor and the Infilled Synthetic Turf Installer (if the Turf Installer is not a direct employee of the Turf Vendor, then a representative of the Turf Vendor shall also be present) shall inspect the free draining finishing stone layer to verify his acceptance of installation and condition. Commencement of subsequent installation in a given work area indicates acceptance of underlying substrates and systems.
2. The Base Contractor and Infilled Synthetic Turf Vendor/Installer and associated subcontractors shall comply with the drawings, specifically notes regarding sequencing, existing condition investigations and proposed grade tolerances.

D. Planarity and Grade:

1. Deviation in planarity of the prepared subgrade shall not exceed 1/2" beneath a 25' straightedge. Deviation from a straight grade between levels on drawings shall not exceed 1/2".
2. Deviation in planarity of the Free Draining Crushed Stone layer shall not exceed 1/4" beneath a 25' straightedge. Deviation from a straight grade between levels on drawings shall not exceed 1/4".
3. Deviation in planarity of the Free Draining Finishing Stone layer shall not exceed 1/8" beneath a 10' straightedge. Deviation from a straight grade between levels on drawings shall not exceed 1/8".
   a. Refer to testing requirements to show achievement of the planarity.

E. Protection: Heavy equipment or vehicles (with the exception of tracked or low ground pressure (LGP) vehicles) of any kind should not be allowed on the completed base.

F. Security: Refer to Section 02 00 00 – SITE REQUIREMENTS.

G. Restoration of Damage: The General Contractor and his subcontractors (including, but not limited to, both the Base Contractor and the Infilled Synthetic Turf Installer) shall exercise care in the execution of his work and avoid damage or defacement of the existing subgrade, field profile, and adjacent or surrounding areas by using suitable protective means. Damage or defacement that occurs shall be remedied at the General

Contractor's cost to the satisfaction of the Owner.

1.07 SUBMITTALS

A. In accordance with Conditions of the Contract, submit the following information **with the Bid:**

1. Base Contractor's Site Forman's resume showing compliance with QUALITY CONTROL – Experience section of this specification with contact names, addresses and telephone numbers to enable such data to be validated prior to the award of the project.
2. Infilled Synthetic Turf Vendor:
   a. Submit a signed statement from the Infilled Synthetic Turf Vendor that the Drawings and Specifications have been reviewed by a qualified representative of the Infilled Synthetic Turf Vendor and all major materials suppliers, and that they are in agreement that the materials and installation methods to be used for the Drainage Base and Infilled Synthetic Turf System are proper and adequate for use as a high quality playing surface for multi-purpose high school athletic training use.
   b. The Vendor's recent reference list showing compliance with QUALITY CONTROL – Experience section of this specification with contact name, address and telephone number to enable such data to be validated.
   c. Infilled Synthetic Turf Vendor's Installation Supervisor's resume showing compliance with QUALITY CONTROL – Experience section of this specification with contact names, addresses and telephone numbers to enable such data to be validated.
   d. Infilled Synthetic Turf System Installer's Foreman's showing compliance with QUALITY CONTROL – Experience section of this specification with contact names, addresses and telephone numbers to enable such data to be validated.
   e. Provide a sample written 8-year labor and materials warranty from the Infilled Synthetic Turf Vendor meeting the requirements of the project specifications.
   f. Provide a sample written Third Party Warranty.
   g. A signed letter on company letterhead holding the Owner, Landscape Architect / Civil Engineer and all other project consultants harmless for any violation of patent rights or infringement.
   h. Cut Sheets for all materials required under this Section including third party ASTM certified lab reports.
   i. Material Safety Data Sheets (MSDS) for all materials required under this Section.
   j. The Infilled Synthetic Turf Vendor shall submit a signed letter, on company letterhead, stating the company's specific manufacturing and procurement practices that address Health and Human Safety concerns. The letter shall certify, through the independent testing of all Infilled Synthetic Turf System components that their system's lead and other heavy metal content complies with the United States Consumer Product Safety Commission's (CPSC) most stringent requirement for lead content in children's toys (below 100 ppm), is safe for the environment and for use by people of all ages. Copies of the testing reports shall also be provided in conjunction with the certification. Installation of the field shall not commence until the written certification is received. Adjustments to the project schedule to accommodate testing laboratory schedules will not be granted.
   k. The Infilled Synthetic Turf Vendor shall submit a signed letter, on company letterhead, stating that the Vendor and their suppliers do not use PFAS (as

defined in EPA Method 537 and California Proposition 65) in or as part of their manufacturing process for their turf fibers, primary backings, and urethane coatings or the assembly of any components of the system or system as a whole. If an Infilled Synthetic Turf Vendor is unable to provide this information, they will be rejected for not meeting this requirement.

B. Submit the following in accordance with Conditions of the Contract.

1. Manufacturer's Literature:
   a. A recent reference list showing compliance with 1.06.A.3. with contact name, address and telephone number to enable such data to be validated prior to the commencement of work.
   b. Infilled Synthetic Turf System Installer's Foreman's showing compliance with 1.06.A.3.a. with contact names, addresses and telephone numbers to enable such data to be validated prior to the commencement of work.
   c. Cut Sheets for all materials required under this Section including third party ASTM certified lab reports.
   d. Material Safety Data Sheets (MSDS) for all materials required under this Section.
   e. The Infilled Synthetic Turf Vendor shall submit a signed letter, on company letterhead, stating the company's specific manufacturing and procurement practices that address Health and Human Safety concerns. The letter shall certify, through the independent testing of all Infilled Synthetic Turf System components installed as part of the Project, that their system's lead and other heavy metal content complies with the United States Consumer Product Safety Commission's (CPSC) most stringent requirement for lead content in children's toys (below 100 ppm), is safe for the environment and for use by people of all ages. Copies of the testing reports shall also be provided in conjunction with the certification. Installation of the field shall not commence until the written certification is received. Adjustments to the project schedule to accommodate testing laboratory schedules will not be granted.
2. Shop Drawings:
   a. The Base Contractor and the Infilled Synthetic Turf Vendor shall coordinate and provide details that illustrate the scope of work, including but not limited to materials, cross sections, subsurface and penetration details.
   b. The Infilled Synthetic Turf Vendor shall provide a seaming plan at 1"=20'.
   c. The Infilled Synthetic Turf Vendor shall supply shop drawings (including details) at an approved scale indicated method of attaching synthetic turf carpet to existing concrete turf anchor.
3. Product Samples and Information (Infilled Synthetic Turf Vendor to submit):
   a. Provide color samples of polyethylene slit film and monofilament fiber for approval.
   b. Provide a minimum 12-inch by 12-inch sample of slit film polyethylene and monofilament fiber carpet.
   c. Provide a letter describing the proposed materials and method(s) of attachment for the carpet panels.
   d. Provide 12" long sample of seam tape.
   e. Provide sieve analysis of infill materials for approval.
   f. Provide a 1-quart sample of the infill mix at the Landscape Architect's approved mix ratio.
4. Delivery slips for all Infilled Synthetic Turf System materials delivered to the site.
   a. Note that delivery slips for infill materials shall be supplied to the Landscape Architect to confirm ratios of infill installed within the field.

C. Submit the following at Project Closeout:

1. Provide final GMax Test and Infill Depth Results.
2. Provide Field Maintenance Training and a comprehensive written Maintenance Manual to the Owner.
3. Warranties per the requirements of 1.10A.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products in exact accordance with the Manufacturer's requirements and specifications.

B. Products delivered to the site that are not in compliance with the requirements of this Section shall be removed from the site immediately at no cost to the Owner.

1.09 PROJECT CONDITIONS

A. Weather Limitations: No part of the construction shall be conducted during a rainfall or when rainfall is imminent, or unless both ambient and materials temperatures are at least 40 degrees F and rising.

B. After a rainfall, sufficient time shall be given to allow surfaces and infill materials to dry before resuming work. Surfaces and materials shall be dry, as well as clean. Adhesives should not be applied within 12 hours after rainfall, or when rainfall is forecasted.

C. Do not apply Infilled Synthetic Turf System materials or components over wet, frozen, or muddy base.

1.10 WARRANTY

A. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of God beyond the control of the Owner or the manufacturer. The warranty shall be fully third party insured; pre-paid for the full 8 years of the manufacturer's warranty. The Contractor shall provide a warranty to the Owner that covers defects in the installation, workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's representative. Prior to final payment for the synthetic turf, the Contractor shall submit to Owner an insurance policy, guaranteeing the warranty to the Owner. The insurance must reflect the following values: 1) Must have a minimum per claim coverage amount of $1,000,000 per field. 2) Minimum of $10,000,000 annual aggregate. 3) Must cover full 100% replacement value of total square footage of turf installed. 4) Pre-paid 8 year third party policy must be issued by a carrier with an A.M. Best rated "A" or better rating. Proposed synthetic turf contractor must submit a certified letter directly from the 3rd party insurance carrier stating that the 3rd party warranty in place is not in any way supported by a letter of credit. Any policy supported in any way by a letter of credit will not be accepted. A complete copy of the actual 3rd party policy in place, not just the certificate, must be submitted along with the certified letter for review by the Owner's designated representatives.

B. Provide the manufacturer's standard Third Party Insured Warranty. The Owner shall be named as an additional insured party.

C. Provide resilient underlayment manufacturer's standard warranty.

D. Emergency Service – Provide the Owner with a 24-hour emergency response time for all field repair issues.

1.11 PERFORMANCE TESTING ON FINAL SURFACE

A. Performance Testing by an Independent Testing Company, paid for by the Infilled Synthetic Turf Vendor/Installer, as specified within will be completed and the results verified as acceptable prior to substantial completion.

1. GMAX: The Infilled Synthetic Turf System Vendor shall have G-Max testing performed by an approved and certified Independent Testing Company prior to requesting Substantial Completion. Testing shall consist of shock attenuation per ASTM F-355-A and F-1936 current edition and shall include the depth of infill as the test location as well as the temperature on the day of testing. The Owner and Owner's Representative shall be provided with copies of all testing.
   a. Testing locations shall be performed in accordance with ASTM Test Method F-1936 current edition. Tests shall also be taken at four (4) random spots. Locations to be selected by the Owner's Representative or Owner.
   b. At no time shall the G-Max be less than 85 nor exceed 150 at any one point of the field.
   c. In cases where the result of a test falls outside the specified values, additional tests shall be taken in 10-foot increments in four (4) opposite directions (north, south, east and west) from the failing test point and each subsequent failing test point until all tests fall within the specified values. The failing area shall be marked off, repaired and retested by the Infilled Synthetic Turf System Vendor until all tests fall within the specified values.
   d. G-Max testing during the remainder of the warranty period will be performed by and at the discretion of the Owner. Results of these tests will be provided to the Base Contractor and Infilled Synthetic Turf Vendor, if specifically requested.
   e. If any tests fall within 5% of the maximum specified value, the Owner, at his discretion may require one additional set of tests at any time during the calendar year to be paid for by the Infilled Synthetic Turf Vendor.
2. Infill Depth Testing: Test infill depth by means of an infill depth gauge capable of measuring 0 to 2 inches per ASTM WK51663 using a Constant Ground Pressure 3-Prong Gauge. A minimum of 40 test locations shall be taken at random and documented in the test results provided the Landscape Architect and Owner.
   a. If the results of the depth gauge show the infill height to be on average below the depth specified, the Infilled Synthetic Turf System Installer shall provide additional infill to meet the infill heights specified, after settlement.
3. If the results of the infill depth gauge show the infill height to be below the specified height requiring the Infilled Synthetic Turf System Installer to install additional infill, another infill depth and G-Max test (per the requirements above) shall be conducted to confirm compliance with these specifications. Once the result of the infill depth and G-Max test meet the requirements of these specifications, another HIC and Artificial Athlete Test shall be conducted. The costs for these additional tests shall be bourne by the Infilled Synthetic Turf Installer.

1.12 PATENT RIGHTS AND INFRINGEMENT

A. There are various established performance criteria throughout this specification and request for products and services. There may exist patent coverage for some means and methods of achieving those performance criteria. Bidders are responsible for ascertaining that means and methods of the products and services that they are providing are not being provided in violation of any such patent rights. Bidder's responsibilities are as follows:

1. To hold harmless, the Owner, the Landscape Architect and all Project Consultants, as to any violation to include dollar amounts that could be owed as a result of

damages for infringement including potential treble damages as provided for under U.S. Patent Law.

2. Any and all costs that the Owner, the Landscape Architect and all Project Consultants would incur in replacing materials and services which are determined to infringe patent rights.
3. All administrative, legal and other costs that would be incurred as a result of an infringement.

B. If any product or services proposed to be provided by the Bidder are known by the Bidder to be subject to any existing claims of infringement, Bidder shall notify the Owner and the Landscape Architect of such claim and provide evidence of financial ability to perform on the above hold-harmless requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. This specification covers the installation of a new outdoor multi-purpose Infilled Synthetic Turf System comprised of tufted synthetic turf with an infill mixture (as specified herein) filled into the pile. The installed system after infilling shall have a permeability rate in excess of ten (10) inches per hour. The tufted synthetic turf is comprised of polyethylene parallel slit film and monofilament fibers tufted into a coated/backed carpet as specified herein and meeting F.D. Doc FF1–70 and ASTM D–2859 flammability requirements, with an abrasion index of less than 25 per ASTM F1015 and meeting the following values for Static Coefficient of Friction per ASTM F1551.

1.	Dry Surface Static Friction	1.06 minimum
2.	Dry Surface Sliding Friction	0.96 minimum
3.	Wet Surface Static Friction	1.00 minimum
4.	Wet Surface Sliding Friction	0.83 minimum

2.02 CEMENT CONCRETE INFILLED SYNTHETIC TURF ANCHOR

A. The concrete synthetic turf anchor for attaching the synthetic turf carpet shall be an extruded or cast-in-place concrete curb and shall be provided and installed as specified in Section 03 00 00, CAST-IN-PLACE CONCRETE, detailed in the Drawings and per approved Shop Drawings.

2.03 FREE DRAINING INFILLED SYNTHETIC TURF FIELD BASE AND DRAINAGE MATERIALS

A. Geotextile Fabric:

1. Shall be a needle-punched woven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Fabric shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.
2. Geotextile Fabric - Shall be equivalent to Mirafi 140N as manufactured by Ten Cate.

B. Drainage Piping:

1. Refer to Section 33 40 00, STORM DRAINAGE SYSTEM for specifications.

C. Free Draining Base Stone:

1. Shall be double washed durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15% of the total weight. Thin or elongated pieces are defined as stones whose average width exceeds four (4) times their average thickness. Elongated stones shall be considered to be stones whose average length exceeds four (4) times their average width. The Free Draining Base Stone shall be uniformly blended according to the gradation requirements for the respective stone sizes for the following:

Sieve Designation	% Passing by Weight	
	Minimum	Maximum
1 in.	100	--
3/4 in.	90	100
1/2 in.	30	60
3/8 in.	25	45
No. 4	5	30
No. 10	0	10

2. The material shall also meet the Los Angeles Abrasion Test ASSHTO T96 of not more than 45% loss and the Sodium Sulfate Soundness ASSHTO T104 of not more than 12%.
3. Free Draining Base Stone shall bridge with selected Free Draining Finishing Stone material to prevent loss of Free Draining Finishing Stone material into Free Draining Crushed Stone layer.
4. Free Draining Base Stone shall drain at a rate of not less than twenty (20") inches per hour after compaction.
5. Based upon the type and source of Free Draining Base Stone and Free Draining Finishing Stone submitted, other criteria may be required for approval.

D. Free Draining Finishing Stone:

1. Shall be inert angular crushed rock derived from a stone quarry that is hard, durable and free of deleterious materials and shall not consist of natural or crushed sand. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used. The Free Draining Finishing Stone shall be uniformly blended according to the target gradation requirements for the respective stone sizes for the following:

Sieve Designation	% Passing by Weight	
	Minimum	Maximum
1/2 in.	100	--
3/8 in.	85	100
No. 4	60	90
No. 8	35	75
No. 16	10	55
No. 30	0	40
No. 60	0	15
No. 100	0	8
No. 200	0	2

2. The material shall also meet the Los Angeles Abrasion Test ASSHTO T96 of not more than 45% loss and the Sodium Sulfate Soundness ASSHTO T104 of not more than

12%. A submittal of testing reports shall be provided showing compliance.

3. Installed Free Draining Finishing Stone shall drain at a rate of no less than ten (10) inches per hour after compaction.
4. Based upon the type and source of Free Draining Base Stone and Free Draining Finishing Stone submitted, other criteria may be required for approval.

2.04 SYNTHETIC TURF CARPET

A. Tufted Synthetic Turf:

1. Synthetic Turf Carpet shall be a dual fiber system comprised of monofilament and parallel slit film fibers.
   a. Parallel Slit Film Fiber: Yarn shall be UV resistant designed for use in outdoor infilled synthetic athletic turf applications. The Parallel silt film shall be equivalent to TenCate XP Blade+ and shall comply with the following approved system requirements.
   b. Monofilament Fiber: Yarn shall be a UV resistant polyethylene monofilament, designed for use in outdoor infilled synthetic athletic turf applications and shall comply with the following approved system requirements. Monofilament shall be shaped monofilament equivalent to TenCate Monoslide products.
2. Tufting of the fibers (for the dual fiber system) in a single needle is preferred and is required for systems with a stitch gauge of ½" or greater.
3. Minimum requirements for the approved turf systems are as follows:

Green Carpet Colors	Minimum two (2) different fiber colors for slit film fibers and two (2) different colors for monofilament fibers shall be selected by the Landscape Architect/Civil Engineer from the Manufacturer's Standard Colors
Pile Denier	8,000 denier minimum per ASTM D 1907
Pile Height	2.25" minimum per ASTM D 5823
Stitch Gauge	3/8" preferred, 1/2" max. per ASTM D-5793
Face Weight	48 oz. minimum per s.y. per ASTM D-5848
Fiber Thickness	Slit film – 100 microns minimum per ASTM D 3218 Monofilament – 260 microns minimum
Tuft Bind	10 lbs. minimum without fill per ASTM D 1335
Grab Tear Strength (Average)	200 lbs. minimum per ASTM D-5034
Stitch Count	2.4 per inch minimum per ASTM D-5793
Elongation to Break	>50% per ASTM D-2256
Break Load	>25 lbs. per ASTM D-2256

B. Reflective Fiber Technology: Fibers shall include additives which reflect light and reduce the ambient temperature of the turf system, if available to the manufacturer.

C. Primary Carpet Backing:

1. Shall be equivalent to Multilayer Thiobac Pro K29 as manufactured TenCate Grass North America, Dayton, TN. Vendor shall provide information on the layers used in the primary backing.
2. If necessary, additional fabric layers or other provisions shall be made to ensure dimensional stability of the system and ensure appropriate connections at all seams. Additional layers or provisions shall not compromise the integrity of the

system.

D. Secondary Coating shall be high quality polyurethane specifically formulated for outdoor synthetic turf carpet. The Secondary Coating shall be heat treated to hold the yarn in place and shall meet the following requirements:

1. Weight 20 oz. per s.y. minimum

E. Rolls shall be a minimum of 15 feet wide. Rolls shall be of sufficient length to cover from side of turf area to side of turf area.

F. Seams:

1. The Infilled Synthetic Turf System Vendor/Installer shall provide **glued seams at all panel connections and all inlaid lines**.
   a. Seam tape for securing seams in the tufted synthetic turf shall be high quality seam tape made specifically for Infilled Synthetic Turf applications with a minimum roll width of 12 inches equivalent to Ultrabond Turf Tape as manufactured by Mapei, 1144E Newport Center Drive, Deerfield Beach, Florida, 33442, (800) 992-6273.
   b. Adhesives for bonding tufted synthetic turf shall be one-component moisture cured polyurethane obtained from a single manufacturer and be equivalent Ultrabond Turf PU 1K as manufactured by Mapei, 1144E Newport Center Drive, Deerfield Beach, Florida, 33442, (800) 992-6273. Adhesive shall be modified with amendments as recommended by the manufacturer for installation during adverse weather conditions.
   c. Turf fibers shall be free of all glue upon completion.
2. The Infilled Synthetic Turf Installer is informed that all seams shall be flat and indiscernible upon installation. Shearing of the fiber pile will not be permitted as a means of achieving a flat seam and inlay. Infilling shall not commence until the Field Consultant is satisfied that all seams are flat and all trapped fibers are freed from the seam.
3. If an alternative method of seaming is proposed, information shall be provided to the Landscape Architect/Civil Engineer for consideration prior to the bid.

G. If the Infilled Synthetic Turf Vendor or Installer intends to modify any of the above criteria, it is required that all modifications be approved in writing, by the Landscape Architect, prior to submitting a bid.

2.05 INFILL MATERIALS

A. The Infilled Synthetic Turf Vendor shall provide a signed letter on company letterhead stating that their system (with the resilient underlayment) using the infill mix ratio below will meet performance requirements set forth in this specification. In the event that the Vendor does not believe they can meet the performance criteria within this specification, the Vendor shall provide a request to the Landscape Architect/Civil Engineer prior to the date questions are due with a requested alternative mix ratio.

B. Infill Materials shall be uniformly filled to a depth which leaves no more than 1/2" of exposed pile after settlement, and consist of a homogeneous non-compacting mixture of silica sand and resilient granules meeting the following criteria:

1. The infill ratio shall be:
   a. 65% sand: 35% SBR by weight
2. Silica sand shall meet the following criteria:
   a. Infill sand shall be high quality clean grains of rounded silica sand (SiO2)

equivalent to:

Granusil 4095
Unimin Corporation, New Cannan, CT
203-966-8880
20/40 HC

Oglebay Norton, Brady, TX
915-597-0721
20/40 Oil Frac

US Silica, Chicago, IL
312-291-4400

b. Angular or sub-angular particles will not be accepted. Sand particles shall have 100 % passing the #16 sieve, no more than 80% passing the #30 sieve and no more than 0.5% passing the #50 sieve per ASTM E-11 and also meet the following requirement:

(i)	Hardness	7.0 Mohs
(ii)	Moisture Content	<0.1% per ASTM C-566
(iii)	Specific Gravity	2.65 g/cm3 per ASTM C-128
(iv)	Aerated Bulk Density	92-102 lb/ft2 per ASTM C-29
(v)	Compacted Bulk Density	98-110 lb.ft2 per ASTM C-29

3. Resilient granules shall meet the following criteria:
   a. SBR Rubber - Granules shall be processed recycled rubber derived from passenger vehicle tires. Rubber shall containing no dust or contaminants and shall work to hold the infill sand in suspension. Color to be black.

C. Samples of the free draining, homogenously blended infill (and separate sand and resilient granules) shall be submitted to the Landscape Architect for review. Samples shall also be sent by the Contractor to an independent testing laboratory to confirm that the infill is free draining and meets (or exceeds) the drainage requirements set forth in this specification. Copies of the testing reports shall be submitted to the Landscape Architect for review. The Contractor is responsible for costs associated with infill testing.

D. If infill sand delivered in bulk cannot be staged on pavement, the sand shall be delivered to the site in supersacks. There shall not be an additional cost to the Owner to provide the sand in supersacks.

PART 3 - EXECUTION

3.01 GENERAL

A. The substrate to receive the Infilled Synthetic Turf System shall be inspected and certified by the Base Contractor and the Infilled Synthetic Turf System Installer (if the Infilled Synthetic Turf Installer is not a direct employee of the Infilled Synthetic Turf Vendor, then a representative of the Infilled Synthetic Turf Vendor shall also be present and provide certification) as ready for the installation of the Infilled Synthetic Turf System and must be perfectly clean as installation commences and shall be maintained in that condition throughout the process.

B. All installation operations shall be performed by personnel fully familiar with the materials and their application, under the full time direction and supervision of a qualified technical

supervisor directly employed by the Infilled Synthetic Turf System Vendor. Refer to QUALITY CONTROL – Experience section of this specification.

C. The Contractor's attention is called to the specific testing requirements set forth in the following sections.

3.02 CONCRETE SYNTHETIC TURF ANCHOR

A. The Concrete Synthetic Turf Anchor for attaching the Tufted Synthetic Turf carpet shall be a cast-in-place concrete curb and shall be provided and installed as specified in Section 03 00 00, CAST-IN-PLACE CONCRETE and approved Shop Drawings, by others.

3.03 PREPARATION OF SUBGRADE

A. Refer to Section 31 20 00, EARTHWORK and the notes on the drawings for preparation of the subgrade and recommended sequencing.

3.04 FREE DRAINING INFILLED SYNTHETIC TURF BASE INSTALLATION

A. Geotextile Fabric:

1. Install Geotextile Fabric over excavated and prepared subgrade and the bottom and sides of excavated drainage system and perimeter trenches in accordance with Manufacturer's recommendations. Provide 1/3 minimum overlap at all seams and in accordance with Section 31 20 00, EARTHWORK

B. Drainage Piping:

1. Install drainage pipe and backfill in accordance with Section 33 40 00 STORM DRAINAGE SYSTEM.

C. Free Draining Base Stone:

1. Install in accordance with Section 31 20 00, EARTHWORK to the depth as shown in the Project Details. The material shall be fine graded and suitably rolled and compacted to achieve a tolerance of 1/4" in 25'.
2. The Free Draining Base Stone layer shall be inspected by the Base Contractor by means of a laser level on a 25-foot grid pattern.
3. The Base Contractor shall verify that the Free Draining Base Stone layer and Subsurface Drainage System are functioning properly prior to installing the Free Draining Finishing Stone layer. Provide written verification to the Landscape Architect.
    a. If the base materials fail to drain at the specified rates, they shall be repaired or removed and replaced at no cost to the Owner until they achieve the specified requirements.

D. Free Draining Finishing Stone:

1. Install and fine grade in accordance with Section 31 00 00 EARTHWORK to the depths as shown in the Project Details. The material shall be fine graded and suitably rolled and compacted to achieve a tolerance of 1/8" in 10'.
    a. Fine grading operations shall be completed using a hydraulically controlled laser grading apparatus. The use of a drag behind or box grader shall not be allowed.
2. Planarity Testing of Free Draining Finishing Stone

a. Upon completion of fine grading, complete a 3-meter straight edge planarity test across the field **by an Independent Testing Company** to show compliance with the 1/8" in 10' tolerance. Planarity testing shall be coordinated and paid for by the Contractor.
b. The Base Contractor shall be responsible for fixing all deficiencies in the base to provide a base that meets the specified tolerance.

3. Drainage Testing on Free Draining Base
a. Upon completion of fine grading, complete a Dual Ring Infiltrometer Testing (ASTM D3385-9), (or other pre-approved method) by an Independent Testing Company coordinated and paid for by the Contractor. Two (2) tests shall be performed in locations determined by the Landscape Architect/Civil Engineer and/or Owner. Each test location shall have a permeability rate in excess of ten (10) inches per hour.
b. If preliminary results in the field do not yield ten (10) inches per hour, the Landscape Architect/Civil Engineer and/or Owner may ask for additional locations to be tested. The Base Contractor and the Infilled Synthetic Turf Vendor shall provide written verification to the Landscape Architect/Civil Engineer that that the base and subsurface drainage system are functioning properly. Commencement of subsequent work prior to written verification constitutes acknowledgement that the systems are functioning properly.
c. If the base materials fail to drain at the specified rates, they shall be repaired or removed and replaced at no cost to the Owner until they achieve the specified requirementsat no cost to the Owner until they achieve the specified requirements.

E. The Base Contractor and the Infilled Synthetic Turf Vendor shall verify that the Subsurface Drainage System, Free Draining Crushed Stone layer and Free Draining Finishing Stone layer are functioning properly prior to work performed by Infilled Synthetic Turf Vendor begins. Provide written verification to the Landscape Architect/Civil Engineer.

3.03 INFILLED SYNTHETIC TURF SYSTEM INSTALLATION

A. Upon final written certification from the Base Contractor and Infilled Synthetic Turf Vendor that the Free Draining Stone Base and entire drainage system has been properly installed; the Infilled Synthetic Turf System installation shall commence.

B. Tufted Synthetic Turf Rolls shall be manufactured to be installed perpendicularly across the training area. Turf rolls shall be of sufficient length to permit full cross-field (edge to edge) installation. No head or cross seams will be allowed.

C. Tufted Synthetic Turf shall be installed with no wrinkles, ripples or bubbles. Shearing of fibers, slits in the fabric or driven spikes or staples to relieve such defects will not be permitted.

D. All Tufted Synthetic Turf seams shall be glued unless otherwise specified. All seams shall be flat, tight, and permanent with no separation or fraying. Tufted Synthetic Turf Yarn pile that is trapped between seems shall be freed from the seams by hand or other approved method to an upright position prior to brushing and infilling. Extreme care shall be taken to prevent carpet pile form becoming trapped underneath the infill. If necessary, the Landscape Architect/Civil Engineer may direct the Infilled Synthetic Turf Installer to completely remove and reinstall the infill.

E. Upon completion of seaming and prior to infilling, the entire field shall be brushed with a motorized rotary nylon broom to free trapped or tangled fibers. The blended infill materials shall be spread evenly by using a drop spreader in multiple applications at uniform rates

until the specified infill depth (after settlement) is achieved. Between applications the infill materials shall be brushed in multiple directions with a static nylon groomer.

F. Performance Testing

1. Drainage Testing
   a. Upon completion of the synthetic turf system installation, complete a Dual Ring Infiltrometer Testing (ASTM D3385-9), (or other pre-approved method) by an Independent Testing Company coordinated and paid for by the Contractor. Two (2) tests shall be performed in locations determined by the Landscape Architect/Civil Engineer and/or Owner. Each test location shall have a permeability rate in excess of ten (10) inches per hour.
   b. If preliminary results in the field do not yield ten (10) inches per hour, the Landscape Architect/Civil Engineer and/or Owner may ask for additional locations to be tested.
   c. If the synthetic turf system fails to drain at the specified rates, they shall be repaired or removed and replaced at no cost to the Owner until they achieve the specified requirements.
2. Refer to Item 1.11 PERFORMANCE TESTING in this specification for additional testing requirements.
3. Upon completion the Infilled Synthetic Turf Vendor shall provide the Owner with all independent testing data stating that the finished field falls within the performance criteria requirements

3.04 ACCEPTANCE

A. Should any imperfections develop in the substrate or surface prior to the final acceptance of the work, they shall be properly repaired with the removal and replacement of materials as required.

1. All such repair work shall be done at no additional cost to the Owner.

3.05 CLOSE OUT

A. Infilled Synthetic Turf System Vendor shall provide the Landscape Architect/Civil Engineer with an electronic copy of the approved Standard Warranty and Third Party Insured Warranty.

B. Infilled Synthetic Turf System Vendor shall train the Owner's designated personnel in the proper maintenance and care of the field and provide the Landscape Architect/Civil Engineer with an electronic copy of the Standard Maintenance Manual. Training shall at a minimum address:

1. Use and maintenance of equipment including when/how often to use the particular pieces of machinery, how fast/slow to operate machinery, etc.
2. How to clean stains/markings from the field.
3. Snow removal (plow versus snowblowing, etc.)
4. What to do if a problem is encountered in the field – who to call/contact.
5. Any small repairs that can be done by the Owner (if any) without affecting the warranty.
6. How to inspect a field and what to look for as well as how often this should be done.
7. Maintenance Log Information – discuss the importance in respect to warranty.

3.06 CLEAN UP

A. Infilled Synthetic Turf System Vendor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items.

B. Additional Turf Materials:

1. A minimum of 200 square feet of tufted synthetic turf shall be provided as one 10 foot by 20 foot section both green carpets.

C. Surfaces, recesses, enclosures, etc. shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

END OF SECTION

SECTION 32 31 29

WOOD GUARDRAIL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 010000 – GENERAL REQUIRMENTS which are hereby made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Wooden Guardrail

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Earthwork
B. Cast-in-Place Concrete
C. Bituminous Concrete Pavement
D. Cement Concrete Pavement
E. Loam and Seed

1.04 REFERENCES

A. ASTM - American Society for Testing and Materials

B. Commonwealth of Massachusetts Highway Department - Standard Specifications for Highways and Bridges (MHD Specifications)

1.05 QUALITY ASSURANCE

A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.

B. Codes and Standards: Perform ornamental metal fence and gate work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.

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

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

1.06 LAWS, ORDINANCES, PERMITS AND FEES

A. The Contractor shall:

1. Give necessary notices, obtain all permits and pay all Governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals of the local Building Departments having jurisdiction.

2. Obtain all required certificates of inspection for this work and deliver same to the Architect before request for acceptance and final payment for the work.

3. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on the Drawings and/or specified.

1.07 SUBMITTALS

A. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of all parts of the work under this Section including but not limited to the following:

1. Product data in the form of manufacturer's technical data, specifications, and installation instructions of the guard rail.

2. Drawings showing location of guard rail, including each post, details of post installation, hardware, and accessories. Show sizes and thicknesses of all members, types of materials, methods of connection and assembly, complete dimensions, clearances, anchorage, relationship to surrounding work, and other pertinent details of fabrication and installation.

B. Samples for Verification: Include samples of the following:

1. Wood post sample
2. Wood rail sample

C. Qualification Data: Submit qualification data for fabricator.

PART 2 - PRODUCTS

2.01 GENERAL

A. All wood material shall be pressure treated cedar. Materials shall be free from loose knots, cracks and other imperfections. All materials shall be straight without bows or bends.

2.02 WOODEN MATERIALS

A. Posts

1. All posts for the guardrail shall be 6"x6" Grade A pressure treated lumber.
2. Posts shall be of proper length to be installed in footings as shown on the drawings.

B. Rails

1. All rails on the guardrail shall be as detailed on the drawings and shall be cut plumb to allow smooth transition between rail lengths.
2. Max rail length shall be 16'.

PART 3 - EXECUTION

3.01 WOOD GUARDRAIL

A. Guardrail shall be installed in strict accordance with plans, specifications and approved shop drawings.

B. Excavation: Drill or hand-excavate (using post-hole digger) holes for post to size and spacings indicated, in firm, undisturbed or compacted soil.

C. Unless otherwise indicated, excavate hole depths not less than 36 inches below the finish grade surface.

D. Setting Posts in Earth: Center and align posts in holes, space as required by manufacturer. Brace terminal post against structure as required.

E. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

F. Unless otherwise indicated, set top of concrete footings 4 inches below finish grade.

3.02 CLEAN-UP AND PROTECTION

A. Clean guardrail of all stains or marks and protect from damage. Replace any materials which are part of the final work that are broken or can not be cleaned to the satisfaction of the Owner's Representative.

B. After the guardrail work is installed, it shall be the responsibility of the Contractor to see that the guardrails are properly and adequately protected from damage.

END OF SECTION

SECTION 32 33 00

EXTERIOR SITE FURNISHINGS
BASE BID AND ALTERNATE #1

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. Work Included: Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

1. Bollards
2. Removable Bollards
3. Picnic Tables
4. **Alternate #1 -** Trash and Recycling Receptacles
5. **Alternate #1 -** Site Benches

1.03 RELATED WORK

A. Cast-In-Place Concrete
B. Site Preparation
C. Earthwork
D. Electrical
E. Cement Concrete Pavement
F. Loam and Seed
G. Planting

1.04 REFERENCES

A. Work shall conform to codes and standards of the following:

1. ASTM – American Society of Testing Materials
2. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications)

1.05 QUALITY ASSURANCE

A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.

B. Codes and Standards: Perform site improvement work in compliance with applicable requirements governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.

C. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the

necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performances of the work of this Section.

D. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades which adjoin materials of this Section before installing items specified.

1.06 SUBMITTALS

A. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of each site furnishing item under this Section.

B. Product Information: Provide manufacturer's data showing installation and limitations in use of each site furnishing item. Supply Certificates of Compliance for all materials required for fabrication and installation.

C. Material Selection and Samples: Submit samples showing the complete range of colors, textures and finishes available for all components required for construction. Work includes but is not limited to the following:

1. Provide one sample, 6 inch x 6 inch of shop-applied finish for each site furnishings item.

PART 2 - PRODUCTS

2.01 BOLLARDS

A. Bollards shall be equivalent to:

1. Bollard Model 400-42 as manufactured by DuMor Inc., 138 Industrial Circle, Mifflintown, PA 17059, (800) 598-4018
2. Bollards shall be embedded with sleeve directly into concrete foundations per the Drawings, manufacturer's recommendations, and approved Shop Drawings.
3. Finish: Bollards shall be powder coated black.
4. Quantity: Two (2), refer to Drawings.

2.02 REMOVABLE BOLLARDS

A. Removable Bollards shall be equivalent to:

1. Removable Bollard Model 400-42/S-1SL as manufactured by DuMor Inc., 138 Industrial Circle, Mifflintown, PA 17059, (800) 598-4018
2. Bollards shall be embedded with sleeve directly into concrete foundations per the Drawings, manufacturer's recommendations, and approved Shop Drawings. Lock to be provided by the Owner.
3. Finish: Bollards shall be powder coated black.
4. Quantity: Three (3), refer to Drawings.

2.03 PICNIC TABLES

A. Picnic table shall be equivalent to:

1. Model Gretchen Picnic Table without umbrella hole as manufactured by Landscape Forms Inc., 7800 E. Michigan Avenue, Kalamazoo, MI 49048, (800) 521-2546.
2. Picnic table top and bench surface shall be a recycled plastic lumber (Polysite). Color to be selected by Owner from manufacturer's standard color chart.
3. Steel support tubing shall be powder coated – Color to be selected by Owner

from manufacturer's standard color chart.
4. Picnic tables shall be surface mounted.
5. Quantity: Five (5), refer to Drawings.

2.04 **ALTERNATE #1 -** TRASH AND RECYCLING RECEPTACLES

A. Trash receptacle shall be equivalent to:

1. Receptacle Model 287-32SH-SO, Side-Opening Style with shield, 32 Gallon Capacity Liner as manufactured by DuMor Inc., 138 Industrial Circle, Mifflintown, PA 17059, (800) 598-4018.
2. Color of Receptacle and lid shall be Black.
3. Surface mounted.
4. Quantity: Six (6), refer to Drawings.

B. Recycling receptacle shall be equivalent to:

1. Receptacle Model 287-32SH-RC0002, Side-Opening Style with shield, 32 Gallon Capacity Liner as manufactured by DuMor Inc., 138 Industrial Circle, Mifflintown, PA 17059, (800) 598-4018.
2. Color of Receptacle and lid shall be Black.
3. Surface mounted.
4. Recycling receptacles shall receive "Mixed Recycling" sign decal.
5. Quantity: Six (6), refer to Drawings.

2.05 **ALTERNATE #1 -** SITE BENCHES

A. Site Benches shall be equivalent to:

1. Bench Model Parallel 42 as manufactured by Landscape Forms Inc., 7800 E. Michigan Avenue, Kalamazoo, MI 49048, (800) 521-2546.
2. Benches shall be 67" long (straight with straight ends, no backrest or arms)
3. Benches wood shall be Ipe.
4. Bench end supports shall be powder coated – Color to be selected by Owner from manufacturer's standard color chart.
5. Surface mounted.
6. Quantity: Ten (10), refer to Drawings.

PART 3 - EXECUTION

3.01 GENERAL

A. All site furnishings shall be laid out in the field for approval by the Landscape Architect prior to installation.

B. Site furnishings shall be erected as indicated on the Drawings, plumb, level, snug, and free from rocking. Make necessary shimming and final adjustments.

1. Shims shall be stainless steel sized so that they do not protrude beyond the base of the item so as to be visible in completed installation.

3.02 BOLLARDS

A. Install per Manufacturer's recommendations and approved shop drawings.

3.03 REMOVABLE BOLLARDS

A. Install per Manufacturer's recommendations and approved shop drawings.

3.04 PICNIC TABLES

A. Install per Manufacturer's recommendations and approved shop drawings.

3.05 **ALTERNATE #1 -** TRASH AND RECYCLING RECEPTACLES

A. Install per Manufacturer's recommendations and approved shop drawings.

3.06 **ALTERNATE #1 -** SITE BENCHES

A. Install per Manufacturer's recommendations and approved shop drawings.

3.07 FINAL CORRECTION

A. The Landscape Architect reserves the right to inspect the work to determine if adjustments are necessary in grade, alignment or layout. The Contractor shall make such adjustments without further compensation

END OF SECTION

SECTION 32 92 19

LOAM AND SEED

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Refer to the Drawings for the extent and details of this work.

B. The work of this Section consists of all seeding and related work as shown on the Drawings or required herein and includes, but is not limited to the following:

1. Providing all topsoil required for work of this Section.
2. Screening stripped and stockpiled topsoil.
3. Providing all soil amendments, fertilizers, erosion controls and mulches as required for work in this Section.
4. Scarification of subsoil in preparation for loaming.
5. Spreading and fine grading topsoil for all lawn areas.
6. Seeding required for work in this Section.
7. Maintenance and guarantee.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Cast-in-place Concrete
B. Cement Concrete Pavement
C. Bituminous Concrete Pavement
D. Vertical Granite Curb
E. Wood Guardrail
F. Planting
G. Storm Drainage System

1.04 SUBMITTALS

A. Materials list: Submit a complete list of all materials proposed for use in this work, demonstrating complete conformance with the requirements specified.

1. Submit grass seed mixes for approval.
2. Submit topsoil analysis results for review by the Landscape Architect. State recommended quantities of amendments necessary to produce satisfactory topsoil as stated in the specifications herein. If on-site stockpiled topsoil is to be used, submit topsoil analysis of screened products.
3. Submit product information with mix ratios and amounts for hydromulching to be used during hydroseeding for Landscape Architect's approval.
4. Submit fertilizer, herbicide and fungicide products for application as required for Landscape Architect's approval.
5. Submit mechanical analysis of any soil amendments.

1.05 QUALITY ASSURANCE

A. All seed and amendments shall comply with all Federal, State and local laws and regulations requiring inspection for plant disease and insect control.

1.06 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver all items to the job site in their original containers with all labels intact and legible at time of Landscape Architect's inspection.
2. Immediately remove from the site all materials which do not comply with the specified requirements.
3. Use all means necessary to protect seed from moisture and other contaminants which may adversely effect proper germination.
4. Use all means necessary to protect fertilizers, amendments and other materials from moisture and other contaminants which may adversely effect their efficacy.

1.07 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before spreading topsoil.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Topsoil

1. Topsoil stockpiled from on-site stripping shall be utilized for all seeded areas as indicated in the Drawings.
2. All topsoil utilized in these areas shall be screened to a maximum stone size of 3/8 in.

B. Lime

1. Lime shall be an approved agricultural limestone containing no less than fifty (50%) percent of total carbonates and twenty five (25%) percent total magnesium with a neutralizing value of at least one hundred (100%) percent.
2. The material shall be ground to such a fineness that forty (40%) percent will pass through a Number 100 U.S. Standard Sieve, and ninety eight (98%) percent will pass through a Number 20 U.S. Standard Sieve.
3. The lime shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis.
4. Any lime which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

C. Fertilizer:

1. Apply a starter fertilizer at approximate rate of 1 lb. of nitrogen per 1,000 square feet, 0.5 to 1 lb. of P_2O_5 (Phosphate) per 1,000 square feet, and 0.5 to 1 lb. of K_2O (Potash) per 1,000 square feet using a fertilizer with approximate 2:1:1 ratio of N:P_2O_5:K_2O.

D. Water

1. Water shall be supplied by the Contractor unless otherwise specified.
2. General Lawn Areas:

   a. The Contractor is responsible for providing all equipment, hoses, etc. for watering throughout the project and until final acceptance of lawn and turf areas by the Landscape Architect.

E. Herbicides, Pesticides and Fungicides

1. Herbicides, pesticides, and fungicides may be used subject to the approval of the Landscape Architect, and handled by State Licensed operators only in accordance with 333 CMR 14 Protection of Children & Families from Harmful Pesticides.

F. Straw Blanket

1. Straw Blanket to be used on seeded 3:1 - 4:1 slopes shall be equivalent to Model ECS-1B Single Net Straw Biodegradable Rolled Erosion Control Product as manufactured by East Coast Erosion Control, 443 Bricker Road, Bernville, PA 19506.

G. Coir Netting

1. Coir mats to be used on seeded 1:1 slopes shall be woven with coir fiber yarns that shall be fully biodegradable within 2-3 years pending soil and weather conditions. Mats shall have a minimum open space of 50% and shall be equivalent to IVI Coir 700 manufactured by Indian Valley Industries, Inc., Johnson City, NY, (800) 659-5111, EC-4Y as manufactured by East Coast Erosion Control, 443 Bricker Road, Bernville, PA, (800) 582-4005, and Earthshield Natural CM400 Woven Coir as manufactured by ACF Environmental, Richmond, VA (800) 448-3636.

H. Seed

1. Grass seed shall be clean, new crop seed, composed of a mixture of varieties, mixed in proportion by weight and tested for minimum percentages of purity and germination. Submit proposed mixture to the Landscape Architect for approval.

   a. General Lawn Area Mix:
      i. Perennial Ryegrass 20%
      ii. Kentucky Bluegrass 80%

I. Hydroseed Mix

1. All work will be carried out by an approved spraying machine specifically used for this work. Amounts of fertilizer used shall reflect recommendations outlined in the Soil Analysis, see Section 2.01 C. The Contractor shall submit to the Owner's Representative for approval, prior to the start of work, a certified statement as to number of pounds of fertilizer, amounts and types of grass seed, and processed fiber, per one hundred (100) gallons of water.
2. Hydromulch: Shall be Terra-Sorb GB, or an approved equal. Add Terra-Sorb to the hydroseed tank at the amount of 60 pounds per acre.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBSOIL

A. Prior to spreading topsoil, subsoil should be rough graded to correspond with finish grades as indicated on the Drawings. Subgrade shall slope to allow for subsurface drainage. Depressions shall be filled, and areas which are highly compacted shall be loosened to a depth which is adequate for the passage of gravitational water through the subsoil.

B. After acceptance of subsoil grades, loosen and mix subgrade material two inches to four inches (2"-4") deep. Remove stones over two (2") inches, sticks, rubbish, and other deleterious materials which may impede the healthy and vigorous growth of grass. Move no heavy objects or machinery, except as necessary for the spreading of topsoil, over sod and seed beds after preparation of subgrade.

C. Subsoil which becomes compacted due to excessive construction activity, shall be loosened as directed by the Landscape Architect at no additional cost to the Owner.

3.02 SPREADING OF TOPSOIL

A. Immediately after approval of subgrade, evenly spread and lightly compact approved topsoil to finish grades as indicated on the Drawings. Do not spread topsoil which is in a muddy or frozen condition. Handle no topsoil when dry or above the plastic limit. Install a minimum of twelve (6") inches of screened topsoil to disturbed areas unless otherwise indicated on the Drawings.

B. When possible, spreading of topsoil shall be performed from the edge of the lawn area outward. Contractor may use alternate spreading pattern as approved in writing by the Landscape Architect.

C. Caution should be exercised to minimize or eliminate travel over areas previously covered with topsoil. Topsoil which becomes compacted due to excessive construction activity, shall be stripped and re-spread, or loosened as directed by the Landscape Architect at no additional cost to the Owner.

3.03 SEED BED PREPARATION

A. The minimum depth of topsoil in all seeded areas shall be six (6") inches. Contractor is responsible for supplying all topsoil needed from off-site sources if stockpiles are inadequate.

B. Grade all lawn areas to finish grades as indicated on the Drawings. When no grades are shown, areas shall have a smooth and continuous grade between existing or fixed controls and elevations shown on plans. Roll, scarify, rake and level as necessary to obtain true even lawn surfaces. All lawn areas shall slope to drain. Finish grades shall be approved by the Landscape Architect prior to commencing any seeding work. Install soil additive per manufacturer's instructions and as indicated on the Drawings.

C. Spreading Limestone: Spread ground limestone evenly over the topsoiled surface. Incorporate limestone within the top four to six (4"-6") inches of soil prior to finish raking. Apply limestone at the rate of 70 lbs./1,000 square feet.

D. Spreading Fertilization: Apply a starter fertilizer at approximate rate of 1 lb. of nitrogen per 1,000 square feet, 0.5 to 1 lb. of P_2O_5 (Phosphate) per 1,000 square feet, and 0.5 to 1 lb. of K_2O (Potash) per 1,000 square feet using a fertilizer with approximate 2:1:1 ratio of $N:P_2O_5:K_2O$. Fertilizer shall be incorporated within the top four to six (4"-6") inches of soil prior to finish raking.

3.04 SEEDING

A. Schedule for Seeding: Sow grass seed between April 1 and May 31, or between August 15 and October 1, except as otherwise approved in writing by the Landscape Architect.

B. If seeding out of season as described above, the Contractor is still obligated by all conditions and responsibilities described under 3.06 LAWN MAINTENANCE, until final acceptance of all

lawn areas.

C. Place soil amendment in the areas of the lawn areas as shown on the Drawings. Follow the manufacturer's recommendations for installation.

D. Spreading Limestone: Spread ground limestone evenly over the topsoiled surface. Incorporate limestone within the top four (4") to six (6") inches of soil prior to finish raking. Apply limestone at the rate recommended by the testing and analysis agency.

3.05 FERTILIZING

A. Contractor to have the topsoil tested for soil fertility by an approved soil testing laboratory, and a complete fertilization program will be recommended by the testing laboratory and Landscape Architect for the installation maintenance period.

3.06 LAWN MAINTENANCE

A. All existing grass areas within the limit of work construction fence that are not disturbed during construction operations shall be regularly mowed by the Contractor.

B. Maintenance of the grass areas shall begin immediately, and generally consist of watering, weeding, mowing and edging, reseeding, disease and insect pest control, repair of all erosion, and any other procedure consistent with good horticultural practice, necessary to insure normal, vigorous and healthy growth.

C. Maintenance shall also include filling, regrading, and reseeding as necessary to correct depressions caused by settling, subsidence, or other physical or mechanical damage.

D. Maintenance shall also include all temporary protection fences, barriers, signs and all other work incidental to proper maintenance.

E. The Contractor shall be responsible for maintenance to establish a uniform stand of the approved grasses (no less than 90% coverage) until acceptance. After the grass has started, all areas and parts of areas showing poor germination or growth shall be re-seeded, repeatedly, until all areas are covered with a satisfactory growth of grass. At the time of the first cutting, mow lawn with sharp mowing units not less than two and one half (2-1/2") inches high. Lawn shall be maintained between two and one half inches to three and one half inches (2-1/2"-3-1/2") high. Do not remove more than one third 1/3) of the grass blade. All lawns shall receive a minimum of three (3) mowings before Contractor's request for inspection and acceptance. Additional mowings may be required before acceptance.

F. Watering: The Contractor shall include cost for daily, and if necessary, continuous watering of all grass areas during a normal 8 hour working day. The seed bed shall be maintained in a continuous moist condition, satisfactory for good germination and growth of grass, as specified. Seeded grass areas must be kept in a moist condition until acceptance.

G. Full and complete written instructions for maintenance of the lawn areas are to be furnished to the Owner, by the Contractor at least ten (10) days prior to the end of the contractual maintenance period, to familiarize him with the maintenance requirements for proper care and development of the lawns.

3.07 INSPECTION AND ACCEPTANCE

A. The Landscape Architect shall inspect the lawns upon written request by the Contractor. The request shall be received at least ten (10) days before the anticipated date of inspection.

B. Final acceptance will not be granted until all seeded areas are in satisfactory condition.

C. If the grass is in satisfactory condition, the Contractor's care and maintenance responsibilities

will end. If the grass stand is unsatisfactory, the Contractor's maintenance responsibility shall continue, including a normal program of mowing, irrigation, reseeding, fertilization and repair until an acceptable stand of grass is achieved.

3.08 CLEAN UP

A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Landscape Architect, at no cost to the Owner.

END OF SECTION

SECTION 32 92 23

LOAM AND SOD

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Refer to the Drawings for the extent and details of work.

B. The work of this Section consists of all seeding and related work as shown on the Drawings or required herein and includes, but is not limited to the following:

1. Providing all topsoil required for work of this Section.
2. Providing all fertilizers and mulches as required for work in this Section.
3. Spreading and fine grading topsoil for all sodded areas.
4. Sod required for work in this Section.
5. Maintenance and guarantee.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Earthwork
B. Erosion and Sediment Control
C. Loam and Seed
D. Planting

1.04 SUBMITTALS

A. Materials list: Submit a complete list of all materials proposed for use in this work, demonstrating complete conformance with the requirements specified.

1. Submit sod grass seed mixes for approval.
2. Submit fertilizer products for application as required for Landscape Architect's approval.

1.05 QUALITY ASSURANCE

A. All sod and amendments shall comply with all Federal, State and local laws and regulations requiring inspection for plant disease and insect control.

1.06 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver all items to the job site in their original containers with all labels intact and legible at time of Landscape Architect's inspection.

2. Immediately remove from the site all materials which do not comply with the specified requirements
3. Use all means necessary to protect sod from moisture and other contaminants which may adversely effect proper establishment.
4. Use all means necessary to protect fertilizers, amendments and other materials from moisture and other contaminants which may adversely affect their efficacy.

1.07 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before spreading topsoil.

PART 2 - PRODUCTS

2.01 LAWN PRODUCTS

A. Topsoil

1. Utilize existing on-site topsoil to complete the work.

B. Fertilizer:

1. Shall be commercially available starter fertilizer.

C. Water

1. Water shall be in the form of the new hand watering or new irrigation system if installed as part of Alternate #1 - unless otherwise specified.

2. In the event that the system is not operational, the Contractor is responsible for providing all equipment, hoses, etc. for watering throughout the project and until final acceptance of turf areas by the Landscape Architect.

D. Herbicides, Pesticides And Fungicides

1. Herbicides, pesticides, and fungicides may be used subject to the approval of the Landscape Architect, and handled by State Licensed operators only.

E. Sod

1. Sod shall be a blend of at least three Kentucky bluegrass cultivars in approximately equal proportions. At least 70% of the sod blend shall be at least two of the following varieties: Arcadia, Award, Brilliant, Showcase, America, Connie, Limousine, Rambo, Unique, Apollo, Advocate, Midnight, Total Eclipse, P-105, Odyssey, Blacksburg, Blackstone, and Moonlight. Any variety substitutions or deviations from these specifications must be approved by the Landscape Architect.
2. Sod shall be good quality, free of weeds, disease and insects, and of good color and density. Sod shall be machine cut at a uniform soil thickness necessary for plant viability during the harvest-transport-installation cycle. Individual pieces of sod shall be cut to the suppliers' standard width and length. Maximum allowable deviation from standard widths and lengths shall be five (5%) percent. Standard size sections of sod shall be strong enough to support their own weight, and retain their size and

shape when suspended vertically from a firm grasp on the upper ten (10%) percent of the section.

3. The sod shall be as grown by Tuckahoe Turf Farms, Inc., Slocum, RI, (800)-556-6985; Kingston Turf Farms, Inc. Kingston, RI, (401) 789-0630; Gold Star Sod Farms, Inc., Canterberry, NH (800) 648-8873; or other approved source.
4. Sod shall be machine cut at a uniform soil thickness of 3/4 in. plus or minus 1/4 in. at the time of cutting. Measurement for thickness shall exclude top growth and thatch. Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be five (5%) percent. Broken pads and torn or uneven ends will not be acceptable. Sod shall be at least one (1) year old from time of original seeding.
5. Sod shall be furnished and installed in rectangular sod strips measuring 12 in. or 16 in. in width and min. 4 ft. in length, stored in rolls with the grass top side inverted so that the topsoil is to the exterior.
6. Stakes: Stakes for pegging the sod shall be sound hardwood approximately one inch by two inches (1"x 2") and of sufficient length to penetrate the mat, the seed bed and to a minimum depth of two (2") inches of subsoil. Stakes shall be free from insects and fungi and capable of remaining in the ground at least two (2) years

PART 3 - EXECUTION

3.01 SOD BED PREPARATION

A. The minimum depth of topsoil in all seeded/ sodded areas shall be six (6") inches. Contractor is responsible for supplying all topsoil needed from off-site sources if stockpiles are inadequate.

C. Grade all earthmounds to finish grades as indicated on the Drawings. When no grades are shown, areas shall have a smooth and continuous grade between existing or fixed controls and elevations shown on plans. Roll, scarify, rake and level as necessary to obtain true even lawn surfaces. All lawn areas shall slope to drain. Finish grades shall be approved by the Landscape Architect prior to commencing any seeding work. Install soil additive per manufacturer's instructions and as indicated on the Drawings.

D. Place soil amendment in the areas of the turf areas as shown on the Drawings. Follow the manufacturer's recommendations for installation.

3.02 SODDING

A. Sod may be placed as long as the ground is not frozen.

B. Sod shall be harvested, delivered and transplanted within a period of twenty-four (24) hours. Soil on sod pads shall be kept moist at all times.

C. Immediately prior to sodding operations, the sod bed shall be lightly scratched with a fine-toothed harrow or hand rake to provide a slightly roughened surface to accept the sodding application.

D. The sod bed shall be reasonably moist and shall be watered, if necessary. The sod shall be laid smoothly, edge to edge with a maximum joint tolerance of 1/16".

E. Apply the sod by hand in rows at right angles to the direction of the slope, starting at the base of the area to be sodded and working upward. On slopes steeper than 3:1 or areas of concentrated flows, sod should be secured with wooden pegs, or other approved techniques. Wooden pegs should be a minimum of 10 inches long, spaced 2 feet apart in any direction, and driven flush with the surface of the sod.

F. Sod shall be watered during and immediately after installation to prevent drying. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new sod pad, and topsoil immediately below the pad, are thoroughly wet.

G. After sodding, the area shall be rolled with an approved lawn roller weighing not more than 65 pounds per foot of width.

3.03 FERTILIZING

A. Apply starter fertilizer at the manufacturer's recommended rate.

3.04 SOD MAINTENANCE

A. Maintenance of the sod areas shall begin immediately, and generally consist of watering, weeding, mowing and edging, reseeding, disease and insect pest control, repair of all erosion, and any other procedure consistent with good horticultural practice, necessary to insure normal, vigorous and healthy growth.

B. Maintenance shall also include filling, regrading, and reseeding as necessary to correct depressions caused by settling, subsidence, or other physical or mechanical damage.

C. Maintenance shall also include all temporary protection fences, barriers, signs and all other work incidental to proper maintenance.

D. The Contractor shall be responsible for maintenance to establish a uniform stand of the approved grasses until acceptance. After sodding, all areas and parts of areas showing poor establishment or growth shall be re-sodded, repeatedly, until all areas are covered with a satisfactory growth of grass. At the time of the first cutting, mow turf with sharp mowing units not less than two and one half (2-1/2") inches high. Turf shall be maintained between two and one half inches to three and one half inches (2-1/2"-3-1/2") high. Do not remove more than one third 1/3) of the grass blade. All lawns shall receive a minimum of two mowings before Contractor's request for inspection and acceptance. Additional mowings may be required before acceptance.

E. Watering: The Contractor shall include cost for daily, and if necessary, continuous watering of all grass areas during a normal 8 hour working day. The sod shall be maintained in a continuous moist condition, satisfactory for good germination and growth of grass, as specified.

F. Full and complete written instructions for maintenance of the lawn areas are to be furnished to the Owner, by the Contractor at least ten (10) days prior to the end of the contractual maintenance period, to familiarize him with the maintenance requirements for proper care and development of the lawns.

3.05 INSPECTION AND ACCEPTANCE

A. The Landscape Architect shall inspect the sod upon written request by the Contractor. The request shall be received at least ten (10) days before the anticipated date of inspection.Final acceptance will not be granted until all sodded areas are in satisfactory condition

B. If the sod is in satisfactory condition, the Contractor's care and maintenance responsibilities will end. If the sod is unsatisfactory, the Contractor's maintenance responsibility shall continue, including a normal program of mowing, irrigation, resodding, fertilization and repair until an acceptable stand of grass is achieved.

3.06 CLEAN UP

A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed.

Repair any damage to site or structures to restore them to their original condition, as directed by the Landscape Architect, at no cost to the Owner.

END OF SECTION

SECTION 32 93 00

PLANTING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section, whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all under the Contract.

1.02 DESCRIPTION OF WORK

A. Refer to the Drawings for extend and details of this work.

B. The work of this Section consists of all landscaping and related work as shown on the Drawings or required herein and includes, but is not limited to the following:

1. Bioretention/rain garden soil substrate
2. Planting of trees, shrubs and perennials
3. Maintenance and guarantee

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Earthmoving
B. Loam & Seed
C. Sodding

1.04 QUALITY ASSURANCE

A. All plant materials shall be true to name according to "Standardized Plant Names", published by the American Joint Committee on Horticulture Nomenclature, 1942 edition. Each plant or bundle shall be tagged with the name and size of plants in accordance with the standards of the American Association of Nurserymen (AAN). In all cases, botanical names shall take precedence over common names.

B. Quality and size shall conform to the current edition of "Horticultural Standards" for number one grade nursery stock as adopted by the AAN.

C. All plants and plant materials shall comply with all Federal, State and local laws and regulations requiring inspection for plant disease and insect control.

D. All trees shall installed in accordance to the International Society of Arboriculture (ISA) specifications for Planting, Planting Soil and Tree Protection.

1.05 SUBMITTALS

A. Refer to Division 1 for specific requirements.

B. Materials list: Submit a complete list of all materials proposed for use in this work, demonstrating complete conformance with the requirements specified.

C. Submit soil analysis results for review by the Landscape Architect.

D. Submit a list of plant nurseries to the Landscape Architect for approval of selected plant material species.

E. Manufacturer's certificate of compliance for controlled release fertilizer issued by the manufacturer only, showing quantity of material order and specific job application.

F. For all plant materials, submit a complete list showing each type, each source of materials, and the measured size of each.

1.06 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver all items to the job site in their original containers with all labels intact and legible at time of Landscape Architect's inspection.

2. Immediately remove from the site all plants which are not true to name, and all materials which do not comply with the specified requirements.

3. Use all means necessary to protect plant materials before, during, and after installation and to protect the work and materials of all other trades.

4. Replacements: in the event of damage, immediately make all repairs and replacements necessary to the approval of the Landscape Architect and at no additional cost to the Owner.

1.07 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

PART 2- PRODUCTS

2.01 GENERAL

A. Loam – friable, typical of local cultivated topsoil containing 5% (min.) decayed organic matter (humus), no toxic materials, from well drained, arable site, reasonably free of subsoil, stones, earth, cods, sticks, roots, or debris.

1. Test for acidity, fertility and general texture by a recognized commercial or government agency. Report findings and recommendations to the Landscape Architect. Add soil conditioners as per report findings and recommendations, by the Landscape Architect.

2. Deliver no topsoil in frozen or muddy condition.

B.

C. Superphosphate – finely ground phosphate rock eighteen percent (18%) minimum available phosphoric acid.

D. Bone Meal – commercial raw bone meal, finely ground, 1% nitrogen and 18% phosphorus acid (min.).

E. Manure – well rotted, unleached, cattle manure, reasonably free of wood shavings, sawdust, or other litter and no chemicals or other ingredients harmful to plants. Dehydrated manure (Bovung) is acceptable.

F. Fertilizer – all plants will be fertilized with a controlled release 16-8-16 analysis fertilizer contained in polyethylene perforated bags with micropore holes. The bag shall contain 4 ounces minimum of water soluble fertilizer to be effective for 8 years. Pills, spikes, tablets and injections are not considered controlled release packets.

1. Deliver as specified in standard containers, showing weight, analysis and manufacturer. Store in weather-proof place.

G. Peat – domestic or imported, of partially decomposed vegetable matter of natural occurrence, brown, clean, low in content of mineral and woody material; mildly acid, granulated or shredded, free from weedy grasses, sedges or rushes.

H. Lime – ground, dolomite limestone, 95% passing 100 mesh screen.

I. Planting mixture – topsoil thoroughly incorporated with well rotted manure or equivalent dehydrated manure or bone meal and peat proportioned 1 c.y. to 7 c.y. topsoil.

J. Mulch – aged pine bark consisting of the outer bark of pine trees with minimum hardwood bark. Bark shall be thoroughly mixed and aged in stock piles a minimum of 6 months, partially decomposed, dark brown in color, and generally free of chunks of wood thicker than 1/4". Aged pine bark containing an excess of fine particles will not be acceptable. (Mulch is to be provided as part of Base bid.)

K. Water – The Contractor will furnish hose, hose connections and required watering all plant materials until completion of the project.

2.02 BIORETENTION/RAIN GARDEN ENGINEERED SOIL MIX

A. The soil mix for bioretention areas should be a mixture of sand compost and soil.
- 40 % sand,
- 20-30% topsoil, and
- 30-40% compost

B. Bioretention/rain garden permeable soil substrate shall meet or exceed the criteria specified in Volume 2, Chapter 2, pages 26-27 of the Massachusetts Stormwater Handbook (latest edition).

2.03 PLANT MATERIALS

A. Furnish all plant materials consistent with the kinds and sizes indicated in these Specifications.

B. All plants nursery grown unless authorized to be collected.

C. Plants – in accordance with USDA Standard for Nursery Stock, latest edition, Hardy under climatic conditions similar to locality of project, typical of species or variety, normal habit of growth, sound, healthy, vigorous, well-branched, densely foliated when in leaf, free of

disease, insect pests, eggs, or larvae, with well developed root systems.

D. If plants of specified kind or size are not available, substitutions may be made upon request, if approved by Landscape Architect.

E. Plant Dimensions – conform to USDA Standard for Nursery Stock, latest edition, as specified. Exceptions as follows:

1. Plants larger than specified may be used if approved by Landscape Architect at no increase in contract price. Increase spread of roots or earth ball in proportion to size of plant.

2. Undersize plants (10% max.) in any one variety or grade may be used if approved by the Landscape Architect. Provide sufficient plants above size to make average size of next smaller grade.

F. Balled and burlapped (B & B) plants – dig with firm natural earth roots. Made balls are unacceptable.

G. Container grown plants – grown in container long enough for root system to have developed sufficiently to hold its soil together firm and whole. Plants loose in container will not be acceptable.

H. Protect B & B plants not planted immediately upon delivery with soil, wet moss, or other acceptable material. Prevent voids among roots with careful filling. Bind no plants with wire or rope so as to damage bark or break branches.

I. Plants are subject to inspection and approval at place of growth for conformity to Specifications as to quality, size, and variety. The cost of expenses incurred by the Landscape Architect for such inspections shall be born by the Contractor. Landscape Architect reserves right of inspection upon delivery at the site or during progress of work or right of rejection due to damage suffered in handling or transportation. Remove defective plants immediately from site. Plants to be accompanied by State Nursery inspection certification, if required.

PART 3- EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PLANTING OPERATIONS

A. Plant nursery stock immediately upon delivery to the site and approval by the Landscape Architect. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations, outline plant beds and obtain the Landscape Architects approval before proceeding with planting work.

B. Planting may be done whenever weather and soil conditions are favorable or as otherwise authorized by Landscape Architect. If this is not feasible, heel-in material with damp soil or mulch to protect from sun and wind.

C. Notify Landscape Architect at least one week prior to beginning planting operations. Stake locations of all plant material with surveyors bean poles 48 hours prior to planting for approval by Landscape Architect.

D. Excavate tree pits as shown on plans.

E. Locate pits prepared and backfilled with planting mixture to grade prior to planting by staking and recording on plans for location when planting proceeds.

F. Set plants in center of pits, plumb and straight, with crown of plant 1" higher, after settlement, than surrounding finished grade.

G. When B & B trees are set, compact topsoil mixture around bases of balls to fill all voids. Remove burlap, ropes or wires from tops of balls and tuck them down on the sides before filling in with loam.

H. Container grown plants with well developed root systems shall have roots cut vertically along sides of rootball with utility knife to encourage outward root growth.

I. Thoroughly compact planting mixture around roots or balls and water immediately after plant pit is backfilled. Form a shallow basin slightly larger than pit with a ridge of sod to facilitate and contain watering. Cultivate soil shrub beds, rake smooth and neatly outline after planting. Provide 12" (min.) of loam between all shrubs and 6" (min.) between all ground covers.

J. Distribute controlled release fertilizer packets equidistant within the planting pit adjacent to the rootball but not in direct contact with the roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged.

1. Application rates as follows:

Planting Item	Size	No. of Packets
Deciduous Trees:	2 ½-3" cal.	3
	4-6" cal.	4
Shrubs:	2-3'	2
	Over 3'	3
Evergreen Trees:	6-10'	4
	Over 10'	5
Groundcover:	1 packet per four plants	

K. Prune each plant in accordance with AAN standards to preserve natural character. Remove all dead wood, suckers, and or broken or badly bruised branches. Prune with clean, sharp tools. Paint cuts over 1" in diameter with approved tree paint; cover all exposed cambium and living tissue.

L. Cover all tree and shrub pits immediately after planting with 3" (min.) layer on specified mulch. Limit of mulch for trees shall be area of pit; for shrubs in beds, entire area of shrub bed.

M. If rock or underground obstructions are encountered in plant pit excavation, remove obstructions to 3' (min.) below grade and 12" (min.) below bottom of ball or roots.

N. Contractor shall furnish plans showing locations of underground utilities, as required.

3.03 MAINTENANCE - PLANTING

A. Planting Maintenance

1. Maintenance shall begin immediately after each plant is planted and shall continue for a minimum of ninety days following the completion of all planting installations, and

until the final acceptance of all planting work.

2. Maintenance shall consist of keeping the plants in a healthy growing condition and shall include but is not limited to watering, weeding, cultivating, re-mulching, tightening and repairing of guys, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer.

    a. Plants shall be inspected for watering needs at least twice each week and watered as necessary to promote plant growth and vitality.

    b. Stakes shall be kept plumb and neat in appearance. Guys, wires and anchoring cables shall be tightened and repaired weekly.

    c. Planting beds and individual plant pits shall be kept free of weeds, and mulch shall be replaced as required to maintain the specified layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the designed layout.

    d. Plants that die during the maintenance period shall be removed and replaced at once, unless designated otherwise by the Landscape Architect.

    e. Spraying for both insect pests and diseases shall be included during the maintenance period as required and as directed.

3. During the maintenance period, any decline in the condition of plantings shall require the Contractor to take immediate action to identify the potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures.

3.04 ACCEPTANCE STANDARDS FOR PLANTING

A. Following the minimum required maintenance periods for planting, the Contractor shall request the Landscape Architect in writing for a formal inspection of the completed work. If the plant materials and workmanship for the site are acceptable, written notice will be given to the Contractor stating that the work has received acceptance and that the guarantee period has commenced from the date of acceptance.

B. If a number of plants are sickly or dead at the time of inspection, or if the Landscape Architect's opinion, workmanship is unacceptable, written notice will be given by the Landscape Architect to the Contractor in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. The Contractor's responsibility for maintenance of all the plants shall be extended until replacements are made or other deficiencies are corrected. All dead and unsatisfactory plants shall be removed promptly from the project. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner.

3.05 GUARANTEE FOR PLANT MATERIALS

A. Plants shall be guarantee period of one (1) year after written notification of acceptance and shall be alive and in satisfactory growth at the end of the guarantee period.

B. At the end of the guarantee period, a final inspection will be held to determine whether any plant material replacements are required. Each plant shall show at least 75% healthy growth and shall have the natural character of its species as determined by the Landscape Architect. Plants found unacceptable shall be removed promptly from the site and replaced during the normal planting season, until the plants live through one year. A final inspection for acceptance will be made after the replacement plantings have lived

through one (1) year.

END OF SECTION

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

DIVISION 33 00 00
UTILITIES

ACTIVITAS

SECTION 33 10 00

SITE WATER LINES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

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

1.02 WORK INCLUDED

A. The work described herein consists of furnishing all labor, equipment, materials, and other incidental items to completely install, dewater, disinfect and test water mains, fittings and associated appurtenances as indicated on the Drawings and as described herein.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Site Preparation
B. Earthwork
C. Bituminous Concrete Paving
D. Cement Concrete Paving

1.04 REFERENCES

A. The following standards and definitions are applicable to the work of this Section to the extent referenced herein. All products, materials and procedures shall conform to the following standards in their most current edition:

1. ANSI A21.4/AWWA C104 - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water.
2. ANSI A21.10/AWWA C110 - Gray Iron and Ductile Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
3. ANSI A21.11/AWWA C111 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
4. ANSI A21.51/AWWA C151 - Ductile Iron Pipe.
5. ANSI B.16 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
6. ASTM A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
7. ASTM B62 - Composition Bronze or Ounce Metal Castings.
8. AWWA C502 - Dry Barrel Fire Hydrants.
9. ANSI/AWWA C651 - Disinfecting Water Main.
10. AWWA B300 - Hypo chlorites.
11. AWWA C150 - Thickness Design for Ductile Iron Pipe.
12. ANSI/NSF Standard 61 - Seal Coat for Ductile Iron Pipe.

1.05 REFERENCE STANDARDS

A. All work shall comply with the pertinent standards of the latest editions of the following Codes and Specifications, unless designated otherwise herein:

1. American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19101.
2. American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.
3. American Association of State Highway and Transportation Officials (AASHTO), 341 National Press Building, Washington, D.C. 20004.
4. The Commonwealth of Massachusetts, Highway Department, Standard Specifications for Highways and Bridges, 1988, hereinafter designated in the text as the "MHD Standard Specifications".

1.06 SCHEDULING

A. The Contractor shall submit to the Landscape Architect/Civil Engineer, for approval by the Owner, a progress schedule as specified in the GENERAL CONDITIONS.

1.07 SUBMITTALS

A. Shop Drawings

1. Submit shop drawings or descriptive literature, or both, showing dimensions, joint and other details of all materials to be furnished under this Section. Shop Drawings shall be submitted to the Engineer for approval prior to ordering materials.

B. As-Built Drawings

1. Submit one reproducible of As-Built Drawings upon completion and acceptance of work.
2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction.

1.08 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under applicable Sections of this Specification.

B. Deliver and store valves in shipping containers with labeling in place.

1.10 EXAMINATION OF CONDITIONS

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

PART 2 - PRODUCTS

2.01 GENERAL

A. Drawings and Specifications are intended to supplement and explain each other. Materials not specifically mentioned in the Specifications shall be as indicated on the Drawings. Where no specific kind of quality of material is given, a first-class standard article shall be furnished.

B. The Drawings are diagrammatic only and are intended to indicate the extent but not all details of the piping which shall be supplied. All offsets and materials are not shown; however, the Contractor shall furnish these items as if called for or shown.

C. All products included in this section shall conform to the requirements of the standard specifications referenced herein.

D. Pipe size shall be as shown on the Drawings.

E. All pipe materials and methods of jointing shall be as shown on the Drawings.

F. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates of such tests.

G. In addition, the Owner reserves the right to have any or all pipe, fittings and special casting inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

H. Pipe and fittings shall be subjected to a careful inspection and a hammer test just before being laid or installed.

I. Water Distribution materials and fixtures shall meet Town of Reading standards unless otherwise noted.

2.02 POLYETHYLENE PRESSURE PIPE

A. Polyethylene water lines shall be equivalent to the HDPE 3408 Blue-Stripe AWWA C906 as provided by EJ Prescott.

1. Materials used for the manufacturing of polyethylene pipe and fittings shall be PE 3408 High Density Polyethylene (HDPE) meeting the ASTM D3350 cell classification of 345434C.
2. The material shall have a minimum Hydrostatic Design Basis (HDB) of 1600 psi at 73ÅãF when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4.
3. The material used in the production of potable water pipe shall be approved by the National Sanitation Foundation (NSF).
4. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet the requirements of this specification.
5. Polyethylene pipe shall be manufactured in accordance with AWWA C906 for sizes 4" through 54".
6. Permanent identification of piping service shall be provided by co-extruding longitudinal blue stripes into the pipe's outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or painted on the pipe outside surface shall not be acceptable.
7. Polyethylene fittings shall be made from material meeting the same requirements as the pipe. Polyethylene fittings shall be molded or fabricated by the manufacturer of the pipe.
8. Where applicable, fittings shall meet the requirements of AWWA C906.
9. Molded fittings shall be manufactured in accordance with either ASTM D2683 (socket fused) or ASTM D3261 (butt fused) and shall be so marked.

2.03 DUCTILE IRON PIPING AND APPURTENANCES

A. Pipe shall be designed in accordance with AWWA C150 and shall conform to ANSI A21.51/AWWA C151, Class 52 and shall have push-on joints except that pipe installed in vaults or above grade shall have flanged ends conforming to ANSI B16.1. Pipe shall be double cement-lined with seal coat inside and out, conforming to ANSI A21.4/AWWA C104. Asphalt seal coat applied to the interior of ductile iron pipe shall be a product acceptable to the National Sanitation Foundation (NSF) for use in potable water and shall be listed in the most current NSF summary of approved products. The asphalt seal coat shall be applied and cured in strict conformance with manufacturer's instructions and cautions. The seal coat shall be applied by the pipe manufacturer under controlled factory conditions. Field application is strictly prohibited. The exterior of buried ductile iron pipe shall be bituminous coated. Push-on joints and rubber gaskets shall be in accordance with ANSI A21.11/AWWA C111.

B. The pipe manufacturer shall supply the Engineer with certificates of compliance with these specifications and certification that each piece of ductile iron pipe has been tested at the foundry with the Ball Impression Test, Ring Bending or other approved test for ductility.

C. Fittings shall be cast iron, 250 psi pressure rating, or ductile iron, 350 psi pressure rating, conforming to ANSI A21.10/AWWA C110 with mechanical joints. Compact ductile iron fittings conforming to ANSI A21.53/AWWA C153 will be acceptable. Joints and gaskets shall conform to ANSI 21.11/AWWA C111. Joints shall be furnished with ductile iron follower glands. Fittings shall be double cement-lined and seal-coated inside and out in accordance with ANSI A21.4/AWWA C104 and these Specifications. Tees for hydrant branches and for stubs for future use shall have mechanical joints on the run with a plain end having an integral rotating gland on the branch. The gland will anchor mechanical joint pipe or valve ends to the plain end of the tee.

1. All ductile and cast iron pipe and fittings shall be clean, sound and without defects. The castings shall be smooth and free from pinholes, excess iron, etc. The coatings shall be continuous, smooth and neither brittle nor sticky. The Contractor will, as ordered by the Engineer, cut lengths of pipe in the middle to check thickness of the lining.

2. The Contractor shall furnish and install all mechanical joint couplings to be used in connecting two plain ends of cast or ductile iron pipe. The couplings shall be of cast or ductile iron with bolts and nuts complying with AWWA C111. Couplings shall be Dresser Style 38, Smith-Blair Style 441, Clow Type F1208 or approved equal.

D. Mechanical Joint retainer glands shall be ductile iron and shall conform to ASTM A-536. Mechanical joint retainer glands shall be Megalug™, Ford Uni-flange Series 1400, or approved equal. Set screw retainer glands are not acceptable.

E. Plugs and/or caps shall be installed in locations shown on the Drawings or designated by the Engineer. The wetted surfaces of all plugs, caps and blank flanges shall be cement-lined and asphalt seal coated as specified for ductile iron pipe hereinbefore.

1. Furnish and maintain on the site, temporary water-tight plugs in the various sizes required for the water mains to be installed.

2.04 COPPER TUBING SERVICE PIPING AND APPURTENANCES

A. Service piping up to and including 2" shall be copper type k tubing. The service piping shall conform to the above- referenced standards for polyethylene with a pressure rating of 200 psi and a diameter as specified on the plans, or as directed by Engineer. Copper Tube sizes shall be used to allow the use of compression fittings without special adapters.

B. All fittings, connections, corporations, curb stops, and service appurtenances shall be service

brass as follows: Service brass shall conform to AWWA Standard C-800 (latest revision) and pack joint end connections shall consist of Buna-N beveled gasket for watertight seal. An independent, split-clamp locking device or stainless steel beveled gripper shall be incorporated in the design for additional restraint. Mueller service brass is accepted without substitute.

2.05 THRUST BLOCKS

A. Thrust restraints, cement concrete thrust blocks and/or clamps and tie rods shall be installed in accordance with the relevant provisions of the standard details shown on the Drawings and the directions of the Engineer.

B. The Contractor shall discuss with the Engineer the method[s] to be utilized to restrain thrust prior to installing bends, tees, hydrants and the like. Test pits may be required in areas of existing utilities to determine the exact location and dimensions of thrust restraints to be installed by the Contractor.

C. Concrete for thrust blocks shall have a minimum 28 day's compressive strength of 3,000 psi.

PART 3 - EXECUTION

3.01 GENERAL

A. All existing water lines as noted on drawings shall be removed from the site and disposed of in accordance with the contract requirements. At no time shall the pipe be crushed and left in place unless specifically noted on the drawings.

B. Pipe and accessories shall be handled and stored in such a manner as to ensure that pipe is installed in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. All pipes shall be thoroughly cleaned before being laid.

C. Ductile iron pipe and fittings and the cement linings are comparatively brittle. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or lining, scratching or marring machined surfaces, and abrasion of the pipe coating or lining.

D. Any pipe showing a distinct crack with no evidence of incipient fracture beyond the limits of the visible crack, if approved, may have the cracked portion cut off by, and at the expense of, the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

E. If authorized, cutting of the pipe shall be done so that the cut is square and clean, without causing damage to the pipe lining. Unless otherwise authorized by the Engineer, all pipe cutting shall be done by means of an approved type of power cutter. The use of hammer and chisel, or any other method which results in rough edges, chips and damaged pipe, is prohibited. All cut edges shall be field beveled by use of a power grinder, as required, prior to installation.

F. Each pipe section shall be placed into position in the trench in such manner and by such means required to cause no damage to the pipe, person or to property.

G. The Contractor shall furnish slings, straps, and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from delivery areas to the trench shall be restricted to operations which can cause no damage to the pipe units.

H. Pipe shall not be dropped from trucks onto the ground or into the trench. The Contractor shall

have on the job site, with each laying crew, all the proper tools to handle and cut the pipe.

I. Damaged pipe coating and/or lining shall be restored before installation only as approved or directed by the Engineer.

J. Ductile Iron Pipes shall be laid in accordance with AWWA C600 and with manufacturer's instructions.

K. All testing equipment for the water mains shall be approved by the Town. All water samples shall be taken by an independent testing firm hired by the contractor and approved by the Town. In no case shall the contractor perform the sampling work. The test and samples shall be performed/taken in the presence of the Town representative and any tests /samples performed/taken in the absence of the Town representative shall be considered invalid and shall be repeated at the contractor's expense.

L. Backfill materials shall be as shown on the Drawings and as specified in EARTHWORK Section.

3.02 CONTROL OF ALIGNMENT AND GRADE

A. The Engineer has shown easement and property and other control lines necessary for locating the work as well as elevations and benchmarks used in the design of the work on the Drawings.

B. The Contractor shall use this information to set line and use a surveyor's level or transit to set grade as required.

C. The use of string levels, hand levels, carpenter's levels or other curved devices for transferring grade or setting pipe are not permitted.

D. During construction, the Contractor shall provide the Engineer, at his request, all reasonable and necessary materials, opportunities, assistance for setting stakes and making measurements, and chain men, as needed, at intermittent times. He shall not proceed until he has made timely request of the Engineer for, and has received from him, such controls and instructions as may be necessary for the work to progress. The work shall then be done in strict conformity with such controls and instructions.

E. The Contractor shall carefully preserve benchmarks, reference points and stakes, and in case of willful or careless destruction by his own employees, he will be charged with the resulting expense and shall be responsible for any mistakes or delay that may be caused by their unnecessary loss or disturbance.

3.03 JOINTS

A. Joints between plain ends of polyethylene pipe shall be made by butt fusion when possible. The Pipe Manufacturer's fusion procedures shall be followed at all times as well as the recommendations of the Fusion Machine Manufacturer. The wall thicknesses of the adjoining pipes shall have the same DR at the point of fusion.

B. When saddle connections are fusion welded the Manufacturer's recommended saddle fusion procedures shall be used.

C. If mechanical fittings (which are designed for, or tested and found acceptable for use with polyethylene pipe) are utilized for transitions between pipe materials, repairs, joining pipe sections, saddle connections, or at other locations, the recommendation of the Mechanical Fitting Manufacturer must be followed. These procedures may differ from other pipe materials.

D. Socket and Saddle fusions shall be tested by a bent strap test as described by the Pipe Manufacturer. The pipe Manufacturer shall provide visual guidelines for inspecting the butt,

saddle, and socket fusion joints.

3.04 PREPARATION OF BED

A. As soon as excavation has been completed to required depth, the Contractor shall place and compact bedding material to the elevation necessary to bring the pipe to grade as specified herein.

B. The compacted bed shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly for the full length of the barrel.

C. Suitable holes for bells or couplings shall be dug around the pipe joints to provide ample space for making tight joints.

D. The trench bottom shall be straight, free of bumps or hollows and at the proper depth. Any irregularities in the trench bottom shall be leveled off or filled in with a selected gravel or sand thoroughly tamped. Where ledge or rock excavation is required, the trench shall be backfilled with sand.

E. The pipe shall then be laid on the trench bedding, and the pipe pushed home by approved methods such as with a bar and block. Jointing shall be in accordance with the manufacturer's instructions and appropriate ASTM Standards, and the Contractor shall have on hand for each pipe laying crew, the necessary tools, gauges, pipe cutters, etc. necessary to install the pipe in a workmanlike manner. At no time shall the bucket of the excavator be used to push home any pipe.

F. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.

G. If inspection of the pipe indicates that the pipe has been properly installed as determined by the Engineer, the Contractor may then refill or backfill the remainder of the trench in accordance with the Specifications.

H. At any time that work is not in progress, the end of the pipe shall have a temporary, water tight plug to prevent the entry of animals, earth, water, and debris.

I. Acceptable alignment shall be preserved in laying. The deflection at joints shall not exceed three degrees, or twelve inches for an 18-foot length of pipe. Fittings, in addition to those shown on the Drawings, shall be provided, if required, in crossing utilities which may be encountered upon opening the trench. Solid sleeves shall be used only where approved by the Engineer.

J. Concrete thrust blocks or other material approved by the Engineer shall be installed at all fittings and other locations as directed by the Engineer. Minimum bearing area shall be as shown on the Drawings. Joints must be protected by 6 Mil polyethylene barrier prior to placing concrete. Thrust blocks shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for poured in place thrust blocks. Concrete shall be produced in accordance with the contract documents.

K. Push-on joints shall be made in strict accordance with the manufacturer's instructions. A rubber gasket shall be inserted in the groove of the bell end of the pipe and joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be jointed and pushed home with a jack or by other means. After jointing the pipe, a metal feeler shall be used to make certain that the rubber gasket is located correctly. Bell or coupling holes shall be excavated as necessary to ensure that the pipes and not the pipe bells or couplings are bearing the weight of the backfill and traffic load.

L. Mechanical joints at valves, fittings and where designated shall be in accordance with the "Notes on Method of Installation" under ANSI Specification A21.11 and the instruction of manufacturer. To assemble the joints in the field, the Contract or shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tight to the specified torque. Under no conditions shall extension wrenches, pipe over handle or ordinary ratchet wrench be used to secure greater leverage.

3.05 CONCRETE THRUST BLOCKS

A. Where pipes change horizontal and vertical direction, at hydrants, tees and other fittings, and wherever abnormal thrust forces may be developed, the Contractor shall construct thrust and anchor blocks as detailed on the Drawings. They shall be Concrete, of minimum dimensions as detailed on the plans or of adequate additional size to suit actual conditions to withstand pressures anticipated, and shall be founded in virgin soil.

B. Concrete for thrust blocks shall have a minimum 28 day's compressive strength of 3,000 psi. Transit mix concrete may be used subject to approval of the Engineer.

3.06 GATE VALVES AND BOXES

A. Generally, valves shall be laid on native soil, with the trench bottom being firmly compacted and shaped to accept the valve. Where the soil in the subgrade is found to be soft, loose, freshly filled earth, unstable or unsuitable as a base, the Engineer may, at his discretion, order it excavated to such additional depth and width as he may deem necessary and replace the unsuitable foundation with gravel bedding.

B. Valve boxes shall be set centered and plumb over the operating nuts of all direct burial valves. The top of each valve box shall be set to finished grade with at least 10 inches of overlap remaining between the upper sections for future vertical adjustment. Minimum overlap for lower, extension pieces shall be 4 inches.

C. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

3.07 BACKFLOW PREVENTER

A. Install per Drawings and Manufacturer's recommendations.

3.08 TESTING

A. The contractor shall furnish all labor, pumps, taps, chemicals, and other necessary equipment to conduct hydrostatic pressure tests, measured leakage test and approved by the Town. The Contractor shall hire an independent testing firm that specializes in water line testing and disinfections of water distribution systems for laboratory bacteriological analysis on the mains laid under this contract in accordance with Section 4 AWWA C600-82 Installation of Ductile Iron Water Main and Part 3.7 of this Specification Section. The cost associated withal testing, sampling and work performed by the independent testing firm shall be included in the contract unit price for the items to be tested and/or those items, which may affect the testing of existing utilities.

B. The tests shall be conducted at a time specified by and under the supervision of a Town representative and success or failure of the work to meet the required standards. Any tests performed in the absence of the Town representative shall be considered invalid and shall be repeated at the contractor's expense.

C. In the event that the work fails to meet the required standards as stated herein, the Contractor shall perform such excavation, repair, re-laying of pipe, re-chlorinating and all other work necessary to correct the work; and shall repeat the tests as often as may be necessary and

until such time as the required standards are met.

3.09 PRESSURE TESTS

A. Before applying the specified test pressure, all air shall be expelled from the pipe. If suitable means of expelling air are not available at high places, the Contractor shall make all the necessary taps as shown on plans or as the Engineer may direct. After the tests have been completed, the corporation stops shall be left in place or removed and plugs inserted, as directed by the Engineer.

B. The newly laid pipe shall be tested in valved or plugged sections as determined by the Engineer in the field. Water shall be slowly introduced into the section being tested by means of an approved power-driven high pressure test pump.

C. The newly laid pipeline shall be tested to a pressure equal to 150% of the maximum static pressure for the section being tested, measured at the lowest point of the section being tested, corrected to the elevation of the test gauge. If the static pressure of any newly laid section of pipeline being tested is less than 100 psig measured at the lowest point of the pipeline section, then the minimum test pressure shall be 150 psig.

D. The pressure shall be raised to the test pressure required for each section being tested as determined by the Engineer. When the test pressure is reached, the time shall be recorded and the test shall begin. The duration of each pressure test shall be a minimum of one hour. During the test, pressure shall be maintained in the section of pipeline being tested by means of a re-circulating, by-pass type test pump. Water shall be added in measured amounts from a container of known volume if required to maintain pressure. The addition of excessive amount of water shall constitute immediate test failure. The Engineer will approve all gauges and test equipment.

E. During the test, the line will be examined by the Engineer for visible leaks and breaks. Any defects in the works shall be repaired, and any defective materials shall be removed and replaced by the Contractor as and where directed by the Engineer.

3.10 LEAKAGE TEST

A. The leakage test shall be conducted concurrently with the pressure test. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within five psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

B. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD \,/\, P}{133{,}200}$$

In which L is the allowable leakage, in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

C. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/h/in. of nominal valve size shall be allowed.

D. When hydrants are in the test section, the test shall be made against the closed hydrant.

E. Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid

discloses leakage greater than that specified, the Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance, as determined by additional testing.

F. All visible leaks are to be repaired regardless of the amount of leakage. At the end of the test period, if the amount of water added to the main from the calibrated vessel is less than the allowable leakage, and if the line shows no visible leaks or other failures, that portion of the main tested will be approved by the Engineer.

3.11 DISINFECTION

A. After satisfactory pressure and leakage tests have been completed and before placing the newly-laid mains in service, the contractor shall clean the mains and disinfect by chlorination. Disinfection of water mains shall be in accordance with AWWA C651 and related chemical standards such as ANSI/AWWA B300 - Hypochlorites, or ANSI/AWWA B301 - Liquid Chlorine.

B. Prior to chlorination, the mains shall be flushed to remove dirt and other foreign substances.

C. The mains shall be disinfected under the supervision of the Town representative. Disinfection shall be achieved using one of the following chlorination chemicals: liquid chlorine, sodium hypochlorite, or calcium hypochlorite appropriately mixed with water to form a solution. The contractor shall use a manually controlled, vacuum type solution feed chlorinator or electrically powered chemical feed pump suitable for feeding high concentrations of chlorine solutions. The chlorine shall be introduced into the main through a 3/4-inch corporation stop installed approximately one foot up-stream from the valve at the beginning of the job and testing for residual chlorine shall be at a 3/4-inch corporation stop installed approximately one foot from the down-stream valve at the end of the project.

D. Water from an approved source shall be introduced slowly into the main during the application of chlorine. The rate of chlorine solution flow shall be in proportion to the rate of water entering the pipe such that the chlorine dose entering the mains shall be at least 25 milligrams per Liter (mg/L) measured as free chlorine. The Contractor shall measure the chlorine concentration at regular intervals and as directed by the Engineer to ensure a dosage of greater than 25 mg/L. When the pipe line has been completely filled with treated water, the main shall be sealed off. Treated water shall be retained in the main for a period of at least twenty-four (24) hours. At the end of the retention period, the chlorinated water at the extremities of the pipe and at other representative points shall have a residual of at least ten (10) mg/L free chlorine.

E. Should the first treatment fail to meet the above requirements, the procedure shall be repeated until tests show that, in the opinion of the Engineer, effective disinfection has been accomplished.

F. Following acceptance of the disinfection process, the chlorinated water shall be flushed from the newly-laid main into the sewer line (or dechlorinate) until such time as the replacement water throughout its entire length shall be equal in quality to that elsewhere in the system.

G. After the main has been flushed of chlorinated water a representative water sample shall be taken by the independent testing firm hired by the contractor and approved by the Town under the supervision of the Engineer. This sample shall be taken to a Massachusetts DEQE certified laboratory for a bacteria analysis. The cost associated with the collection and analysis of the sample(s) shall be paid for by the Contractor. A minimum of one (1) sample shall be taken per 3000 linear feet. When satisfactory bacteriological test results indicating zero coliform and background levels, a second set of samples shall be taken at least 24 hours after the first sample and delivered to a certified laboratory for analysis. If both sets of samples are found to be free of coliform and are of equal or better bacteriologic quality than that of the distribution system quality, the new mains may be connected to the existing system and placed into service.

H. Failure of any bacteria analysis shall require the contractor to re-flush and re-chlorinate the mains until acceptable bacteriological results are obtained.

I. Special disinfection procedures, such as soaking or swabbing, approved by the Engineer, shall be used in connections to existing mains and where the method outlined above is not practicable.

3.12 CONNECTION TO EXISTING SYSTEM

A. The Contractor shall furnish all necessary labor, tools, joint materials, equipment, etc. to connect new water pipes to existing water pipes with the required proper fittings. Flexible transition couplings used to connect new water pipes to existing water pipes shall be as specified.

B. All connections shall be made at such time and in such manner as to cause as little interruption in water service as possible.

C. Coordination of all such work shall be made with the Engineer, Owner and Water Department General Foreman who shall be present when the work is done and shall operate all valves. The Contractor shall notify the Engineer, Water Department and Fire Department 24 hours in advance of when he plans to connect into the existing water mains and/or take existing mains out of service.

D. All materials, equipment and labor necessary for the connection of the new water mains to the existing water mains shall be accomplished as shown on the Drawings or as directed by the Engineer and shall be considered subsidiary to the pipe laying items.

3.13 BACKFILLING

A. The excavated trench is to be backfilled as directed by the Engineer. In all cases, the backfilled material shall be compacted in lifts not exceeding twelve (12) inches in depth (loose measurement).

3.14 INSTALLATION OF SERVICE TUBING

A. Care shall be exercised in the placing and laying of tubing to be sure that the pipe does not have kinks or is not placed on sharp stones or ledge which would cause damage to the pipe. Place in a 12-inch sand envelop around pipe, as shown on the Drawings, adjacent to, above and below the tubing. No stone shall be dropped on the tubing until the depth of backfill above the tubing is in excess of one foot. Blue metallic warning tape shall be placed 2-feet above top of pipe. Insert stiffeners shall be installed when compression connections are made to PVC pipe.

B. Make connections of new services with existing services unless otherwise directed by the Engineer. Use bushings and/or couplings as required to connect the new tubing with existing services.

C. Tracer wire shall be installed along and wrapped around PE water service tubing. Tracer wire shall be installed in such a manner as to enable its detection with electronic locating equipment. Tracer wire shall be from corporation stop extended continuously along polyethylene (PE) water service tubing to the curb stop and up to top of curb stop box. Where PE water service is installed on ductile iron or cast iron water mains, tracer wire shall be secured at the corporation stop with brass thaw wire nut compression assembly with set screw. Where PE water service is installed on PVC water mains, tracer wire for PE water service tubing shall be spliced to the tracer wire for the PVC water main. For curb boxes located in grassy areas, tracer wire shall travel up the outside of curb box and wrap 3 times around underside of box lip. For curb boxes located in concrete or asphalt areas, tracer wire shall travel up inside

curb box shaft and extend 1 foot longer than top of box with wire tucked inside box. Number of splices made on the tracer wire shall be kept to a minimum. Splices shall be made using an approved connector and shall be water tight and corrosion resistant. Wire nuts shall not be used. The use of split bolt style connectors shall require the installation of three successive layers each of rubber splicing and vinyl tapes. After installation of tracer wire on mains and services has been completed, the Contractor shall test the tracer wire for electrical continuity. Upon successful completion of system test and submission of certification form to the Town, tracer wire system shall be checked for functionality by a representative of the Water Division. Deficiencies in the tracer wire system shall be repaired by the Contractor at no additional cost to the Town and the tracer wire system shall be retested.

D. Prior to connecting new water service to existing service, new service line shall be flushed with clean water making sure all debris is removed from the line. Make connections of new services with existing services unless otherwise directed by the Engineer. Joint couplings for HDPE tubing shall be Quick Joint compression type with solid stainless steel internal stiffeners inside ends of HDPE tubing.

3.15 INSTALLATION OF VALVES AND FITTINGS

A. Gate valves and boxes shall be set with the stem vertical and box vertically centered over operating nut. Valves shall be set on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve. The gate box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade.

B. Valves shall be anchored to all tees or fittings with 3/4" threaded rods, mega lugs and or retainer glands, wherever possible or as directed by the Engineer.

C. Couplings and fittings shall be installed in accordance with manufacturer's instructions.

3.16 INSTALLATION OF MANUAL AIR RELEASE / CHLORINATION INJECTION POINTS

A. Installation of chlorination taps shall be by direct tap, after which corporation shall be removed, the top shall be plugged with a brass plug as directed by Town engineers.

B. The exact location of the manual air releases will be determined in the field.

3.17 TESTING OF VALVES AND HYDRANTS

A. All valves and hydrants shall be pressure tested during the main pipeline test. Hydrant gate valves shall remain open during the main pressure test. After the pipeline has been pressure tested and accepted, the hydrant gate valve shall be closed and the hydrant valve cracked open to release some pressure on the hydrant side of the gate valve. An acceptable test for each hydrant gate valve shall be no loss of pressure in the main line test pressure as each valve is closed.

B. All main line butterfly or gate valves and control valves on any intersecting side streets shall also be tested by the same procedures outlined above as far as practical. The Engineer shall decide if it is impractical to test any one particular valve location. No pressure test shall be considered acceptable until all possible control valves have been tested to insure proper closing and water tightness.

C. The Contractor shall make any taps and furnish all necessary caps, plugs, etc., as required in conjunction with testing. He shall also furnish a test pump, gauges and any other equipment required in conjunction with carrying on the hydrostatic tests. He shall at all times protect the new water mains and the existing water mains against the entrance of polluting material.

END OF SECTION

SECTION 33 30 00

SANITARY SEWERAGE SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 010000 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

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

1.02 WORK INCLUDED

A. The work described herein consists of furnishing all labor, equipment, materials, bedding, bedding material, excavation, backfilling, compaction, dewatering and other incidental items to completely install, repair and test sewer mains/manholes, fittings and associated appurtenances as indicated on the Drawings and as described herein. Testing shall be required, in accordance with the Town of Reading's Department of Public Works Regulations.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Erosion Control Plans
B. Earthwork
C. Storm Drainage

1.04 REFERENCES

A. All work shall comply with the pertinent standards of the latest editions of the following Codes and Specifications, unless designated otherwise herein:

1. American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19101.
2. American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.
3. American Association of State Highway and Transportation Officials (AASHTO), 341 National Press Building, Washington, D.C. 20004.
4. Requirements of the Town of Reading Department of Public Works.

B. Reference herein to any technical society, organization, group or body are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable:

1. ASTM - American Society for Testing and Materials
2. ACI - American Concrete Institute
3. ANSI - American National Standards Institute

C. The following standards and definitions are applicable to the work of this Section to the extent referenced herein:

1.	ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
2.	ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
3.	ASTM D2729	Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

1.05 SCHEDULING

A. The Contractor shall submit to the Engineer, for approval by the Owner, a progress schedule as specified in the GENERAL CONDITIONS. All schedules shall be reviewed by the Contractor with the Town of Reading for compliance with Town Engineering requirements.

1.06 SUBMITTALS FOR REVIEW

A. Product Data: Provide data indicating pipe, pipe accessories, manholes, grease traps, cleanouts and frames and covers.

1.07 SUBMITTALS FOR INFORMATION

A. Manufacturer's Instructions: Indicate special procedures required to install products specified.

B. Certificates: Certify that products meet or exceed specified requirements.

1.08 SUBMITTALS AT PROJECT CLOSEOUT

A. As-Built Drawings:

1. Submit one reproducible of As-Built Drawings upon completion and acceptance of work.

2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built Drawings shall include a minimum of three (3) ties to each manhole from fixed permanent objects. Record location of pipe runs, connections, and invert elevations. As-Built drawings shall also contain any additional information required by the Town of Reading (including stamping if required).

B. Identify, indicate and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.09 REGULATORY REQUIREMENTS

A. All work under this Section of the Specifications shall be installed in accordance with the Laws, Ordinances, Rules and Regulations of all Local, State and Federal authorities having jurisdiction, the Rules and Regulations of the National Board of Fire Underwriters, and the Public Utility Companies.

1.10 INSPECTION

A. The supplier is responsible for the provisions and all test requirements as specified in ASTM D3034 for SDR 35 gravity pipe and ASTM D2241 for PVC pressure rated sewer pipe. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for

compliance with these specifications by an independent testing laboratory selected by the Engineer. The Contractor shall require the manufacturer's cooperation in these inspections.

B. Inspection of the pipe may also be made by representatives of the Engineer after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though samples pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.11 DELIVERY, STORAGE AND HANDLING

A. All materials furnished under this section shall be delivered to the job adequately protected from damage during transit. Pipes shall not be dropped. All pipes shall be examined before laying and no piece shall be installed which is found to be defective.

B. Pipe and other appurtenances which are defective from any cause, including damage caused by handling, and determined by the Engineer as irreparable shall be unacceptable for installation and shall be replaced at no cost to the Owner.

C. Storage and handling of pipes, manholes and other sanitary sewer appurtenances shall be in accordance with the manufacturer's recommendations, subject to the approval of the Engineer.

1.12 EXAMINATION OF CONDITIONS

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

PART 2 - PRODUCTS

2.01 GENERAL

A. All products included in this section shall conform to the requirements of the standard specifications referenced herein.

B. Pipe sizes and material types shall be as shown on the Drawings.

C. All pipe materials and methods of jointing shall be as shown on the Drawings.

D. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates of such tests.

E. In addition, the Owner reserves the right to have any or all pipe, fittings and special casting inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

F. Pipe and fittings shall be subjected to a careful inspection and a hammer test just before being laid or installed.

2.02 PIPE MATERIALS

A. Plastic Pipe: ASTM D3034, Polyvinyl Chloride (PVC) material; inside nominal diameter as indicated on plans with bell and spigot style solvent sealed joint end.

2.03 PIPE ACCESSORIES

A. Joints: PVC pipe shall have an integral wall bell and spigot push-on joint with elastomeric gaskets secured in placed in the bell of the pipe. The bell shall consist of an integral wall section with a solid cross section elastomeric gasket, factory assembled, securely locked in place to prevent displacement during assembly. Elastomeric gaskets shall conform to ASTM D3212.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tree, bends, elbows, cleanouts, reducers, traps and of the configurations required.

2.04 CLEAN-OUTS

A. Clean-out Cover: Shall be Model 1564 Frame and Cover, as provided by EJ Prescott or approved equal.

B. Load Design: Vehicular traffic load (H-20).

C. Shaft Construction: Ductile Iron (DI) pipe sections lipped male/female joints, nominal shaft diameter as shown on plans.

D. Pad: Cast-in-place concrete of type specified in Section 03300.

2.05 BEDDING AND BACKFILLING MATERIALS

A. Bedding: Crushed stone as specified in Section 02200.

B. Cover: Gravel as specified in Section 02200.

PART 3 - EXECUTION

3.01 GENERAL

A. Pipe and accessories shall be handled and stored in such a manner as to insure that pipe is installed in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. All pipes shall be thoroughly cleaned before being laid.

B. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or lining, scratching or marring machined surfaces, and abrasion of the pipe coating or lining.

C. Any pipe showing a distinct crack with no evidence of incipient fracture beyond the limits of the visible crack, if approved, may have the cracked portion cut off by, and at the expense of the Contractor, before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

D. If authorized, cutting of the pipe shall be done so that the cut is square and clean, without causing damage to the pipe lining. Unless otherwise authorized by the Engineer, all pipe cutting shall be done by means of an approved type of power cutter. The use of hammer and chisel, or any other method, which results in rough edges, chips and damaged pipe, is

prohibited. All cut edges shall be field beveled by use of a power grinder, as required, prior to installation.

E. Each pipe section shall be placed into position in the trench in such manner and by such means required to cause no damage to the pipe, person or to property.

F. The Contractor shall furnish slings, straps, and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from delivery areas to the trench shall be restricted to operations which can cause no damage to the pipe units. Pipe shall not be dropped from trucks onto the ground or into the trench. The Contractor shall have on the job site, with each laying crew, all the proper tools to handle and cut the pipe. Damaged pipe coating and/or lining shall be restored before installation only as approved or directed by the Engineer.

G. The portions of sewer main that is to be repaired shall be cut out, removed and replaced matching the existing pipe size with pvc. The contractor will be responsible for all materials including but not limited to; pvc pipe, fittings and elbows.

3.02 CONTROL OF ALIGNMENT AND GRADE:

A. The Engineer has shown easement and property and other control lines necessary for locating the work as well as elevations and benchmarks used in the design of the work on the Drawings.

B. The Contractor shall use this information to set line and use a surveyor's level or transit to set grade as required.

C. The use of string levels, hand levels, carpenter's levels or other curved devices for transferring grade or setting pipe are not permitted.

D. During construction, the Contractor shall provide the Engineer, at his request, all reasonable and necessary materials, opportunities, assistance for setting stakes and making measurements, and chain men, as needed, at intermittent times. He shall not proceed until he has made timely request of the Engineer for, and has received from him, such controls and instructions as may be necessary for the work to progress. The work shall then be done in strict conformity with such controls and instructions.

E. The Contractor shall carefully preserve benchmarks, reference points and stakes, and in case of willful or careless destruction by his own employees, he will be charged with the resulting expense and shall be responsible for any mistakes or delay that may be caused by their unnecessary loss or disturbance.

3.03 PREPARATION OF BED

A. As soon as excavation has been completed to required depth, the Contractor shall place and compact bedding material to the elevation necessary to bring the pipe to grade as specified herein.

B. The compacted bed shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly for the full length of the barrel.

C. Suitable holes for bells or couplings shall be dug around the pipe joints to provide ample space for making tight joints.

D. The trench bottom shall be straight, free of bumps or hollows and at the proper depth. Any irregularities in the trench bottom shall be leveled off or filled in with a selected gravel or sand thoroughly tamped. Where ledge or rock excavation is required, the trench shall

be backfilled with sand. The bedding/bedding material shall then be installed in accordance to the Town of Reading Sewer Regulations.

E. The pipe shall then be laid on the trench bedding, and the pipe pushed home by approved methods such as with a bar and block. Jointing shall be in accordance with the manufacturer's instructions and appropriate ASTM Standards, and the Contractor shall have on hand for each pipe laying crew, the necessary tools, gauges, pipe cutters, etc. necessary to install the pipe in a workmanlike manner.

F. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.

G. If inspection of the pipe indicates that the pipe has been properly installed as determined by the Engineer, the Contractor may then refill or backfill the remainder of the trench in accordance with the Specifications.

H. At any time that work is not in progress, the end of the pipe shall have a temporary, water tight plug to prevent the entry of animals, earth, water, and debris.

I. Acceptable alignment shall be preserved in laying. The deflection at joints shall not exceed three degrees, or twelve inches for an 18-foot length of pipe. Fittings, in addition to those shown on the Drawings, shall be provided, if required, in crossing utilities which may be encountered upon opening the trench. Solid sleeves shall be used only where approved by the Engineer.

J. Push-on joints shall be made in strict accordance with the manufacturer's instructions. A rubber gasket shall be inserted in the groove of the bell end of the pipe and joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be jointed and pushed home with a jack or by other means. After jointing the pipe, a metal feeler shall be used to make certain that the rubber gasket is located correctly. Bell or coupling holes shall be excavated as necessary to ensure that the pipes and not the pipe bells or couplings are bearing the weight of the backfill and traffic load.

3.04 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive work and excavations, dimensions and elevations are as indicated on drawings.

3.05 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with coarse aggregate.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.06 BEDDING

A. Excavate pipe trench in accordance with EARTHWORK Section for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom in accordance with EARTHWORK Section. Level materials in continuous layers not exceeding 6 inches compacted depth, compact to 95 percent.

C. Maintain moisture content of bedding material to plus or minus 2 percent to attain

required compaction density.

3.07 INSTALLATION - PIPE

A. Install pipe, fittings and accessories in accordance with ASTM D2321 and manufacturer's instructions. Seal joints watertight.

B. All sewer piping shall be laid accurately to the lines and grades shown in the Drawings and/or as approved by the Engineer and in conformance with pipe manufacturer's recommended procedures.

1. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash before installing in the line. Extreme care shall be taken to keep the bells of the pipe free from dirt and rocks so that joints may be properly assembled without overstressing the bells. No pipe is to be trimmed or chipped to fit.
2. No length of pipe shall be laid until the proceeding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1:1000.

D. Install bedding at sides and over top of pipe to minimum compacted thickness of 6 inches; compacted to 95 percent.

E. Refer to EARTHWORK Section for trenching requirements. Do not displace or damage pipe when compacting.

F. Connect to building sanitary sewer outlet and municipal sewer system through installed sleeves.

G. Pipe Extension: Where existing pipe is to be extended, the same type of pipe shall be used unless otherwise specified or approved by the Engineer.

H. Full Lengths of Pipe: Only full lengths of pipe are to be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

I. Pipe Entrances to Structures: All pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe surface within the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation. The method of cutting and finishing shall be subject to the approval of the Engineer.

J. Protection During Construction: The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Contractor's risk.

K. At all times when pipe laying is not in progress, all open ends of pipes shall be closed by approved temporary water-tight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has passed.

L. Pipe shall be jointed in strict accordance with the Pipe manufacturer's instruction. Jointing of all pipe shall be done entirely in the trench.

M. Lubricant for jointing of PVC pipe shall be applied as specified by the pipe manufacturer. Use only lubricant supplied by the pipe manufacturer.

1. PVC Pipe shall be pushed home by hand or use of bar and block. The use of power equipment such as a backhoe bucket is not recommended and shall only be used at the direction of the manufacturer.
2. To join field-cut pipe, pipe and shall be cut square. The cut end of the pipe surface shall be properly beveled to the size and shape of a factory-finished beveled end. All sharp edges shall be rounded off.

3.08 INSTALLATION - CLEAN-OUTS

A. Form and place cast-in-place concrete pad with provision for sanitary sewer pipe ends.

B. Establish elevations and inverts for inlets and outlets as indicated.

C. Mount clean-out surface hub level in grout, to elevation indicated.

3.09 SERVICE CONNECTIONS

A. General Requirements: The Contractor shall make all required connections of the building sanitary sewer service where and as shown on the Drawings and/or as approved by the Engineer. Work shall include making the service line connections into the onsite sanitary sewer system to points located ten (10) feet outside of the proposed building lines and properly sealing the ends with watertight plugs. Service line extensions from these points into the building will be performed by others.

B. Coordination with Building Contractor: The Contractor will be required to coordinate his Work with the work of the Building Contractor to determine the exact location and elevation of the point of entry into the building. If the Building Contractor has installed his portion of the sanitary sewer service line, Work under this Contract shall also include final connection of the sanitary sewer service line ten (10) feet outside the building line to the building service line at no additional cost to the Owner.

C. The Contractor shall install 45 degree wye branches in the onsite sanitary sewer mains in all locations where building sewer service line connections are shown on the Drawings directly entering the onsite sewer main. Connections of the sanitary sewer service lines shall be made into the wye branches by means of 45 degree bends. The connections shall be made thoroughly watertight and concrete shall be placed under each connection to bear on undisturbed earth and firmly support the connection. All Work shall be performed to the satisfaction of the Engineer.

3.10 FIELD QUALITY CONTROL

A. Request inspection prior to, and immediately after, placing bedding.

B. Compaction testing will be performed in accordance with ASTM D 1557.

C. Moisture content testing will be performed in accordance with ASTM D1557.

3.11 TESTING:

A. This shall be accomplished through the combination of visual inspections, deflection tests, low-pressure air tests and leakage tests methods. Acceptance test shall only be performed after all work adjacent to and over the pipe has been completed. All testing shall be performed in the presence of the Town representative. Tests performed in the

absence of the Town representative shall be considered invalid and shall be repeated at the Contractor's expense. The contractor shall furnish all labor, pumps, plugs, inlet taps, compressors, pressure gauges, mandrels, and other necessary equipment to perform required tests, on the mains and/or manholes installed under this contract.

B. The tests shall be conducted at a time specified by and under the supervision and success or failure of the work to meet the required standards. The sequence of testing shall be as follows: construction completed and all backfill and superimposed loads in place, landscaping over and around sewer appurtenance is completed, manholes completed, lines thoroughly cleaned, visual inspection ("Flashing"), mandrel testing, determination of ground water table, air testing or infiltration testing (pipe, manhole).

C. In the event that the line or manhole fails to meet the required standards as stated herein, the Contractor shall perform such excavation, repair, re-laying of pipe, and all other work necessary to correct the work and shall repeat the tests as often as may be necessary and until such time as the required standards are met at the Contractor's own expense.

3.12 VACUUM TEST

A. All sanitary sewer manholes constructed by the contractor shall be vacuum tested for leakage in the presence of the Town representative. Vacuum testing shall be performed in accordance with ASTM C1244. The vacuum test requirements will not apply to any existing manhole, or any existing manhole that has been converted to a drop manhole by the contractor. All lifting holes shall be plugged with an approved non-shrinking grout inside and out. Manhole joints shall be grouted from the outside only. All pipes entering the manhole shall be plugged. The contractor shall securely brace the plugs in order to keep them from being drawn into the manhole. The test head shall be placed at the inside of the top of the cone section of the manhole and the seal inflated in accordance with the manufactures recommendations. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time for the vacuum to pump to 9 inches shall not be less than that shown in the table below:

Depth of Manhole (Feet)	Diameter of Manhole (Inches) 48"	60"	72"
0-8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

(Times shown are minimum elapsed times, in seconds for a drop in vacuum of 1 inch of mercury.)

3.13 CONNECTION TO EXISTING SYSTEM:

A. The Contractor shall furnish all necessary labor, tools, joint materials, equipment, etc. to connect the existing sewer pipes to new sewer manholes with the required proper fittings. Flexible transition couplings used to connect new sewer pipes to existing sewer pipes and/or manholes shall be as specified on the Drawings or as directed by the Engineer and shall be considered incidental to the appropriate item.

3.14 BACKFILLING

A. The excavated trench is to be backfilled as directed by the Engineer. In all cases, the backfilled material shall be compacted in lifts not exceeding six (6) inches in depth (loose measurement).

3.15 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

3.16 CLEANING AND REPAIR

A. The Contractor shall clean the entire sanitary sewer system of all debris and obstructions. This shall include, but not be limited to removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sanitary sewers or streams; all debris shall be removed from the system.

B. All work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of the Engineer.

3.17 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance by the Engineer, the entire sanitary sewer system shall be subjected to a final inspection in the presence of the Engineer. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, leakage tests and workmanship have been met.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 00 00 - GENERAL REQUIREMENTS, which are hereby, made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

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

E. Materials shall conform with Town of Reading DPW / Engineering Standards.

1.02 WORK INCLUDED

A. Site storm drainage piping, fittings and accessories, and bedding

B. Connection of drainage system to existing storm drainage system

C. Structures, area drains, cleanouts and site surface drainage

1.03 RELATED WORK UNDER OTHER SECTIONS

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

1. Erosion and Sediment Control
2. Earthwork
3. Cast-in-place Concrete
4. Bituminous Concrete Paving
5. Portland Cement Concrete Pavement
6. Loam and Seed
7. Planting

1.04 REFERENCES

A. References herein to any technical society, organization, group or body are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable:

1. ASTM American Society for Testing and Materials
2. ACI American Concrete Institute
3. ANSI American National Standards Institute
4. AASHTO American Association of State Highway and Transportation Officials
5. MHD Massachusetts Highway Department's "Standard Specifications for Highways and Bridges", latest Edition

B. All work shall comply with the pertinent standards of the latest editions of the following Codes and Specifications, unless designated otherwise herein:

1. American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19101.
2. American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.
3. American Association of State Highway and Transportation Officials (AASHTO), 341 National Press Building, Washington, D.C. 20004.

C. The following standards and definitions are applicable to the work of this Section to the extent referenced herein:

1.	ASTM A48	Standard Specification for Gray Iron Castings
2.	ASTM C32	Standard Specification for Sewer and Manhole Brick
3.	ASTM C55	Standard Specification for Concrete Brick
4.	ASTM C62	Standard Specification for Building Brick
5.	ASTM C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
6.	ASTM C139	Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
7.	ASTM C270	Standard Specification for Mortar for Unit Masonry
8.	ASTM C443	Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets.
9.	ASTM C 478	Standard Specification for Precast Reinforced Concrete Manhole Sections
10.	ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
11.	ASTM D1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb. (4.54 kg) Rammer and 18 inch (457 mm) Drop.
12.	ASTM D2729	Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
13.	ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
14.	ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

1.05 SCHEDULING

A. The Contractor shall submit to the Landscape Architect/Civil Engineer, for approval by the Owner, a progress schedule as specified in the GENERAL CONDITIONS. All schedules shall be reviewed by the Contractor with the Owner for compliance with street opening and Town Engineering Department requirements.

1.06 SUBMITTALS FOR REVIEW

A. Product Data: Provide data indicating pipe and pipe accessories, manholes, catch basins, leaching basins, clean-outs, frames, grates and covers, and all other pertinent information and equipment to be used.

1.07 SUBMITTALS FOR INFORMATION

A. Manufacturer's Instructions: Indicate special procedures required to install products specified.

B. Certificates: Certify that products meet or exceed specified requirements.

1.08 SUBMITTALS AT PROJECT CLOSEOUT

A. Accurately record actual locations, both horizontally and vertically, of pipe runs, connections, catch basins, all manholes, stormwater treatment system structures, stormwater detention/recharge systems, and other stormwater infrastructure.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.09 REGULATORY REQUIREMENTS

A. All work under this Section of the Specifications shall be installed in accordance with the Laws, Ordinances, Rules and Regulations of all Local, State and Federal authorities having jurisdiction, the Rules and Regulations of the National Board of Fire Underwriters, and the Public Utility Companies.

1.10 COORDINATION

A. Coordinate work under provisions of the applicable Sections of these Specifications.

1.11 EXAMINATION OF CONDITIONS

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

1.12 DELIVERY, STORAGE AND HANDLING

A. All materials furnished under this section shall be delivered to the job adequately protected from damage during transit. Pipes shall not be dropped. All pipes shall be examined before laying and no piece shall be installed which is found to be defective.

B. Pipe and other appurtenances, which are defective from any cause, including damage caused by handling, and determined by the Engineer irreparable shall be unacceptable for installation and shall be replaced at no cost to the Owner.

C. Storage and handling of pipes, pre-cast structures and other storm drainage appurtenances shall be in accordance with the manufacturer's recommendations, subject to the approval of the Engineer.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall meet the requirements specified in the following Subsections of Division III, Materials - Massachusetts Highway Department, Standard Specifications for Highway and Bridges:

1.	Reinforced Concrete Pipe	M5.02.1
2.	Reinforced Concrete Pipe Flared Ends	M5.02.2
3.	Ductile Iron Pipe and Fittings	M5.05.3
4.	Plastic (PVC) Pipe	M5.03.7
5.	Corrugated Plastic (Polyethylene) Pipe	M5.03.10
6.	Mortar for Pipe Joint	M4.02.15
7.	Crushed Stone	M2.01.5

2.02 STORM DRAIN PIPE MATERIALS

A. High Density Corrugated Polyethylene Pipe: Pipe shall have a full circular cross section with an outer corrugated pipe wall and a smooth inner wall. Pipe shall be Hancor "HI-Q" pipe, ADS N-12, Prinsco "Goldflo" dual-wall pipe, or approved equal. Pipe manufactured for this specification shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252, and M294. Pipe shall be made from virgin PE compounds which conform to the applicable current edition of the AASHTO Material Specifications for cell classification as defined and described in ASTM D 3350.

1. Joints and Fittings: Standard 45 Degree "Y" connections, tees, bends, and other fittings shall be fabricated to sizes shown on the drawings. Coupling Bands shall be per manufacturer's specifications. Couplers shall cover not less than one corrugation on each section of pipe. Fittings shall be made from virgin PE compounds which conform to the applicable current edition of the AASHTO Material Specifications for cell classification as defined and described in ASTM D 3350.

2.03 PRECAST UNITS (MANHOLES, CATCH BASINS, LEACHING BASINS/DRY WELLS)

A. Precast units shall be manufactured in accordance with ASTM Designation C478, the diameter and depth as detailed on the Drawings and utilize 4000psi concrete. All walls shall be a minimum of 6" thick.

B. Precast unit joints shall be butyl rubber section joints per ASTM C443.

C. Exterior of precast unit shall have a bituminous coating.

D. Manholes

1. Shall utilize eccentric cones at the top section or a flat top slab as needed if grades and elevations do not allow for a coned top section.
2. Steps shall be the drop-front extruded aluminum type with 12-inch wide stepping surface.
3. Castings shall be equivalent to "Massachusetts Standard" - 26" manhole frame and cover as provided by EJ Prescott and shall read "DRAIN" on the cover.

E. Catch Basin

1. All catch basins shall have a minimum 48" sump.
2. Unit shall utilize a concentric cone at the top section or a flat top slab as needed if grades and elevations do not allow for a coned top section.
3. All proposed catch basins shall be constructed with oil hoods. Oil hoods shall be "The Eliminator" as manufactured by Ground Water Rescue, Inc. of Quincy or approved equal.
4. Castings shall be equivalent to "Maine, Mass & Vermont Catch Basin" – heavy Duty Catch Basin with 2" Square Openings as provided by EJ Prescott.
   a. Provide a three flange model where adjacent to a curb and a 4 flange model when not adjacent to a curb.
5. All catch basins will be equipped with hoods on the outlet pipe.

F. Leaching Basin / Dry Well

1. Leaching Basins / Dry Wells shall be a minimum of 1200 gallon and 6' diameter unless otherwise noted on the Utility Plan.
2. Shall utilize an eccentric cone or a flat top slab as needed if grades and elevations do not allow for a coned top section.
3. Castings shall be equivalent to "Maine, Mass & Vermont Catch Basin" – heavy

Duty Catch Basin with 2" Square Openings as provided by EJ Prescott.

a. Provide a three flange model where adjacent to a curb and a 4 flange model when not adjacent to a curb.

G. Precast Unit Alternative (Shallow Structures Only and with Approval of Landscape Architect/Civil Engineer).

1. When approved by the Landscape Architect/Civil Engineer, precast units may be constructed with brick or concrete block walls and poured reinforced concrete bases as an alternative to precast concrete units. Brick shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II; or ASTM C 32, Grade MS. Precast concrete segmental block shall conform to ASTM C 139, not more than 200 mm (8 inches) 8 inches thick, not less than 200 mm (8 inches) 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

2.04 AREA DRAINS

A. Area drains shall be equivalent to 12" H-10 Pedestrian Grate as manufactured by ADS-Pipe.

2.05 CLEANOUTS

A. Cast iron frames and covers shall conform to ASTM A48, latest issue, Class 30.

1. Provide concrete collars as shown on the Drawings

2.06 BEDDING AND COVER MATERIALS

A. Bedding: Crushed stone as specified in Section EARTHWORK.

B. Cover: Gravel as specified in Section EARTHWORK.

PART 3 - EXECUTION

3.01 GENERAL:

A. The bedding for the Pipe shall be shaped to conform reasonably close to the lower 10% of the pipe and recesses excavated for bells of bell and spigot pipes. All pipe shall be laid to the specified line and grade, with a firm bearing throughout each length and with bell ends uphill.

B. Drainage pipe shall be backfilled with gravel having no stone greater than 3 inches unless otherwise noted on plans.

C. The joint of reinforced concrete pipe shall be thoroughly cleaned and wetted with water before being joined. Reinforced concrete pipe shall be joined using a flexible water tight rubber gasket conforming to ASTM C443 and the filling the joint be completed with cement mortar. Any alternative joint design must be pre-approved by the Landscape Architect/Civil Engineer. The invert shall be kept smooth and free of obstructions.

D. The drain trench shall be excavated to the depth designated on the plans or, if directed, to a stratum of impervious material.

E. The excavation shall proceed in advance of the actual drain construction only to the extent the Landscape Architect/Civil Engineer direct.

F. Where rock is encountered in the excavation, no part of any rock remaining in the trench shall come within six inches of any portion of the pipe.

G. Joints shall be grouted or sealed when using reinforced concrete pipe and corrugated plastic pipe shall be firmly joined with an approved coupling.

H. The Contractor shall be responsible for keeping the backfill material clean and free of objectionable material from a line one inch below the flow line of the pipe to the top of the trench.

I. Existing drainage infrastructure is to be field cored with the proper equipment approved and satisfactory to the Landscape Architect/Civil Engineer. Contractor shall confirm the invert of the proposed tie-in prior to beginning drainage excavations.

J. Removal and disposal of the existing drain pipe within the trenching area of proposed pipe shall be included in contract unit price per foot of kind of pipe at no additional compensation to the Contractor.

K. Removal and disposal of the existing drain pipe outside of the trenching area of proposed pipe shall be excavated and completely removed then backfilled and compacted with the proper material.

3.02 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive work and excavations, dimensions and elevations are as indicated on drawings.

3.03 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with coarse aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.04 BEDDING

A. Excavate pipe trench in accordance with Section 02200 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.

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

3.05 INSTALLATION - PIPE

A. Install pipe, fittings and accessories in accordance with applicable standards and manufacturer's instructions. Seal joints watertight.

B. Place pipe on bedding to depths indicated on drawings. Notch under pipe bells and joints, where applicable to provide for uniform bearing under entire length of pipe.

C. Lay pipe to slope gradients noted on drawings with maximum variation from true slopes of 1/8 inch per foot.

D. Install bedding at sides and over top of pipe. Provide top cover to minimum compacted

thickness as indicated on drawings. Compact to 95%.

E. Refer to EARTHWORK Section for trenching, bedding, backfilling and compaction requirements. Do not displace or damage pipe when compacting.

3.06 INSTALLATION – PRECAST UNITS

A. Manholes, Catch Basins and Outlet Control Structures shall be constructed at the locations and to the lines, grades, dimensions and design noted on Drawings or as required.

B. Precast Concrete Construction shall be done in a manner to insure watertight construction and all leaks in precast concrete shall be sealed. If required, precast concrete shall be repaired or replaced to obtain watertight construction.

C. Concrete barrels, cones and slabs shall be precast concrete sections.

D. Bases shall be either precast with a barrel integrally cast with the base, or poured concrete suitably shaped by means of accurate bell-rung forms to receive the barrel sections. Manhole invert channels in manholes shall be formed in concrete.

E. Precast units shall have an adjustment ring at the top of the cone to permit the frame and cover to meet the finished surface. This shall consist of courses of brick or reinforced grading rings not to exceed 11 inches.

F. Stubs shall be short pieces cut from the bell ends of the appropriate size and class of pipe. Concrete stubs shall be plugged with brick masonry unless otherwise directed.

G. Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.

H. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

I. The Contractor may, as an alternate to suitable nonshrink mortar joints, use premolded elastomeric-sealed joints for pipe into precast manhole bases.

J. All materials, accessories and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint.

K. Openings for pipe and materials to be embedded in the walls of the base for these joints shall be cast in the base at the required locations during the manufacturer of the base. Incorrectly cast and patched pipe openings will be rejected.

L. Manhole risers and tops shall be installed using approved "o-ring" type, neoprene gaskets for sealing joints. Units shall be installed level and plumb. Water shall not be permitted to rise over newly made joints nor until after inspection as to their acceptability. All jointing shall be done in a manner to insure watertightness.

M. Openings shall be provided in the risers to receive entering pipes. These openings may be made at the place of manufacture or cut in the field. The openings shall be sized to provide a uniform 3/4 inch maximum annular space between the outside of the pipe wall and the opening in the riser. After the pipe is in position, the annular space shall be solidly filled with nonshrink mortar. Care shall be taken to assure that the openings are located to permit setting of the entering pipe at its correct elevation as indicated.

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

O. Where required by the Drawings, a slot and opening shall be cast in the catch basin wall suitable for mounting the cast iron hood and discharge pipe. The hood hinge may be furnished to the precast supplier by the Contractor for incorporation into the casting.

3.07 BRICK MASONRY

A. Brick Masonry Construction shall be done in a manner to insure watertight construction and all leaks in brick masonry shall be sealed. All workmanship shall conform to the best standard practice and all brick masonry shall be laid by skilled workmen.

B. All beds on which masonry is to be laid shall be cleaned and wetted properly. Brick shall be wetted as required and shall be damp but free of any surface water when placed in the work. Bed joints shall be formed of a thick layer of mortar which shall be smoothed or furrowed slightly. Head joints shall be formed by applying to the brick to be laid a full coat of mortar on the entire end, or on the entire side as the case requires, and then shoving the mortar covered end or side of the brick tightly against the bricks laid previously. The practice of buttering at the corners of the brick and then throwing the mortar or crappings in the empty joints will not be permitted. Dry or butt joints will not be permitted. Joints shall be uniform in thickness and shall be approximately 1-1/4 inch thick.

C. Brickwork shall be constructed accurately to dimensions and brickwork at top of manholes shall be to the dimensions of the flanges of the cast-iron frames.

D. Joints on the inside face of walls shall be tooled slightly concave with an approved jointer when the mortar is thumbprint hard. The mortar shall be compressed with complete contact along the edges to seal the surface of the joints.

E. All castings to be embedded in the brickwork shall be accurately set and built-in as the work progresses. Cast-iron frames and manhole covers shall be well bedded in mortar and accurately set to finished grades indicated or as directed.

F. Water shall not be allowed to flow against brickwork or to rise on the masonry for 60 hours after it has been laid, and any brick masonry damaged in this manner shall be replaced as directed at no additional expense to the Owner. Adequate precautions shall be taken in freezing weather to protect the masonry from damage by post.

3.08 CONCRETE MASONRY UNITS

A. Concrete Masonry Unit Construction shall be soaked in water before laying. As circular concrete block walls are laid-up, the horizontal joints and keyways shall be flushed full with mortar. As rectangular blocks are laid-up, all horizontal and vertical joints shall be flushed full with mortar. Plastering of the outside of block structures will not be required. The joints in precast units shall be wetted and completely mortared immediately prior to setting a section. No structure shall be backfilled until all mortar has completely set.

3.09 MANHOLE STEPS

A. Placement of steps into the precast walls shall be by a proven method as recommended by the supplier of the precast manhole sections. Details of the steps and method of placement shall be submitted for approval.

B. Aluminum steps shall have an anchoring lip if cast into the wall or serrated legs if driven into the green concrete or polypropylene inserts after casting. Those parts of aluminum

steps which will be in contact with the concrete shall be thoroughly cleaned and given a protective coating of an acceptable heavy-bodied bituminous material.

3.10 CASTINGS

A. Cast-Iron Frames for grates and covers shall be well bedded in cement mortar and accurately set to the grades indicated or as directed. The frames shall be encased with a thick cement-mortar collar around the entire perimeter of the frames.

B. All voids between the bottom flange shall be completely filled to make a watertight fit. A ring of mortar, at least one-inch thick and pitched to shed water away from the frame shall be placed over and around the outside of the bottom flange. The mortar shall extend to the outer edge of the masonry all around its circumference and shall be finished smooth. No visible leakage will be permitted.

C. Structures within the limits of bituminous concrete pavement shall be temporarily set at the elevation of the bottom of the binder course or as ordered. After the binder course has been compacted, these structures shall be set at their final grade. Backfill necessary around such structures after the binder course has been completed shall be made with Class A concrete unless otherwise ordered. [Landscape Architect/Civil Engineer to review Concrete section to verify Class A included in Specifications.]

3.11 ADJUSTING DRAINAGE STRUCTURE FRAME AND GRATE/COVER

A. Frames and grates or covers shall be adjusted in accordance with MHD Sections 201 and 220.

3.12 OIL HOODS

A. Install oil hoods in accordance with the details on the Contract Drawings and the manufacturer's instructions and recommendations

3.13 AREA DRAINS

A. Area drains shall be installed in accordance with the details on the Contract Drawings and the manufacturer's instructions and recommendations

3.14 CLEANOUTS

A. Cleanouts shall be installed in accordance with the details on the Contract Drawings and the manufacturer's instructions and recommendations.

3.15 CLEANING

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

3.16 PROTECTION

A. Protect finished work under provisions of applicable sections of these specifications.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

HIGH SCHOOL TRACK AND FIELD RENOVATIONS

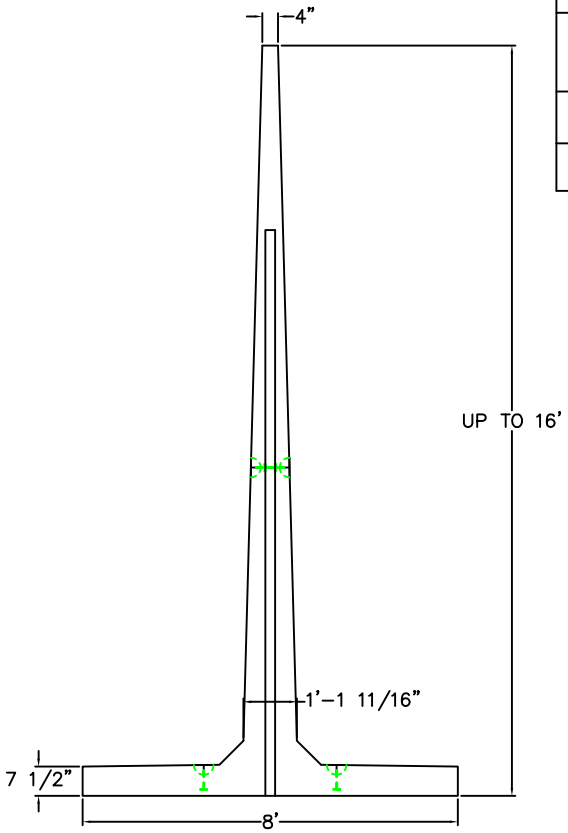
APPENDIX

ACTIVITAS

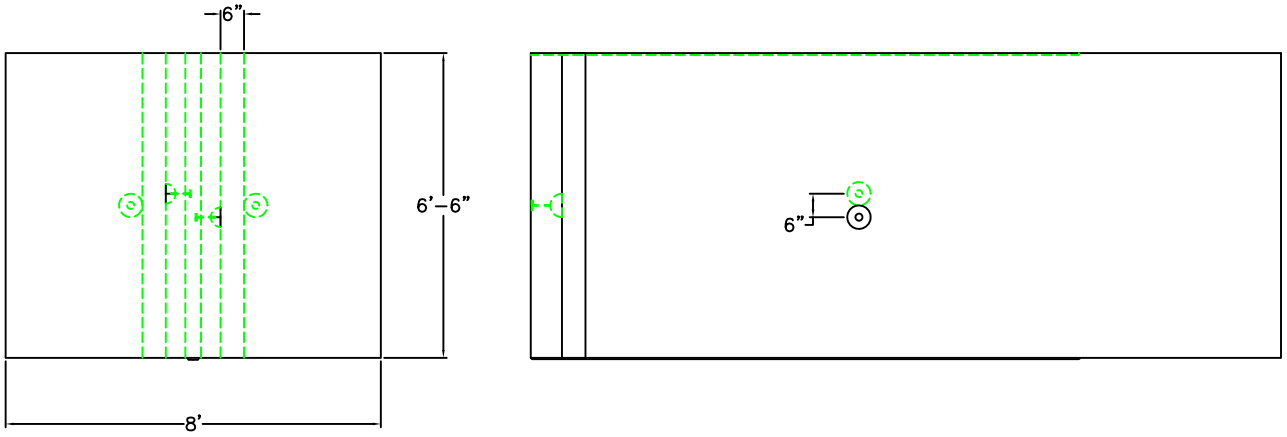
SCITUATE COMPANIES
120 CLAY PIT ROAD
MARSHFIELD, MA 02050
PHONE # 1-800-440-0009
FAX # 781-837-4320

CONTRACTOR:	JOB NAME:
DATE:01/09/2019 APPROVED BY:	DRAWING BY: C. J. SCOTT

SCP STANDARD T-WALL



DESIGN NOTES:
1. CONRETE 4,000 PSI @ 28 DAYS
2. REINFORCING PER ASTM A615 GRADE 60 OR GREATER
3. WEIGHT 17,500 LBS.



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Precast ... The Concrete Solution.