

Schematic Design Outline Specification

September 12, 2018

Fuller Middle School

Framingham Massachusetts

Jonathan Levi Architects
266 Beacon Street
Boston, Massachusetts 02116

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SECTION 011000 - SUMMARY

1. Project Identification and Description of Work
 - a. Project Identification: The name of the Project on Contract Documents is "Fuller Middle School", located in Framingham, Massachusetts.
2. Description: Project consists of constructing a new School for grades 6-8 in Boston, MA.
3. Phased landscape development, paving, site utility work, and other site improvements are required as part of the Work.
4. Existing 196,000 gsf Fuller School building hazardous materials abatement and building demolition are required as part of the Work.
5. Project shall have early bid packages for site preparation and foundations.
6. Project shall achieve at minimum a LEED for Schools V4 Certified rating.
7. Project shall shall use Construction Manager at Risk project delivery method.

-END OF SECTION-

SECTION 011001 – Project Schedule

1. Package No. 1 – Site prep

Award	6/7/19
Substantial Completion	8/20/19

2. Package No. 2 - Building Construction

Award	9/13/19
Substantial Completion	6/15/2021

3. Building Demolition

Start Work	7/1/2021
Substantial Completion	12/20/2021

-END OF SECTION-

SECTION 011002 - Alternates

- 1) Provide alternate to irrigate playfield over site of existing building after demolition.

Base bid: The existing building has a crawl space under the building at elevation 160.2. Fill the excavated area with imported sand and 6" topsoil, and hydroseed.

Alternate: add subsurface irrigation system to 360 ft x 230 ft area.

-END OF SECTION-



CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

LIMITED HAZARDOUS MATERIALS SUMMARY REPORT

**Fuller Middle School
31 Flagg Drive
Framingham, Massachusetts**

Prepared for

Jonathan Levi Architects
266 Beacon Street Boston MA 02116

November 2017

CDW Project # 1597.0



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1.0 INTRODUCTION

CDW Consultants, Inc. (CDW) is pleased to present this letter report summarizing the findings of the limited suspect asbestos-containing materials (ACM), and hazardous materials inspection of the Fuller Middle School (Site). The scope of work was to review previous United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) reports and conduct an inspection to identify and quantify suspect ACM, lead based paint (LBP), and visually identify hazardous materials located in the building. The inspection was conducted in support of a feasibility study for Site renovations.

In October 2017, Ms. Susan Cahalan, (Massachusetts DOS Asbestos Inspector #AI60784) conducted a visual interior and exterior building inspection for suspect materials.

2.0 GENERAL SITE CONDITIONS

Constructed in 1958 as the Framingham South High School, the building is currently used as Fuller Middle School. The Fuller Middle School houses grades 6-8. Fuller is also home to the Framingham Public Access Television Station that occupies 8,000 square feet (SF) of building space. In addition, the Buildings and Grounds Department houses its operations and storage for vehicles and equipment occupying approximately 15,000 SF of building space.

The Site building is a one-story cast-in-place concrete structure founded on precast concrete piles. The roof structure is gypsum concrete. Exterior walls are single-glazed aluminum store front with some areas of brick masonry. Two-thirds of the building area has a dirt floor crawl-space beneath it. The interior is concrete masonry block painted. Ceilings are mixed ceiling tectum with suspended ceilings in select areas throughout the building including the auditorium. Flooring is vinyl composite tile with some known to contain asbestos. Select rooms have carpet. Doors, frames and hardware are original.

The building is comprised of approximately 100 rooms of which 50 are classrooms with an average size of 732 SF. There are five science classrooms and one science laboratory with an average size 871 SF. There are two gymnasiums (one at 9,500 SF and one at 5,000 SF) and one 6,800 SF auditorium. The building was constructed on structural piles and caissons with a crawl space and a dirt floor beneath the entire building.

No additions have been made to the building since it was originally constructed. Framingham South High School became Fuller Middle School in 1995 without major capital improvement. The following capital projects and improvements have been completed at Fuller Middle School:



- 1995 Roof Replacement
- 2005 Converted heating system from oil to natural gas
- 2005 Replaced boilers, boiler room pipe abatement
- 2007 Auditorium Improvements

The heating system is comprised of 3 natural gas fired boilers and the majority of the building is hydronic forced hot water. Ventilation is provided through AHUs in the crawl-space and classroom unit-ventilators. The electrical system has original switch gear.

3.0 AHERA REPORTS SUMMARY

CDW reviewed the AHERA report, prepared by Fuss & O’Neill EnviroScience, dated June 2016 and the Survey Report, prepared by Universal Environmental Consultants, ND.

ACM findings of the Universal Environmental Consultants Report are presented in the below table:

Material	Location	Quantity
Vinyl Floor Tile and Mastic	Throughout	106,000 SF
Pipe and Hard Joint Insulation	Throughout	6,500 LF
Interior Windows and Doors	Throughout	400 Each
Blackboards	Throughout	200 Each
Flex Connectors	Throughout	15 Each
Roof Drain Insulation	Throughout	450 LF
Transite Board	Science Rooms	220 SF
Wood Flooring Paper and Mastic	Stage	500 SF
Wire Insulation	Stage	60 LF
Wood Flooring, Paper and Mastic	Gym	8,000 SF
Windows	Exterior	400 Each
Doors	Exterior	30 Each
Univent Caulk	Exterior	40 each



ACM findings from the Fuss & O'Neill EnviroScience AHERA Report are presented in the below table:

Material	Location	Asbestos Content	Quantity
Mudded Pipe Insulation	Basement Storage Room, Crawlspace, A3, A27, A17, A37, C-13, C18, C-15, C-16, D-31 Pipe Tunnel, D-32, B-37, West Penthouse on Roof	5% Chrysotile	575 Each
Corrugated Paper Type Pipe Insulation	Basement Storage Room, Crawlspace A, B, C & D, A3, A27, A17, A37, C-13, C-17 and 18, C-15, C-16, D-31 (Pipe Tunnel), D-32, B-37A, West Penthouse on Roof	80% Chrysotile	6,210
Vibration Isolators	Crawlspace, A-21, B-1A, B-26, C-13, D-9	PACM	25 Each
Roof Drain Insulation	A-24, B-8, B-18, B-15A, B-20, B-22, B-28, B-46, C-8, C-27, C-22, C-09, C-15, D-31, D-16, D-29, D-33	Sampled, Positive	20 Each
Fiber Reinforced Paneling	B-9-Lab Hood, D-31 Exhaust Vent, D-6-Upper Wall at Vent	15% Chrysotile	210 SF
Wire Insulation	Stage	PACM	60 LF
Fire Curtain	Stage	PACM	1 Each



Material	Location	Asbestos Content	Quantity
9x9 Floor Tile and Associated Mastic	Hall to Auditorium Stage, Hall outside Boy's Locker Room, Hall outside: C-14, B-32, B-35, B-37, B-39, A-8, C-1, B-1, B-3, B-4	2%-3% Chrysotile	105,300 SF

Items that do not contain ACM, from the Fuss & O'Neill EnviroScience AHERA Report are presented in the below table:

Material	Location
Spray-On Fire Proofing	Basement Stooge Room Ceiling
Red, Orange, Tan Mottled 12x12 Floor Tile and Associated Mastic	C17 Women's Bathroom
White and Beige Mottled 12x12 Floor Tile and Associated mastic	Hallway Outside B-4
Black Vinyl Baseboard and Associated Mastic	Classrooms, Hallways, Offices Throughout

4.0 ASBESTOS SURVEY

4.1 Methods

The investigative work for the asbestos survey included conducting a limited visual inspection of physically accessible areas of the interior and exterior of the building. Bulk samples of representative suspect materials identified were collected in a random manner in accordance with USEPA and OSHA regulatory guidelines. Once the visual inspection was completed, the building components were categorized into homogeneous areas. A homogenous area is an area that is similar in color, texture and date of application. Hand tools were used to collect bulk samples which were promptly placed in sealed plastic bags using a unique numbering system. Samples were not collected of non-suspect materials, including wood, fiberglass, plastic/vinyl, ceramic, concrete, neoprene/rubber, glass, and carpeting.

The bulk samples were delivered under chain of custody to Asbestos Identification Laboratory, Inc. (AIL) located in Woburn, Massachusetts, a NVLAP-accredited laboratory for asbestos analysis. Bulk samples were analyzed for asbestos content by polarized light microscopy (PLM) using EPA Method 600/R-93/116. A positive stop method was used – if one sample in a homogeneous group is positive then additional samples of the same material are not analyzed. The asbestos analytical results are provided in Attachment A. Samples analyzed to contain greater than 1% asbestos are to be treated as



ACMs as defined by the USEPA and Commonwealth of Massachusetts Department of Environmental Protection (MassDEP).

4.2 Findings

Findings of the limited sampling are presented in the below table:

Laboratory ID	Description	Location	Condition	Result
1A, 1B, 1C	Interior Window Glaze on 4x4 Chix Wire Windows	Classrooms to Hall – C Classrooms C-15, C-11, C-10	Good	2% chrysotile
2A, 2B	Interior Window Glaze	Sidelight Hall Door Assembly Near C15	Good	ND
3A, 3B	Interior Window Glaze on Door	Hall Assembly Near C15	Good	ND
4A, 4B, 4C	Interior Window Glaze on 4x4 Chix Wire Windows	Classrooms to Hall – B Classrooms B-17, B-15A, B-21	Good	ND
5A, 5B	Interior Window Glaze on Sidelights	Hall Door Assembly Near B-17	Good	ND
7	Black Sink Coating	B5-Science, Standard Sink	Good	5% Chrysotile
8A, 8B	Interior Window Glaze	A-5, Adult ESL Wood Framed Window	Good	2% Chrysotile
9A, 9B, 9C	Interior Window Glaze on 4x4 Chix Wire Windows	Classrooms B-5, B-7, B10	Good	2% Chrysotile
10A, 10B, 10C	Interior Window Glaze on Chix Wire Wood Framed Windows	Near A-12, A-13	Good	3% Chrysotile
11A, 11B, 11C	Interior Window Glaze	Fancy Wood Framed Windows at Library	Good	2% Chrysotile



Laboratory ID	Description	Location	Condition	Result
12A, 12B, 12C, 12D, 12E	Interior White/Gray Caulk	Between Steel Beams and CMU in Classrooms- Classroom #s B-11, B-24, B-41, B-32, B-41	Painted, Good	10% chrysotile
13A, 13B, 13C, 13D, 13E	Interior Hard Yellow Caulk	Between Steel Beams and CMU ½ Wall Interior Side of Courtyard	Painted, Good	5% chrysotile
14A, 14B	Interior White Caulk	Between Steel Beam and Brick Near Door #9	Painted, Good	3% Chrysotile
15A, 15B, 15C, 15D, 15E, 15F, 15G	White 2x2 Ceiling Panel	Ceiling, Hall Outside Library, Main Offices	Good	ND
16A, 16B, 16C, 16D, 16E, 16F, 16G	Yellow Insulation	Under White 2x2 Ceiling Panels	Good	ND
17A, 17B, 17C, 17D, 17E, 17F, 17G	White 2x4 Ceiling Panel	Ceiling, Hall Outside B-20, A-18, B-48, Main Entrance Hall, Hall, Outside C-14, Hall Near Door 16, Hall Near Fitness Center	Good	ND
18A, 18B, 18C, 18D, 18E, 18F, 18G	Yellow Insulation	Under White 2x4 Ceiling Panels	Good	ND
19A, 19B, 19C, 19D, 19E, 19F, 19G	Exterior Gray Window Caulk	At the Sides of Window Banks	Poor	5% Chrysotile
20A, 20B	Exterior Thick, Chunky Window Glaze	2x2 Windows Near Kitchen	Fair	ND
21	Exterior Door Caulk	Door 16	Good	2% Chrysotile
22	Exterior Door Caulk	Door 11	Good	2% Chrysotile



Laboratory ID	Description	Location	Condition	Result
23	Exterior Door Caulk	Door 9	Good	2% Chrysotile
24A, 24B	Exterior Brown Fibrous Expansion Joint	Foundation	Fair	ND
25A, 25B, 25C, 25D, 25E, 25F, 25G	Exterior Gray Window Glaze	Window Banks, Interior Side of Exterior Window	Poor, Damp from Leaks	2% Chrysotile

The quantities for the limited sampling combined with the visual survey and AHERA report are provided in the attached Table 1. The laboratory analytical report is provided in Appendix A.

3.3 Recommendations

The limited inspection was conducted for feasibility. It is recommended a full destructive survey be conducted. Prior to disturbance, the ACM identified must be abated by a Commonwealth of Massachusetts-licensed asbestos abatement contractor following all federal, state & local regulations governing asbestos abatement. A copy of the asbestos Waste Shipment record must be received within 30 days of removal from the Site. Asbestos air quality sampling must be conducted under USEPA regulations following asbestos abatement and prior to re-occupancy of the spaces. If additional materials are discovered that have not been sampled, those materials should be considered ACMs until laboratory analysis determines otherwise.

4.0 LEAD-BASED PAINT

4.1 Methods

CDW performed a visual inspection of painted surfaces. CDW collected samples from different color paints on various types of building component substrates. Samples were submitted to EMSL Laboratories in Cinnaminson, New Jersey for analysis via atomic absorption spectrometry (AAS).

4.2 Findings

The results of the laboratory analysis are provided in the below table:

Laboratory ID	Description	Result (% Weight)
LP-1A	Blue over Yellow Paint on Steel Beams	0.69
LP-1B	Blue over Yellow Paint on Steel Beams	0.15
LP-1C	Blue over Yellow Paint on Steel Beams	0.14
LP-1D	Blue over Yellow Paint on Steel Beams	0.079



Laboratory ID	Description	Result (% Weight)
LP-1E	Blue over Yellow Paint on Steel Beams	0.27
LP-2A	Dark Blue Over Light Blue Paint on Steel Beams	0.056
LP-2B	Dark Blue Over Light Blue Paint on Steel Beams	0.11
LP-2C	Dark Blue Over Light Blue Paint on Steel Beams	0.062
LP-2D	Dark Blue Over Light Blue Paint on Steel Beams	0.49
LP-2E	Dark Blue Over Light Blue Paint on Steel Beams	0.51
LP-3A	Light Blue Paint on Steel Beams	<0.0080
LP-3B	Light Blue Paint on Steel Beams	0.036
LP-3C	Light Blue Paint on Steel Beams	0.019
LP-3D	Light Blue Paint on Steel Beams	<0.011
LP-3E	Light Blue Paint on Steel Beams	<0.0080
LP-4	Gray/White Paint on Exterior CMU Near Kitchen	<0.0080
LP-5	Gray/White Paint on Exterior Window Panels	<0.0080

The USEPA defines LBP as any paint or surface coating that contains lead equal to exceeding one milligram per square centimeter (1.0 mg/cm²) or 0.5% by weight. Two samples contain lead above 0.5% by weight. The laboratory analytical report is included in Attachment B.

Recommendations

Based on the conclusions of this testing, the following recommendations are offered:

- Removal of the LBP is not required. However, in accordance with the EPA Lead Renovation, Repair, and Painting (RRP) Rule 40 CFR 745, workers, visitors and the general public must be protected from lead dust generated during the demolition of LBP or LCP coated surfaces.
- Components identified to contain the presence of lead should not be disturbed in an uncontrolled manner. Disturbance of these materials should only be done by properly trained personnel in a controlled and documented manner to allow for the safety of the workers, bystanders and disposal of waste materials.



- Those components/colors not tested, or in locations not inventoried in this report, should be sampled for lead content prior to disturbance that may cause airborne release of lead.

5.0 OTHER HAZARDOUS MATERIALS SURVEY

OHM Visual Inspection

CDW visually inspected the Site building for universal, special and hazardous wastes associated with building materials. These included but were not limited to the following:

- Mercury-containing devices (fluorescent light tubes, thermostats, gauges, etc.);
- Polychlorinated bi-phenyl (PCB)-containing articles, equipment and devices (light ballasts, electrical switches, etc.);
- Chlorofluorocarbon (CFC)-containing equipment (refrigerants, air conditioners/HVAC equipment, water bubblers, etc.)
- Tritium-containing devices (Exit signs);
- Lead-Acid batteries (emergency lights, etc.); and
- Pressurized-cylinders (fire extinguishers, etc.).

5.1 Findings

OHM

The visual survey for hazardous materials identified mercury-containing light tubes, PCB-containing light ballasts, mercury containing thermostats and switches, lead and tritium batteries, refrigerants and other hazardous materials. No hazardous materials sampling or analysis was conducted as part of this preliminary survey. A list of OHMs identified are included in the below table.

Material Description	Location	Est. Quantity	Units
Compact Fluorescent Bulbs	Throughout	200	EA
Fluorescent Bulbs (Mercury)	Throughout	18,000	Tubes



Material Description	Location	Est. Quantity	Units
DPHE and Electronic Light Ballasts	Throughout	9,000	Each
Thermostats and Switches (Mercury)	Throughout, Mechanical and HVAC	500	Ampules
Emergency Light Batteries (Lead)	Throughout	80	EA
Refrigerants Associated with HVAC	Throughout	5,000	Gallons
Fire Extinguishers (Compressed Gas)	Throughout	150	EA
Refrigerants Associated with Water Bubblers	Throughout	25	Gallons
Exit Signs (Tritium)	Throughout	150	EA
Air Conditioning Units	Sporadic, Window Mounted	100	EA
Chemicals (Mercury and Lead)	Science Sink Traps	25	Gallons
Laboratory Chemicals	Science Labs	NA	NA
Older Door Retractors, (Hydraulic Oil Dampers)	Exit Doors, A Wing Offices, Door Assemblies, Cafeteria, Gym, Locker Rooms, Main Offices, Bathrooms	150	EA
Welding Supplies, Gases	Maintenance Shop	--	Re-use
Hydraulic Fluid	Automotive Shop – Old Lift Reservoirs Under Floor	100	Gallons
PCB Fluid	Old Transformer	150	Gallons



5.2 Recommendations

Prior to removal, light tubes, ballasts, compact florescent bulbs, lead and tritium batteries, thermostats and switches will require proper handling, removal, transportation and off-site recycling/reclamation. Hydraulic oil from the door retractors, automobile lifts and refrigerants will require handling and disposal in accordance with regulations. Any sludge in the science sink traps and acid tank will need to be sampled for laboratory analysis of lead and mercury via TCLP to determine proper disposal requirements. Laboratory chemicals should be properly stored, in their original containers, and are recommended for re-use.

Limitations

The conclusions are limited to the information available at the time of the field survey and the scope of services, as defined. No subsurface soil or groundwater testing was performed. Where access to portions of the Site or to structures on the site was unavailable or limited, CDW renders no opinion as to the presence of hazardous material or the presence of indirect evidence related to hazardous material in that portion of the site or structure. This report cannot be solely relied upon for demolition. The testing performed forms the basis for conclusions expressed and areas inaccessible for testing limits those conclusions. No other conclusions, interpretations or recommendations are contained or implied in this report other than those expressed. No other use of this report is warranted without the written consent of CDW Consultants, Inc.

CDW appreciates the opportunity to provide our services to you on this project.

Very truly yours,

CDW CONSULTANTS, INC.

A handwritten signature in black ink, appearing to read 'Susan Cahalan'.

Susan Cahalan, PG, ISSP-SA
Project Manager

TABLES

**TABLE 1
ACM Quantities
Fuller Middle School
Framingham, Massachusetts**

HA No.	Material Description	Laboratory Sample No. and AHERA	NESHAP Cat.	Location	Est. Quantity	Units
1	Pipe Fittings and Insulation	AHERA and Visual	Cat. 2 Friable ACM	Behind Walls, Crawlspace etc.	17,000	LF
2	Roof Drain Insulation	AHERA and Visual	Cat. 2 Friable ACM	A-24, B-8, B-18, B-15A, B-20, B-22, B-28, B-46, C-8, C-27, C-22, C-09, C-15, D-31, D-16, D-29, D-33	450	LF
3	Gaskets	Visual	Cat I. Non Friable ACM	On Steam and Hot Water Lines and Valves, Crawlspace	250	EA
4	Round Light Gaskets	Visual	Suspect ACM, Not Sampled	Round Lights in Boiler Room Area	25	EA
5	ACM Debris on Soil	Visual	Cat. 2 Friable ACM	Dirt Floor of Crawlspace	25	CY
6	Vibration Isolators on HVAC	AHERA and Visual	Cat. 2 Non Friable ACM	Crawlspace, HV-1, HV-2, HV-3, HV-4, HV-5, HV-6, HV-7, HV-8, HV-9, HV-10, HV-11, HV-12, HV-13, HV-14, A-21, B-1A, B-26, C-13, D-9	40	EA
7	9x9 Floor Tiles and associated Mastic	AHERA and Visual	Cat I. Non Friable ACM	Throughout, Halls Outside Auditorium and Locker Rooms, Halls outside C-14, B-32, B-35, B-37, B-39, A-8, C-1, B-1, Select Classrooms	108,000	SF
8	Wood Flooring Paper and Mastic	AHERA	Cat. 2 Non Friable ACM	Stage and Music Room Stage	4,000	SF
9	Wood Wall Paneling Glue	PACM	Suspect ACM, Not Sampled	Auditorium	2,000	SF
10	Wire Insulation	AHERA	Cat. 2 Non Friable ACM	Auditorium Stage	60	LF
11	Fire Curtain	AHERA and Visual	Cat. 2 Non Friable ACM	Auditorium Stage	1	EA
12	Wood Flooring Paper and Mastic	AHERA	Cat. 2 Non Friable ACM	Gym and Fitness Center	14,500	SF
13	Fiber Reinforced Paneling	AHERA	Cat. 2 Non Friable ACM	B-9 Lab Hood, D-31 Exhaust Vent, D-6 Upper Wall Vent	210	SF
14	Mastic Behind Heaters	PACM	Suspect ACM, Not Sampled	Classrooms	3,200	SF
15	Slate Board Glue Daubs	PACM	Suspect ACM, Not Sampled	Classrooms, Average 3 Per Classroom	250	EA
16	Black Science Table Tops	PACM	Suspect ACM, Not Sampled	Science	320	SF
17	Interior Window Glaze	1A, 1B, 1C, 9A, 9B, 9C,	Cat. 2 Non Friable ACM	At Classrooms and Hall Intersection B Classrooms, C Classrooms, D Classrooms	550	EA
18	Interior Window Glaze	8A, 8B, 10A, 10B, 10C, 11A, 11B, 11C	Cat. 2 Non Friable ACM	Fancy Wood Framed Windows at Admin Offices, "A" Offices, Library. 4x4, 8x4 and 2x4 Sections	150	EA
19	Black Sink Coating	7	Cat. 2 Non Friable ACM	Standard Sinks, B-5, Art, Nurses, Other Areas	30	EA
20	Interior White-Gray Caulk	12A, 12B, 12C, 12D, 12E, 14A, 14B, 14C	Cat. 2 Non Friable ACM	Between Steel Beams and CMU in Classrooms, Intermittent in Halls	3,500	LF
21	Interior Hard Yellow Caulk	13A, 13B, 13C, 13D, 13E,	Cat. 2 Non Friable ACM	Between Steel Beams and CMU 1/2 Wall Interior Side of Courtyard Near Main Office	320	LF
22	Black Mastic/Insulation	Visual	Suspect ACM, Not Sampled	Walk in Refrigerator and Freezer Coating	2	EA
23	Exterior Gray Window Caulk	19A, 19B, 19C, 19D, 19E, 19F, 19G	Cat. 2 Non Friable ACM	At Sides of Long Window Banks, Between Bank and Brick	300	LF
24	Exterior Window Glaze	25A, 25B, 25C, 25D, 25E, 25F, 25G	Cat. 2 Non Friable ACM	Interior of Exterior Window Banks. Each Window Defined by Aluminum Frame above Solid Steel Panel.	175	Each
25	Exterior Door Caulk	21, 22, 23	Cat. 2 Non Friable ACM	Exterior Doors	420	LF
26	Exterior Vapor Barrier	PACM	Suspect ACM, Not Sampled	Behind Brick Façade	6,000	SF
27	Remnant Roofing Tar	PACM	Suspect ACM, Not Sampled	Remnant	10,000	SF
28	Subsurface Transite	PACM	Suspect ACM, Not Sampled	Not Seen - Contingency	2,000	LF

ACM = Asbestos Containing Material. PACM = Presumed Asbestos Containing Material. LF = Linear Foot. SF = Square Foot

APPENDIX A



Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com

Batch: 27227



November 03, 2017

Susan Cahalan
CDW Consultants, Inc.
6 Huron Drive
Natick, MA 01760

Project Number:

Project Name: Fuller Middle School, Framingham MA

Date Sampled: 2017-10-27
Work Received: 2017-10-31
Work Analyzed: 2017-11-03

Analysis Method: BULK PLM ANALYSIS EPA/600/R-93/116

Dear Susan Cahalan,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Susan Cahalan for your business.

Michael Manning
Owner/Director

Susan Cahalan
 CDW Consultants, Inc.
 6 Huron Drive
 Natick, MA 01760

Project Number:

Project Name: Fuller Middle School, Framingham MA

Date Sampled: 2017-10-27

Work Received: 2017-10-31

Work Analyzed: 2017-11-03

Analysis Method: BULK PLM ANALYSIS EPA/600/R-93/116

FieldID	Material	Location	Color	Non-Asbestos %	Asbestos %
LabID					
1A	Interior Window Glaze	4' X 4' Chix Wire Classrooms to Hall / C- Wing Area	multi	Non-Fibrous 98	Detected Chrysotile 2
306480					
1B	Interior Window Glaze	4' X 4' Chix Wire Classrooms to Hall / C- Wing Area			Not Analyzed
306481					
1C	Interior Window Glaze	4' X 4' Chix Wire Classrooms to Hall / C- Wing Area			Not Analyzed
306482					
2A	Interior Window Glaze	Sidelight Hall Door Assembly near C15	multi	Non-Fibrous 100	None Detected
306483					
2B	Interior Window Glaze	Sidelight Hall Door Assembly near C15	multi	Non-Fibrous 100	None Detected
306484					
3A	Interior Window Glaze	Hall Assembly near C15	white	Non-Fibrous 100	None Detected
306485					
3B	Interior Window Glaze	Hall Assembly near C15	white	Non-Fibrous 100	None Detected
306486					
4A	Interior Window Glaze	Chix Wire 4 X 4, 2 Classrooms / B-Wing Area	multi	Non-Fibrous 100	None Detected
306487					
4B	Interior Window Glaze	Chix Wire 4 X 4, 2 Classrooms / B-Wing Area	multi	Non-Fibrous 100	None Detected
306488					
4C	Interior Window Glaze	Chix Wire 4 X 4, 2 Classrooms / B-Wing Area	multi	Non-Fibrous 100	None Detected
306489					
5A	Interior Window Glaze	Hall Assembly near B-17	multi	Non-Fibrous 100	None Detected
306490					
5B	Interior Window Glaze	Hall Assembly near B-17	multi	Non-Fibrous 100	None Detected
306491					
6	Interior Window Glaze	Hall Assembly near B-17	multi	Non-Fibrous 100	None Detected
306492					
7	Black Sink Coating	B5 Science	black	Non-Fibrous 95	Detected Chrysotile 5
306493					

FieldID	Material	Location	Color	Non-Asbestos %	Asbestos %
LabID					
8A	Interior Window Glaze	A-5 Adult ESL Wood Framed	multi	Non-Fibrous 98	Detected Chrysotile 2
306494					
8B	Interior Window Glaze	A-5 Adult ESL Wood Framed			Not Analyzed
306495					
9A	Interior Window Glaze	Chix Wire 4 X 4 Classrooms B5, B7, B10	multi	Non-Fibrous 98	Detected Chrysotile 2
306496					
9B	Interior Window Glaze	Chix Wire 4 X 4 Classrooms B5, B7, B10			Not Analyzed
306497					
9C	Interior Window Glaze	Chix Wire 4 X 4 Classrooms B5, B7, B10			Not Analyzed
306498					
10A	Interior Window Glaze	Chix Wire Wood Framed near A-12, A-13	multi	Non-Fibrous 97	Detected Chrysotile 3
306499					
10B	Interior Window Glaze	Chix Wire Wood Framed near A-12, A-13			Not Analyzed
306500					
10C	Interior Window Glaze	Chix Wire Wood Framed near A-12, A-13			Not Analyzed
306501					
11A	Interior Window Glaze	Fancy Wood Frame at Library	multi	Non-Fibrous 98	Detected Chrysotile 2
306502					
11B	Interior Window Glaze	Fancy Wood Frame at Library			Not Analyzed
306503					
11C	Interior Window Glaze	Fancy Wood Frame at Library			Not Analyzed
306504					
12A	Interior Gray/White Caulk	Between Steel Beam and CMU Classrooms	multi	Non-Fibrous 90	Detected Chrysotile 10
306505					
12B	Interior Gray/White Caulk	Between Steel Beam and CMU Classrooms			Not Analyzed
306506					
12C	Interior Gray/White Caulk	Between Steel Beam and CMU Classrooms			Not Analyzed
306507					
12D	Interior Gray/White Caulk	Between Steel Beam and CMU Classrooms			Not Analyzed
306508					
12E	Interior Gray/White Caulk	Between Steel Beam and CMU Classrooms			Not Analyzed
306509					
13A	Hard Yellow Interior Caulk	Between Steel Beams and CMU 1/2 Wall Int. Courtyard	multi	Non-Fibrous 95	Detected Chrysotile 5
306510					
13B	Hard Yellow Interior Caulk	Between Steel Beams and CMU 1/2 Wall Int. Courtyard			Not Analyzed
306511					

FieldID	Material	Location	Color	Non-Asbestos %	Asbestos %
LabID					
13C	Hard Yellow Interior Caulk	Between Steel Beams and CMU 1/2 Wall Int. Courtyard			Not Analyzed
306512					
13D	Hard Yellow Interior Caulk	Between Steel Beams and CMU 1/2 Wall Int. Courtyard			Not Analyzed
306513					
13E	Hard Yellow Interior Caulk	Between Steel Beams and CMU 1/2 Wall Int. Courtyard			Not Analyzed
306514					
14A	Interior White Caulk	Between Steel Beam and Brick near Door 9	multi	Other 2	Detected
306515				Non-Fibrous 95	
14B	Interior White Caulk	Between Steel Beam and Brick near Door 9			Not Analyzed
306516					
15A	White 2' X 2' Ceiling	Ceiling	white	Non-Fibrous 100	None Detected
306517					
15B	White 2' X 2' Ceiling	Ceiling	white	Non-Fibrous 100	None Detected
306518					
15C	White 2' X 2' Ceiling	Ceiling	white	Non-Fibrous 100	None Detected
306519					
15D	White 2' X 2' Ceiling	Ceiling	white	Non-Fibrous 100	None Detected
306520					
15E	White 2' X 2' Ceiling	Ceiling	white	Non-Fibrous 100	None Detected
306521					
15F	White 2' X 2' Ceiling	Ceiling	white	Non-Fibrous 100	None Detected
306522					
15G	White 2' X 2' Ceiling	Ceiling	white	Non-Fibrous 100	None Detected
306523					
16A	Yellow Layer	Under 2' X 2' White Ceiling Tile	yellow	Mineral Wool 98	None Detected
306524				Non-Fibrous 2	
16B	Yellow Layer	Under 2' X 2' White Ceiling Tile	yellow	Mineral Wool 98	None Detected
306525				Non-Fibrous 2	
16C	Yellow Layer	Under 2' X 2' White Ceiling Tile	yellow	Mineral Wool 98	None Detected
306526				Non-Fibrous 2	
16D	Yellow Layer	Under 2' X 2' White Ceiling Tile	yellow	Mineral Wool 98	None Detected
306527				Non-Fibrous 2	
16E	Yellow Layer	Under 2' X 2' White Ceiling Tile	yellow	Mineral Wool 98	None Detected
306528				Non-Fibrous 2	
16F	Yellow Layer	Under 2' X 2' White Ceiling Tile	yellow	Mineral Wool 98	None Detected
306529				Non-Fibrous 2	

FieldID	Material	Location	Color	Non-Asbestos %	Asbestos %	
LabID						
16G	Yellow Layer	Under 2' X 2' White Ceiling Tile	yellow	Mineral Wool	98	None Detected
306530				Non-Fibrous	2	
17A	White 2' X 4' Ceiling	Ceiling	white	Fiberglass	5	None Detected
306531				Non-Fibrous	95	
17B	White 2' X 4' Ceiling	Ceiling	white	Fiberglass	5	None Detected
306532				Non-Fibrous	95	
17C	White 2' X 4' Ceiling	Ceiling	white	Fiberglass	10	None Detected
306533				Non-Fibrous	90	
17D	White 2' X 4' Ceiling	Ceiling	white	Fiberglass	5	None Detected
306534				Non-Fibrous	95	
17E	White 2' X 4' Ceiling	Ceiling	white	Fiberglass	10	None Detected
306535				Non-Fibrous	90	
17F	White 2' X 4' Ceiling	Ceiling	white	Fiberglass	10	None Detected
306536				Non-Fibrous	90	
17G	White 2' X 4' Ceiling	Ceiling	white	Fiberglass	5	None Detected
306537				Non-Fibrous	95	
18A	Yellow Layer	Under White 2' X 4' Ceiling	yellow	Fiberglass	95	None Detected
306538				Non-Fibrous	5	
18B	Yellow Layer	Under White 2' X 4' Ceiling	yellow	Fiberglass	98	None Detected
306539				Non-Fibrous	2	
18C	Yellow Layer	Under White 2' X 4' Ceiling	yellow	Fiberglass	98	None Detected
306540				Non-Fibrous	2	
18D	Yellow Layer	Under White 2' X 4' Ceiling	yellow	Fiberglass	98	None Detected
306541				Non-Fibrous	2	
18E	Yellow Layer	Under White 2' X 4' Ceiling	yellow	Fiberglass	95	None Detected
306542				Non-Fibrous	5	
18F	Yellow Layer	Under White 2' X 4' Ceiling	yellow	Fiberglass	98	None Detected
306543				Non-Fibrous	2	
18G	Yellow Layer	Under White 2' X 4' Ceiling	yellow	Fiberglass	95	None Detected
306544				Non-Fibrous	5	
19A	Exterior Gray Window Caulk	Exterior Windows	gray	Other	5	Detected Chrysotile 5
306545				Non-Fibrous	90	
19B	Exterior Gray Window Caulk	Exterior Windows				Not Analyzed
306546						
19C	Exterior Gray Window Caulk	Exterior Windows				Not Analyzed
306547						

FieldID	Material	Location	Color	Non-Asbestos %	Asbestos %
LabID					
19D	Exterior Gray Window Caulk	Exterior Windows			Not Analyzed
306548					
19E	Exterior Gray Window Caulk	Exterior Windows			Not Analyzed
306549					
19F	Exterior Gray Window Caulk	Exterior Windows			Not Analyzed
306550					
19G	Exterior Gray Window Caulk	Exterior Windows			Not Analyzed
306551					
20A	Exterior Thick Chunky Window Glaze	2 X 2 Window near Kitchen	white	Non-Fibrous 100	None Detected
306552					
20B	Exterior Thick Chunky Window Glaze	2 X 2 Window near Kitchen	white	Non-Fibrous 100	None Detected
306553					
21	Exterior Door Caulk	Door 16	gray	Non-Fibrous 98	Detected Chrysotile 2
306554					
22	Exterior Door Caulk	Door 11	gray	Non-Fibrous 98	Detected Chrysotile 2
306555					
23	Exterior Door Caulk	Door 9	gray	Non-Fibrous 98	Detected Chrysotile 2
306556					
24A	Exterior Brown Fibrous Expansion Joint	Foundation	brown	Cellulose 70 Non-Fibrous 30	None Detected
306557					
24B	Exterior Brown Fibrous Expansion Joint	Foundation	brown	Cellulose 70 Non-Fibrous 30	None Detected
306558					
25A	Exterior Gray Window Glaze	Window Banks, All Sides	gray	Non-Fibrous 98	Detected Chrysotile 2
306559					
25B	Exterior Gray Window Glaze	Window Banks, All Sides			Not Analyzed
306560					
25C	Exterior Gray Window Glaze	Window Banks, All Sides			Not Analyzed
306561					
25D	Exterior Gray Window Glaze	Window Banks, All Sides			Not Analyzed
306562					
25E	Exterior Gray Window Glaze	Window Banks, All Sides			Not Analyzed
306563					
25F	Exterior Gray Window Glaze	Window Banks, All Sides			Not Analyzed
306564					
25G	Exterior Gray Window Glaze	Window Banks, All Sides			Not Analyzed
306565					

Client: CDM Consultants

Address: Wagon Drive, Natick, MA 01760
 Project Site & #: Filler Waste Road, Framingham, MA
 Phone / email address:

Contact: Radwan O. Saad Consultant, Inc.

Relinquish by date: 10/30/17

Received by date: 10/30/17

of Samples Received: 20

CHAIN OF CUSTODY
 EPA/600/R-93/116

Asbestos Identification Lab
 165 New Boston St.
 Suite 227
 Woburn, MA 01801
 (781)932-9600
 www.asbestosidentificationlab.com



Date Sampled: 10/31/17

BATCH# 27227

Rev 12/15

Page 1 of 10

Turnaround Time Less 3 Hrs Bulk Sample Method

Same Day Soil

Next Day Wipe

Two Day 11/3/17 Point Count

Stop on 1st Positive? YES NO

Notify Method: Mail/E-Mail/Verbal

Analyzed By: Radwan O. Saad

Date: 11/3/17

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Material / Location	Stereo Scope				Optical Properties						Non-Asbestos Percentage (%)											
			Temp in Celsius = <u>24</u>	% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous	
<u>08590</u>	<u>1A</u>	<u>Material: Interior window pane Location: 4'x4' Chix wire classroom To Hall C wing Area</u>																						
<u>08590</u>	<u>1B</u>	<u>Material: " Location: "</u>																						
<u>08590</u>	<u>1C</u>	<u>Material: " Location: "</u>																						

DUE Friday

DUJ

DUJ

file

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Material / Location	Stereo Scope					Optical Properties							Non-Asbestos Percentage (%)									
			Temp in Celsius =	% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous	
8	7	Material: Black Sink Ceiling Location: BS Science			BNS			Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite	5	W	P	F		1										
7	8A	Material: Interior window Location: A-S Aditt ESL Wood framed			CM			Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite																
6	8B	Material: " Location: "						Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite																
5	9A	Material: Interior window Location: AR4 Classroom BS, B7, B10			CM			Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite	2	W	P	F		1										
5	9B	Material: " Location: "						Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite																

QW

QW

Q

Q

Q

filter

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = _____	Stereo Scope					Optical Properties							Non-Asbestos Percentage (%)											
			Material / Location	% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous			
00	DAD	"	Material																							
		"	Location																							
0	DAE	"	Material																							
		"	Location																							
0	DAD	"	Material																							
		"	Location																							
0	DAD	"	Material																							
		"	Location																							
0	DAD	"	Material																							
		"	Location																							
0	DAD	"	Material																							
		"	Location																							

DAD

DAD

DAD

DAD

8

5 w p + L N 150/155

Material Hard yellow interior
Location Between steel beams
and CMS 1/2 wall mt.
and CMS 1/2 covered

0 fine w/cm

APPENDIX B



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 786-5974

<http://www.EMSL.com>

cinnaminsonleadlab@emsl.com

EMSL Order:	201711162
CustomerID:	CDWC26
CustomerPO:	
ProjectID:	

Attn: **Susan Cahalan**
CDW Consultants
6 Huron Drive
Natick, MA 01760

Phone: (508) 875-2657
 Fax:
 Received: 10/31/17 10:30 AM
 Collected: 10/27/2017

Project: **Fuller School**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
LP-1A Site: Blue Over Yellow Paint on Steel Beams	201711162-0001	10/27/2017	11/1/2017	0.69 % wt
LP-1B Site: Blue Over Yellow Paint on Steel Beams	201711162-0002	10/27/2017	11/1/2017	0.15 % wt
LP-1C Site: Blue Over Yellow Paint on Steel Beams	201711162-0003	10/27/2017	11/1/2017	0.14 % wt
LP-1D Site: Blue Over Yellow Paint on Steel Beams	201711162-0004	10/27/2017	11/1/2017	0.079 % wt
LP-1E Site: Blue Over Yellow Paint on Steel Beams	201711162-0005	10/27/2017	11/1/2017	0.27 % wt
LP-2A Site: Dark Blue Over Light Blue Paint on Steel Beams	201711162-0006	10/27/2017	11/1/2017	0.056 % wt
LP-2B Site: Dark Blue Over Light Blue Paint on Steel Beams	201711162-0007	10/27/2017	11/1/2017	0.11 % wt
LP-2C Site: Dark Blue Over Light Blue Paint on Steel Beams	201711162-0008	10/27/2017	11/1/2017	0.062 % wt
LP-2D Site: Dark Blue Over Light Blue Paint on Steel Beams	201711162-0009	10/27/2017	11/1/2017	0.49 % wt
LP-2E Site: Dark Blue Over Light Blue Paint on Steel Beams	201711162-0010	10/27/2017	11/1/2017	0.51 % wt
LP-3A Site: Light Blue Paint on Steel Beams	201711162-0011	10/27/2017	11/1/2017	<0.0080 % wt
LP-3B Site: Light Blue Paint on Steel Beams	201711162-0012	10/27/2017	11/1/2017	0.036 % wt
LP-3C Site: Light Blue Paint on Steel Beams	201711162-0013	10/27/2017	11/1/2017	0.019 % wt
LP-3D Site: Light Blue Paint on Steel Beams	201711162-0014	10/27/2017	11/1/2017	<0.011 % wt
LP-3E Site: Light Blue Paint on Steel Beams	201711162-0015	10/27/2017	11/1/2017	<0.0080 % wt

Phillip Worby, Lead Laboratory Manager
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.008 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, AIHA-LAP, LLC ELLAP 100194, A2LA 2845.01

Initial report from 11/03/2017 09:54:34



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 786-5974

<http://www.EMSL.com>

cinnaminsonleadlab@emsl.com

EMSL Order: 201711162
CustomerID: CDWC26
CustomerPO:
ProjectID:

Attn: **Susan Cahalan**
CDW Consultants
6 Huron Drive
Natick, MA 01760

Phone: (508) 875-2657
Fax:
Received: 10/31/17 10:30 AM
Collected: 10/27/2017

Project: **Fuller School**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
LP-4	201711162-0016	10/27/2017	11/1/2017	<0.0080 % wt
Site: Gray / White Paint EXT CMU Near Kitchen				
LP-5	201711162-0017	10/27/2017	11/1/2017	<0.0080 % wt
Site: Gray / White Paint on EXT. Window Panels				

Phillip Worby, Lead Laboratory Manager
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.008 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, AIHA-LAP, LLC ELLAP 100194, A2LA 2845.01

Initial report from 11/03/2017 09:54:34



EMSL ANALYTICAL, INC.
LABORATORY PRODUCTS TRAINING
LABORATORY PRODUCTS TRAINING

Lead (Pb) Chain of Custody EMSL Order ID (Lab Use Only):

201711162

Cinnaminson, NJ 08077

PHONE: 1-800-220-3675

FAX: (856) 786-5974

Company : CDW Consultants		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different <small>If Bill to is Different note instructions in Comments**</small>		
Street: 6 Huron Drive		<i>Third Party Billing requires written authorization from third party</i>		
City: Natick	State/Province: MA	Zip/Postal Code: 01760	Country: US	
Report To (Name): susan cahalan		Telephone #: 5088752657		
Email Address: scahalan@cdwconsultants.com		Fax #: 5088752657	Purchase Order:	
Project Name/Number: <i>Fuller School</i>		Please Provide Results: <input type="checkbox"/> Fax <input checked="" type="checkbox"/> Email		
U.S. State Samples Taken: MA		CT Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt		
Turnaround Time (TAT) Options* - Please Check				
<input type="checkbox"/> 3 Hour	<input type="checkbox"/> 6 Hour	<input type="checkbox"/> 24 Hour	<input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week	
<small>*Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide</small>				
Matrix	Method	Instrument	Reporting Limit	Check
Chips <input checked="" type="checkbox"/> % by wt. <input type="checkbox"/> mg/cm ² <input type="checkbox"/> ppm (mg/kg)	SW846-7000B	Flame Atomic Absorption	0.01%	<input checked="" type="checkbox"/>
Air	NIOSH 7082	Flame Atomic Absorption	4 µg/filter	<input type="checkbox"/>
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter	<input type="checkbox"/>
	NIOSH 7300M/NIOSH 7303	ICP-OES	0.5 µg/filter	<input type="checkbox"/>
Wipe* <small>*if no box checked, non-ASTM Wipe assumed</small>	SW846-7000B	Flame Atomic Absorption	10 µg/wipe	<input type="checkbox"/>
	SW846-6010B or C	ICP-OES	1.0 µg/wipe	<input type="checkbox"/>
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	SW846-1311/SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)	<input type="checkbox"/>
SPLP	SW846-1312/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	SW846-1312/SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)	<input type="checkbox"/>
TTLC	22 CCR App. II, 7000B/7420	Flame Atomic Absorption	40 mg/kg (ppm)	<input type="checkbox"/>
	22 CCR App. II, SW846-6010B or C	ICP-OES	2 mg/kg (ppm)	<input type="checkbox"/>
STLC	22 CCR App. II, 7000B/7420	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	22 CCR App. II, SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)	<input type="checkbox"/>
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)	<input type="checkbox"/>
	SW846-6010B or C	ICP-OES	2 mg/kg (ppm)	<input type="checkbox"/>
Wastewater <small>Unpreserved <input type="checkbox"/> Preserved with HNO₃ pH < 2 <input type="checkbox"/></small>	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.7	ICP-OES	0.020 mg/L (ppm)	<input type="checkbox"/>
Drinking Water <small>Unpreserved <input type="checkbox"/> Preserved with HNO₃ pH < 2 <input type="checkbox"/></small>	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.5	ICP-OES	0.003 mg/L (ppm)	<input type="checkbox"/>
TSP/SPM Filter	40 CFR Part 50	ICP-OES	12 µg/filter	<input type="checkbox"/>
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter	<input type="checkbox"/>
Other:				<input type="checkbox"/>
Name of Sampler:		Signature of Sampler:		
Sample #	Location	Volume/Area	Date/Time Sampled	
1 LP-1A	Blue over yellow paint on steel beams	—	10/27/17	
2 LP-1B	"	—	"	
Client Sample #s		Total # of Samples:		
Relinquished (Client): <i>[Signature]</i>	Date: 10/30/17	Time:		
Received (Lab): <i>[Signature]</i>	Date: 10/31/17	Time: 1030	FedEx	
Comments: 5088752657				



EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Fuller School.

LEAD (Pb) CHAIN OF CUSTODY
EMSL ORDER ID (Lab Use Only):

201711162

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE: 1-800-220-3675
FAX: (856) 786-5974

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Location	Volume/Area	Date/Time Sampled
3 LP-1C	" "	-	10/27/17
4 LP-1D	" "	-	}
5 LP-1E	" "	-	
6 LP-2A	Dark blue over light blue paint on steel beams	-	
7 LP-2B	" "	-	
8 LP-2C	" "	-	
9 LP-2D	" "	-	
10 LP-2E	" "	-	
11 LP-3A	light blue paint on steel beams	-	
12 LP-3B	" "	-	
13 LP-3C	" "	-	
14 LP-3D	" "	-	
15 LP-3E	" "	-	
16 LP-4	Gray/white paint ext near CMU kitchen	-	
17 LP-5	White/gray paint on ext. window panels	-	

Comments/Special Instructions:

5088752657



CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

November 7, 2017

Philip Gray
Associate Principal
Jonathan Levi Architects
266 Beacon Street Boston MA 02116

RE: Hazardous Materials *Preliminary Costs*
Fuller Middle School
Framingham, Massachusetts

Dear Mr. Gray:

CDW Consultants, Inc. (CDW) is pleased to present this preliminary estimate of abatement construction costs based upon the findings of the feasibility hazardous materials survey of the Fuller Middle School in Framingham, Massachusetts.

The associated costs for the asbestos abatement and other hazardous materials are presented in the tables on the next page, a reflect a renovation/or phased demolition scenario and abatement of all materials.

Under a full demolition scenario with some bulk loading of materials there may be a cost savings of 20-25 percent.

Under a demolition scenario whereas ½ is sealed off for use and ½ demolished, there may be a cost savings of 10 percent.

Please call if you have any questions or require additional information.

Very truly yours,

CDW CONSULTANTS, INC.

Susan Cahalan, PG, ISSP-SA
Project Manager

**Table 1
Abatement Cost Estimates
Fuller Middle School
Framingham, Massachusetts**

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Cost
Pipe Fittings and Insulation	Behind Walls, Crawlspace etc.	17,000	LF	\$ 17.00	\$ 289,000.00
Roof Drain Insulation	A-24, B-8, B-18, B-15A, B-20, B-22, B-28, B-46, C-8, C-27, C-22, C-09, C-15, D-31, D-16, D-29, D-33	450	LF	\$ 17.00	\$ 7,650.00
Gaskets	On Steam and Hot Water Lines and Valves, Crawlspace	250	EA	\$ 25.00	\$ 6,250.00
Round Light Gaskets	Round Lights in Boiler Room Area	25	EA	\$ 30.00	\$ 750.00
ACM Debris on Soil	Dirt Floor of Crawlspace	25	CY	\$ 250.00	\$ 6,250.00
Vibration Isolators on HVAC	Crawlspace, HV-1, HV-2, HV-3, HV-4, HV-5, HV-6, HV-7, HV-8, HV-9, HV-10, HV-11, HV-12, HV-13, HV-14, A-21, B-1A, B-26, C-13, D-9	40	EA	\$ 100.00	\$ 4,000.00
9x9 Floor Tiles and associated Mastic	Throughout, Halls Outside Auditorium and Locker Rooms, Halls outside C-14, B-32, B-35, B-37, B-39, A-8, C-1, B-1, Select Classrooms	108,000	SF	\$ 4.50	\$ 486,000.00
Wood Flooring Paper and Mastic	Stage and Music Room Stage	4,000	SF	\$ 12.00	\$ 48,000.00
Wood Wall Paneling Glue	Auditorium	2,000	SF	\$ 12.00	\$ 24,000.00
Wire Insulation	Auditorium Stage	60	LF	\$ 5.00	\$ 300.00
Fire Curtain	Auditorium Stage	1	EA	\$ 500.00	\$ 500.00

Table 1
Abatement Cost Estimates
Fuller Middle School
Framingham, Massachusetts

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Cost
Wood Flooring Paper and Mastic	Gym and Fitness Center	14,500	SF	\$ 12.00	\$ 174,000.00
Fiber Reinforced Paneling	B-9 Lab Hood, D-31 Exhaust Vent, D-6 Upper Wall Vent	210	SF	\$ 12.00	\$ 2,520.00
Mastic Behind Heaters	Classrooms	3,200	SF	\$ 12.00	\$ 38,400.00
Slate Board Glue Daubs	Classrooms, Average 3 Per Classroom	250	EA	\$ 150.00	\$ 37,500.00
Black Science Table Tops	Science	320	SF	\$ 12.00	\$ 3,840.00
Interior Window Glaze	At Classrooms and Hall Intersection B Classrooms, C Classrooms, D Classrooms	550	EA	\$ 150.00	\$ 82,500.00
Interior Window Glaze	Fancy Wood Framed Windows at Admin Offices, "A" Offices, Library. 4x4, 8x4 and 2x4 Sections	150	EA	\$ 150.00	\$ 22,500.00
Black Sink Coating	Standard Sinks, B-5, Art, Nurses, Other Areas	30	EA	\$ 50.00	\$ 1,500.00
Interior White-Gray Caulk	Between Steel Beams and CMU in Classrooms, Intermittent in Halls	3,500	LF	\$ 12.00	\$ 42,000.00
Interior Hard Yellow Caulk	Between Steel Beams and CMU 1/2 Wall Interior Side of Courtyard Near Main Office	320	LF	\$ 14.00	\$ 4,480.00
Black Mastic/Insulation	Walk in Refrigerator and Freezer Coating	2	EA	\$ 2,000.00	\$ 4,000.00
Exterior Gray Window Caulk	At Sides of Long Window Banks, Between Bank and Brick	300	LF	\$ 14.00	\$ 4,200.00
Exterior Window Glaze	Interior of Exterior Window Banks. Each Window Defined by Aluminum Frame above Solid Steel Panel.	175	Each	\$ 250.00	\$ 43,750.00

Table 1
Abatement Cost Estimates
Fuller Middle School
Framingham, Massachusetts

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Cost
Exterior Door Caulk	Exterior Doors	420	LF	\$ 14.00	\$ 5,880.00
Exterior Vapor Barrier	Behind Brick Façade	6,000	SF	\$ 12.00	\$ 72,000.00
Remnant Roofing Tar	Remnant	10,000	SF	\$ 12.00	\$ 120,000.00
Subsurface Transite	Not Seen - Contingency	2,000	LF	\$ 35.00	\$ 70,000.00
				Total	\$ 1,601,770.00

**TABLE 1A
Other Hazardous Materials
Fuller Middle School
Framingham, Massachusetts**

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Coat	Comments	
Compact Fluorescent Bulbs	Throughout	200	EA	\$1	\$200		
Fluorescent Bulbs (Mercury)	Throughout	18000	Tubes	\$1	\$18,000		
Electronic and DPHE Light Ballasts	Throughout	9000	Each	\$5	\$45,000		
Thermostats and Switches (Mercury)	Throughout	500	Ampules	\$20	\$10,000		
Emergency Light Batteries (Lead)	Throughout	80	EA	\$20	\$1,600		
Refrigerants Associated With HVAC	Throughout	5000	Gallons	\$5	\$25,000		
Fire Extinguishers (Compressed Gas)	Throughout	150	EA	\$0	\$0	Reuse Recommended	
Refrigerants Associated with Water Bubblers	Throughout	25	Gallons	\$5	\$125		
Exit Signs (Tritium)	Throughout	150	EA	\$20	\$3,000		
Laboratory Chemicals	Science Lab	NA	NA	\$0	\$0	Reuse Recommended	
Air Conditioning Units	Window Mounted	100	EA	\$100	\$10,000		
Chemicals, Mercury and Lead	Science Sink Traps and Acid Tank	25	Gallons	\$100	\$2,500		
Older Door Retractors (Hydraulic Fluid)	Doors	150	EA	\$50	\$7,500		
Hydraulic Fluid	Old Lifts Under Floor	100	Gallons	\$25	\$2,500		
PCBs in Caulking	Assumed	4200	LF	\$35	\$147,000		
PCB Fluid	Old Transformer	150	Gallons	\$50	\$7,500		
		TOTAL				\$279,925	

SECTION 024119 - BUILDING DEMOLITION

1. Work Included: Demolish and remove existing buildings, materials, systems, equipment, and structures indicated on the Drawings.
2. Occupancy: Buildings to be demolished will be unoccupied prior to commencement of demolition.
3. Temporary Protections: Provide temporary barricades and other forms of protection as required to for protection of personnel from injury due to demolition operations.
 - a. Provide shoring and bracing as required to prevent collapse of existing systems and adjacent facilities or work to remain.
 - b. Remove temporary protections at completion of the work.
4. Coordination with Owner: Coordinate schedule of building demolition operations with Owner in order to allow Owner plenty of time to install temporary heating systems to the adjacent Walsh building.
5. Locate, identify, stub-off, and disconnect utility services that are indicated not to remain. Provide by-pass services as necessary to maintain continuity of service to occupied areas.
6. Where items are indicated to be salvaged, carefully remove indicated items, clean items, and deliver to storage area designated by Owner.
7. Material resulting from demolition and not identified for salvaging shall become the property of the Contractor and shall be legally transported and disposed of off-site. Disposal shall be performed as promptly as possible and not left until the final clean up.

-END OF SECTION-

SECTION 035413

GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.2 SUMMARY

- A. Section includes self-leveling, gypsum cement underlayment and acoustical mat for application below interior VCT floor coverings on the second and third floor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

- 1. STC Rating of assembly shall be STC-57.

2.2 GYPSUM CEMENT UNDERLAYMENTS

- A. Gypsum Cement Underlayment: Self-leveling, gypsum cement product that can be applied in uniform thickness.

- 1. Basis-Of-Design Product: Provide Gyp-Crete 2000/3.2K Floor Underlayment as manufactured by Maxxon Corporation, or equal products by one of the following, or equal:

- a. ARDEX Americas.
- b. Euclid Chemical Company (The); an RPM company.
- c. Hacker Industries, Inc.
- d. MAPEI Corporation.
- e. Maxxon Corporation.
- f. United States Gypsum Company.

- 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
- 3. Compressive Strength: Not less than 3,000 psi at 28 days when tested according to ASTM C 109/C 109M.
- 4. Density: Not less than 115 pounds per cubic foot.

2.3 ACCESSORIES

- A. Sound Mat:

- 1. Basis-Of-Design: Provide the Acousti-Mat II HP Sound Mat, or equal by one of the following, or equal:

- a. Allied Custom Gypsum Plasterworks, LLC.
- b. Dura Undercushions Ltd.
- c. Hacker Industries, Inc.
- d. Keene Building Products.
- e. Maxxon Corporation.
- f. United States Gypsum Company.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
- B. Sound Control Mat: Install sound control materials according to manufacturer's written instructions.
 - 1. Do not install mechanical fasteners that penetrate through the sound control materials.

3.2 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
- B. Apply surface sealer at rate recommended by manufacturer.
- C. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.3 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION

SECTION 042000

UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide unit masonry work, as indicated on Drawings and as specified herein.
 - 1. Brick masonry veneer.
 - 2. Masonry reinforcing, anchors, and ties.
 - 2. Cavity wall insulation.
- B. Products installed, but not furnished, under this Section include the following:
 - 1. Steel lintels and shelf angles for unit masonry, furnished under Section 055000, METAL FABRICATIONS.

PART 2 PRODUCTS

2.01 BRICK VENEER

- A. Provide face brick conforming to ASTM C 216, Grade SW, Type FBS. Provide building brick conforming to ASTM C 62. Use building brick only where concealed from view. Provide brick masonry as follows:
 - 1. Size: 8 in. x 8 in.
 - 2. Shapes: Provide special shapes where indicated. Never expose cores, frogs, or unfinished surfaces. Provide solidly-grouted bricks at tops of walls and under wall openings.
 - 3. Color/Finish/Texture:
 - a. Brick Type 1: Color shall be equal to Endicott's Medium Iron Spot #46; as manufactured by Endicott Clay Products; or approved equal by Belden Brick or Morin Brick. Finish of Brick shall be smooth.
 - 1) Brick shall have factory cut false 3/8 in. joints; 4 different patterns (1 without joint).

2.02 MORTAR MATERIALS

- A. Portland cement: ASTM C 150, Type I, free from water soluble salts and alkalies. Provide cement which exhibits no efflorescence when tested in conformance with these specifications.
- B. Lime: ASTM C 207, hydrated, Type S.
- C. Grout Aggregate: Complying with ASTM C 404.
- D. Mortar Aggregate: Complying with ASTM C 144, well graded.
- E. Mortar Pigment: Natural and synthetic oxides of iron and chrome, compounded for use in mortar. Use only pigments with proven record of performance. Provide products equal to

Davis Colors or Solomon Grind-Chem.

F. Water: Clean, potable.

2.03 REINFORCING TIES AND ANCHORS

A. Masonry Tie to Steel Z-Furring: Masonry Ties for anchoring of masonry veneer facing wythes to galvanized steel z-channels shall be "HB-345-BT", as manufactured by Hohmann & Barnard, Inc; or approved equal.

B. Miscellaneous Ties: Provide stainless steel straps, bars, rods, and similar items which are fabricated from minimum 16 gage stainless steel sheet or 3/16 in. diameter stainless steel wire.

2.04 MISCELLANEOUS MATERIALS

A. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches.

B. Cavity Drainage Material: thickness as required to fit firmly between back of masonry veneer and face of cavity wall insulation, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings. Subject to compliance with requirements, provide one of the following:

1. Mortar Break; Advanced Building Products, Inc.
2. CavClear Masonry Mat; CavClear.
3. Mortar Net; Mortar Net USA, Ltd.
4. Mortar Stop; Polytite Manufacturing Corp.

2.05 MORTAR AND GROUT MIXES

A. Mortar: Provide mortar complying with ASTM C 270. Mix using known volume measures. Do not batch by shovel.

1. Provide Type N mortar for masonry above grade exterior work, except as indicated otherwise.

B. Do not use admixtures or anti-freeze agents. Do not use masonry cement. Do not use calcium chloride or any compounds or mortar ingredients containing chlorides.

1. To prevent color variations, do not retemper mortar which contains color pigments.

B. Mortar Color: Provide mortar with color as determined by Architect. Do not exceed pigment to mortar ratio by 1:10.

END OF SECTION



Fuller Middle School
Framingham, MA
July 25, 2018

STRUCTURAL NARRATIVE

FOUNDATIONS/GROUND FLOOR

- Preliminary geotechnical information is found in a report by McPhail Associates dated June 4, 2018 titled "Preliminary Foundation Engineering Report"
- The existing site consists of a layer of alluvial/organic silt, peat, or loamy sand up to 8 feet below ground surface. This material is not suitable for bearing and should be removed or improved. Based on the depth of suitable bearing (generally if deeper than 3 feet below grade), ground improvement (rammed aggregate piers) may be more economical than over-excavating and backfilling with controlled structural fill. Typically, there is a 2 foot layer of crushed stone above the ground improvement piers to provide a uniform bearing surface for the foundations and slab.
- Foundations bearing on ground improvement or on structural backfill will be designed as reinforced concrete spread footings. There will be a perimeter frost wall and footing between column footings extending at least 4 feet below grade.
- The soil under the ground floor slab should be removed down to the suitable bearing material or improved. A 5" slab on grade reinforced with welded wire fabric should bear on ground improvement or on controlled backfill.
- Groundwater was encountered at a depth of 0 to 8 feet below ground surface. Temporary dewatering will likely be required during construction, and any slabs or elevator pits that are below the design water elevation will be designed for hydrostatic pressure. These areas should be waterproofed on the underside. Perimeter and underslab drainage should be included to shed water away from the building. A vapor barrier should be placed below the slab on grade.
- Foundation walls on the perimeter of the building will be 16" thick reinforced concrete to support façade elements. They will have pilasters to support the columns.

SUPERSTRUCTURE

- Floor construction
 - 3 1/4" light-weight concrete over 3"-18 gauge galvanized composite deck. The slab will be reinforced with 6x6 W2.1xW2.1 welded wire fabric.
 - For a typical 30'x30' bay, beams will be W14's with 3/4" diameter shear studs. Beam depths will increase for longer spans and at spandrels which need to be stiffer to support façade elements.
 - Floor plates that do not stack will be framed with moment connections and transfer beams.
- Roof construction

- 3"-18 gauge galvanized metal roof deck on W₁₄ steel framing. Concrete can be used locally to provide a surface for mechanical units. Alternatively, larger units can be supported on galvanized steel dunnage above the roof.
- Steel roof screens (to shield mechanical units) will be anchored to the roof beams.
- Roof framing can be designed to be "PV-ready" for negligible cost.
- Columns supporting 3 floors will be W₁₂'s.
- Gymnasium
 - The gym roof will be framed with long-span trusses designed for equipment such as basketball backstops.
 - 3"-18 gauge galvanized metal roof deck.
 - The columns in the gym will be W₁₂'s
 - A series of steel wind girts will be required where the façade material changes.
- Auditorium
 - The auditorium roof will be framed with long-span trusses designed for theater lighting.
 - 3"-18 gauge galvanized acoustic metal roof deck.
 - The columns in the gym will be W₁₂'s.
 - The stage will be built-up from cold-formed metal framing.
- Atrium
 - The atrium floor will be supported by building columns and steel hangers up to the roof steel.
 - Portions of the atrium will cantilever by moment-connecting the steel beams.
 - A curved bent plate will form the slab edge
 - The atrium roof will be supported by steel beams or trusses.

LATERAL SYSTEM

- The lateral force resisting system will consist of steel concentrically braced frames. The braces will be HSS 8x8 members spanning diagonally between columns. Assume 6 bays per floor in each direction.

COST ASSUMPTIONS

FOUNDATIONS

- Ground improvement (rammed aggregate piers) over entire building site at 10'x10' grid.
- Remove 2' soil and provide 2' crushed stone over entire building site.
- Footings: 10'x10'x2' spread footing on a 30'x30' grid with 3 PSF rebar.
- Frost wall footings: 3'x1' continuous footing along perimeter with 3 PSF rebar.
- 2'x2' pilasters at perimeter columns.
- Frost wall: 16" thick x 3' deep continuous along perimeter with 5 PSF rebar.
- 5" slab on grade with 6x6 W_{2.9}xW_{2.9} WWF
- 12" thick pad + 12" thick walls for 5' deep elevator pit

SUPERSTRUCTURE

- Steel framing:
 - Floors- 13 PSF including beams, columns, connections, braced frames.

- Roof- 10 PSF including beams, bridging, and connections.
- 3 ¼" ltwt concrete on 3"-18 ga composite metal deck for 2nd and 3rd floor
- ¾" diameter x 4 ½" shear studs at 12" oc for all floor beams.
- ½" bent plate at slab edges.
- 3"-18 ga metal roof deck (acoustic deck at auditorium)
- Stairs will be metal pan with steel stringers.

SECTION 054000

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install cold formed steel framing, as indicated on the Drawings and as specified herein. Cold formed steel framing includes but is not necessarily limited to:
1. Cold formed steel stud exterior vertical and horizontal framing, including cross-bridging, bracing, and anchoring to the building structure, complete in all respects.
 2. Z-furring at exterior walls.
 3. Interior soffit framing.
 4. Interior partition supports, including box beams and hangers at classroom corridor walls.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
1. AllSteel Products, Inc.
 2. Clark Steel Framing.
 3. Craco Metals Manufacturing, LLC.
 4. Dale/Incor.
 5. Dietrich Metal Framing; a Worthington Industries Company.
 6. MarinoWare; a division of Ware Industries.
 7. Steel Construction Systems.
 8. United Metal Products, Inc.

2.02 FRAMING COMPONENTS

- A. Studs shall be 16 gauge or heavier except where noted on the Drawings. Studs shall be manufactured from steel sheet meeting the requirements of ASTM A 1003, Structural Grade, Type H with a minimum yield strength of 50,000 psi. Studs shall have pre-punched holes. Studs shall be hot dip galvanized in accordance with the following:
1. Grade: ST50H (ST340H).
 2. Coating: G90 (Z275).
- C. Z-Furring: Provide ZF_Series Z-furring as manufactured by Dietrich Metal Framing, or approved equal. Z-furring shall be minimum 20 gage galvanized steel, sizes as required.
- D. Tracks shall be 18 gauge or heavier unpunched tracks manufactured of commercial quality steel sheet meeting the requirements of ASTM A 1003 with a minimum yield strength of 50,000 psi. Provide special shaped tracks with one 4 in. high leg where required. Tracks shall be hot dip galvanized in accordance with the following:
1. Grade: ST50H (ST340H).
 2. Coating: G90 (Z275).

- E. Bridging shall be manufacturer's recommended type to meet the design criteria set forth in Paragraph 1.08 of this Section.
- F. Attachment angles, closure angles, and other miscellaneous components shall be manufactured of commercial quality steel sheet meeting the requirements of ASTM A 446 with a minimum yield strength of 50,000 psi and shall be formed to profiles. All components shall be hot dip galvanized in accordance with ASTM A 525, G 60 Coating Designation.
- G. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with un-stiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows:
 - 1. Minimum Uncoated-Steel Thickness: 0.0538 inch (1.37 mm).
 - 2. Flange Width: A minimum of 2 inches (50 mm), unless otherwise noted.
- H. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with un-stiffened flanges.
 - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads, and as follows:
 - a. Minimum Uncoated-Steel Thickness: 0.0538 inch (1.37 mm).
 - b. Flange Width: A minimum of 3 inches (75 mm), unless otherwise noted.
 - 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Uncoated-Steel Thickness: 0.0538 inch (1.37 mm).
 - b. Flange Width: Minimum flange width of 4 inches (100 mm).
- I. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.03 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 55] threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.04 PAINT

A. Zinc Rich Paint: Zinc rich paint for touch up repair of galvanized coatings damaged during handling and erection and field welding shall conform to ASTM A 780 for zinc-rich primer. Paint shall be equal to one of the following:

<u>Product</u>	<u>Manufacturer</u>
ZRC Cold Galvanize Compound	ZRC
ZIRP	Duncan Industries

B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

END OF SECTION

SECTION 055000 - METAL FABRICATION

1. Description of Work: The scope of work includes:
 - a. Steel handrails, guardrails and railings.
 - b. Steel pipe bollards.
 - c. Miscellaneous framing and supports for the following:
 - 1) Framing, platforms, and supports for equipment.
 - 2) Counters, benches, and vanities.
 - d. Shop priming and finish painting of hot-dip galvanized work.

2. Materials, General: Provide products and materials of new stock, free from defects, and of best commercial quality for each intended purpose.
 - a. Steel Plates, Shapes, and Bars: ASTM A 36.
 - b. Steel Tubing: ASTM A 500 or A 501, hot or cold rolled, as required for design loading.
 - c. Steel Pipe: ASTM A 53, schedule 40, Type S (seamless), black except where galvanized is indicated, Grade A for cold-bending.
 - d. Steel Sheet: ASTM A 366, A 570, or A 611, grade required for design loading.
 - e. Bolts and fasteners: ASTM A 307 and A 325.
 - f. Concrete: Concrete fill for steel bollards is specified in Section 033000, CAST-IN-PLACE CONCRETE.
 - g. Inserts: Threaded or wedge type, galvanized ferrous castings; either ASTM A 47 malleable iron, or ASTM A 27 cast steel. Provide threaded inserts and wedge inserts.
 - h. Provide exposed fastenings of same material and finish as metal to which applied, unless otherwise noted.
 - i. Welding rods: Conform to AWS Standards and recommendations of welding rod manufacturer.
 - j. Grout for Interior Applications: Pre-mixed, non-staining, non-corrosive, non-shrink, non-metallic complying with CE CRD-C-621, Type D.
 - k. Grout for Exterior Applications: Provide Factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating.

3. Fabrication - General: Fabricate work of this Section to be straight, plumb, level and square, and to sizes, shapes and profiles indicated on approved shop drawings. Ease exposed edges. Cut, reinforce, drill and tap metal work as required for proper assembly.
 - a. Fabricate miscellaneous supports, brackets, braces and the like required to fully complete the work.
 - b. Obtain loading requirements from suppliers of work to be supported. Design and support systems with a safety factor of at least 6 unless otherwise indicated.
 - c. Allow for thermal movement resulting from 100°F change in ambient temperature.
 - d. Shear and punch metals accurately. Remove burrs.
 - e. Ease exposed edges to a radius of approximately 1/32 in., unless indicated otherwise. Form bent corners to smallest radius possible without causing grain separation or impairing work.
 - f. Remove sharp or rough areas on exposed traffic surfaces.
 - g. Weld seams continuously. Spot welding is permitted for temporary welding only.
4. Work Exposed to View: For work exposed to view, select materials with special care. Provide materials which are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform hairline joints. Form welded joints and seams continuously. Grind welds flush to be smooth after painting. For exposed fasteners, use hex head bolts or Phillips head machine screws.
5. Radius/Curved Work: Form radius/curved work to true radius without segmentation, buckling, warping, or otherwise altering member dimensions or appearance. Where member cannot be formed to required dimensions, provide equal shape and size member fabricated from equivalent plate stock, fabricated, welded and ground to provide required appearance and performance.
6. Galvanizing: Hot-dip galvanize exterior metal fabrications, items located at exterior locations, and other items indicated to be galvanized, in compliance with ASTM A 123, ASTM A 153, or ASTM A 386. Provide minimum 1.5 oz./ft.² zinc coating. Galvanize after fabrication.
7. Steel Handrails and Guardrails: Conform to ASTM E 985 for design and engineering for 9 performance based on testing performed in accordance with ASTM E 894 and ASTM E 935, using load and deflection values specified below. Design and fabricate handrails and guardrails to support 50 lb. per linear foot uniform load and 200 lb. concentrated load, located at any point to cause greatest stress horizontally or vertically.. Load conditions do not act concurrently. Design maximum deflection of any member under load conditions shall not exceed L/360.
8. Concrete Filled Pipe Bollard Fabrication: Provide minimum 8 in. diameter Schedule 80 steel pipe of length to extend from at least 64 in. below grade to at least 48 in. above grade, unless otherwise indicated.
9. Miscellaneous Framing and Supports: Fabricate miscellaneous framing and supports to adequately support live and dead loads with a safety factor of 6. Provide necessary anchors, inserts, and fasteners. Fabricate support system to carry entire load of work being supported to structure above. Do not transfer any loads to ceiling systems.
10. Counter and Bench Supports: Fabricate counter and bench support brackets to support weight of counter, bench or table, plus an additional 500 lbs. concentrated load located to create greatest stress. Fabricate brackets to be inconspicuous from normal viewing angles, unless otherwise indicated on Drawings. Drill brackets for anchor bolts and fasteners.

-END OF SECTION-

SECTION 061000 - ROUGH CARPENTRY

1. Description of Work: Provide all rough carpentry work, as indicated on the Drawings and as specified herein. Rough carpentry shall include but not be limited to:
 - a. Rough hardware, inserts, and related metal components.
 - b. Rough carpentry sleepers, blockings, curbs, cants, edgings, grounds, nailers, and furring.
 - c. Wood preservative treatments and applications.
 - d. Fire-retardant treatments and applications.
 - e. Construction panels, including plywood backing panels for electrical and telephone equipment; plywood sheathing at exterior walls.

2. Miscellaneous Wood Framing and Blocking: Provide lumber for miscellaneous wood framing, blocking, cant strips, nailers, etc. for all work of the Project, including, but not limiting to, handrails, railings, roofing, flashing, sheet metal work, wall mounted toilet accessories, Dressing Room counters, and the like.

3. General Carpentry Material Schedule shall be as follows:

<u>Item</u>	<u>Grade</u>	<u>Species</u>
Lumber 2 in. nominal thickness or greater	Construction Grade	Spruce-Pine-Fire
Lumber less than 2 in. nominal thickness	Construction Grade	Spruce-Pine-Fire

4. Pressure Preservative Treated Lumber: Pressure preserve wood products using only Arsenic and Chromium-free products in accordance with ACQ Preserve Standard ACQ-99. Pressure preservative treat lumber above ground and in contact with roofing, flashing, sheet metal, masonry, concrete, dampproofing, and waterproofing in conformance with AWPA C1, C2, C5, C9, C15, C17, and P5 as applicable. Provide pressure preservative treated lumber with a minimum net retention of 0.25 pcf. Dry lumber to maximum moisture content of 19% after treatment. Use only waterborne preservatives which conform to AWPA P5. Creosote preservatives and preservatives containing Arsenic or Chromium are not acceptable.

- a. Pressure preservative treat lumber in contact with ground in compliance with AWPA C2 and AWPB LP-22 with a minimum net retention of 0.40 pcf.

5. Construction Panels: Construction panels required to complete the work of this Section include, but is not limited to the following:

- a. Electrical and telephone equipment backing panels, consisting of APA trademarked, Performance-Rated sheathing, UL fire-retardant treated, C-D Plugged, Exposure 1 panels, not less than 5/8 in. thick. Provide fire-retardant treatment which yields a flame spread rating of not more than 25 when tested in conformance with ASTM E 84, and conforms to AWPA C 27, Interior Type A. Kiln dry after treatment to a maximum moisture content of 15%.
 - b. Exterior Plywood Sheathing: Provide plywood sheathing consisting of APA trademarked, Performance-Rated sheathing, UL fire-retardant treated, C-D Plugged, Exposure 1 panels, not less than 5/8 in. thick. Provide fire-retardant treatment which

yields a flame spread rating of not more than 25 when tested in conformance with ASTM E 84, and conforms to AWPA C 27, Interior Type A. Kiln dry after treatment to a maximum moisture content of 15%.

6. Inserts, Anchors, and Fasteners: Provide inserts, anchors, anchor bolts, lag bolts, screws, washers, nuts, nails, and other rough hardware. Assist other trades as necessary in the placement of inserts and anchor bolts in concrete and masonry. Furnish full instructions regarding locations, sizes, and other requirements to ensure proper preparation. Provide rough hardware which complies with requirements of the governing laws and codes.
7. Rough Hardware: Provide rough hardware items for use at roof and other exterior uses hot-dip galvanized in accordance with ASTM A 153. Provide other concealed items cadmium plated or zinc chromate plated.

-END OF SECTION-

SECTION 062000

FINISH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide all finish carpentry and millwork as indicated on the Drawings and as specified herein. Include, but do not limit to:
1. Interior standing and running trim.
 2. Solid surface countertops with undermount stainless steel sinks.

1.02 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 National Standards Institute (ANSI):

A161.2	Performance Standards for Fabricated High Pressure Decorative Laminate Countertops
A208.1	Particleboard, Mat-Formed Wood
 2. American Society for Testing and Materials (ASTM):

E 84	Surface Burning Characteristics of Building Materials
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 3. National Electric Manufacturers Association (NEMA):

LD 3	High Pressure Decorative Laminates
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 4. The Architectural Woodwork Institute (AWI):

Quality Standards	Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program
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1.03 QUALITY STANDARDS

- A. Quality Standard: Provide work complying with applicable requirements of AWI Quality Standards. Where not otherwise indicated, fabricator may choose among options permitted by AWI for grade of work specified.
1. Panel Products: Provide minimum 45 pounds per cubic foot medium density fiberboard. Do not use hardboard.
 2. Fire Performance: All concealed work in this section shall be UL labeled fire-retardant treated. Exposed woodwork shall have a flame spread of less than 200 when tested in compliance with ASTM E 84.

- C. Mockups required for each type of construction.

PART 2 PRODUCTS

2.01 INTERIOR STANDING AND RUNNING TRIM

- A. Quality Standard: Provide AWI Premium Grade materials and workmanship.
- B. Wood Species and Cuts: Provide as follows:
 - 1. Paint Finished Work: FSC Certified Poplar.

2.02 SOLID SURFACING MATERIAL

- A. Basis-Of-Design: Provide Staron Sheet and Staron Sinks and Bowls, as manufactured by Samsung Chemical USA, Inc.; or one of the following solid surfacing materials, or Architect approved equal, in color selected by Architect:
 - 1. Staron Sheet; Samsung Chemical USA, Inc.
 - 2. Corian by DuPont.
 - 3. Fountainhead; Nevamar Corporation; Odenton, MD 21113.
- B. Scope: Solid surfacing work includes, but is not limited to:
 - 1. Countertops.
 - 2. Vanities.
- C. Provide solid surfacing material in sizes, profiles, and configurations indicated on Drawings. Color shall be standard color selected by Architect. Thickness shall be as indicated on Drawings.
- D. Vanities shall include undermounted stainless steel sinks

END OF SECTION

SECTION 064000

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide architectural woodwork as shown on Drawings and specified herein. Work of this Section includes, without limitation, the following:

1. Custom plastic laminate casework and sills.
2. Custom plastic laminate paneling.
3. Custom plastic laminate benches.
4. Upholstered cushions for benches.
5. Wood handrails.

1.02 REFERENCES

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

1. American National Standards Institute (ANSI):

A161.2	Performance Standards for Fabricated High Pressure Decorative Laminate Countertops
A208.1	Particleboard, Mat-Formed Wood
2. American Society for Testing and Materials (ASTM):

E 84	Surface Burning Characteristics of Building Materials
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3. The Architectural Woodwork Institute (AWI):

Quality Standards	Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program
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1.03. QUALITY ASSURANCE

- a. Mockups for each form of construction.

PART 2 PRODUCTS

2.01 PLASTIC LAMINATE CASEWORK

- A. Basis-Of-Design: Plastic laminate types, colors and textures are based on those manufactured by Aborite. Provide these products, or equal from one of the following, or equal:

1. Aborite.
2. Formica.
3. Nevamar.
4. Wilsonart.

- B. Scope: Custom plastic laminate casework includes, but is not limited to, the following:
1. Cabinets.
 2. Cubbies.
 3. Display cases.
 4. Benches and seats.
 5. Wall paneling.
 6. Miscellaneous plastic laminate casework.
- B. Quality Standard: Provide AWI Premium Grade materials and workmanship. Provide exposed facing materials as follows:
1. Provide vertical grade high pressure plastic laminate for both sides of swinging and sliding doors, drawer fronts, and all exposed cabinet ends.
 2. Color/Texture/Pattern: Provide laminates in colors, textures and patterns selected by Architect. Up to 4 different colors of woodgrain Plastic Laminate may be selected.
- C. Preparation for Related Work: Prepare casework for all related electrical, telephone, mechanical, and plumbing work.
- D. Medium-Density Fiberboard (MDF) Cores for Laminated Products: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde. Provide Sierra Pine's "Medex," "Medex NC," and "Medite II" or Weyerhaeuser's "Premier Plus" fiberboard, or equal.
1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- E. Cabinets and Casework: Provide casework matching elevations and details indicated. Provide cabinets having the following features and characteristics:
1. Construction/Style: Provide overlay construction with flush doors and drawer fronts, unless otherwise detailed. Provide cabinets with sliding/swinging doors, with interior cabinet surfaces to be melamine. Cabinets without doors shall have interior surfaces of plastic laminate. Provide solid Maple hardwood noses, or vinyl edges as detailed.
 2. Typical Doors: Provide minimum 3/4 in. MDF with both faces plastic laminate adhered to core. Provide plastic laminate on all edges as detailed.
 3. Lumber Core Doors: At locations indicated, provide minimum 3/4 in. lumber-core doors with both faces plastic laminate adhered to core. Provide plastic laminate on all edges as detailed.
 4. Drawers: Provide cabinet drawers with applied drawer fronts.
 5. Shelves: Provide minimum 3/4 in. MDF with laminate both sides, top and bottom; and edges finished with vinyl nosing or solid Maple nosing as indicated. All shelves shall be adjustable as detailed and shall meet AWI standards for deflection.
- F. Plastic Laminate Casework Hardware: Provide the following or Architect approved equal:
1. Hinges: Provide heavy-duty overlay hinges. Provide at least two hinges per door leaf.
 2. Drawer and Door Pulls: Integral or continuous pulls as detailed.
 3. Drawer Slides: 75 lb. Accuride C3800, or equal manufactured by Blum or Hafele.
 4. Door Silencers: Glynn Johnson GJ-65, or equal manufactured by Blum or Hafele. Provide resilient pads to silence door and drawer closing.
 5. Plastic Tracks and Guides for Sliding Doors: Basis-Of-Design shall be Knappe & Vogt #P2417; color as selected by Architect, or equal from Hafele or Rakks.

6. Pegs for Adjustable Shelving: Basis-Of-Design shall be Knappe & Vogt #331; color as selected by Architect, or equal from Hafele or Rakks.
 7. Storage Cabinet Lock: Basis-Of-Design shall be Shlage Cabinet Door Lock #CL100PB, bright brass 605 finish; or equal from Best or Russwin.
 8. Cubby Hook: Basis-Of-Design shall be Hewi Series 477 Triple Hook; or equal from Hafele or Bobrick.
 9. Aluminum Grille: Provide 1/8 in. perforated aluminum, finished to match Satin Bronze. Peroration pattern shall be as selected by Architect.
 10. Coat Rod: Basis-Of-Design shall be Knappe & Vogt #660; with #734 and #735 tubing flange, or equal from Hafele or Rakks.
- G. Upholstered Cushions: Provide upholstered cushions whose fire performance characteristics comply with Business and Institutional Furniture Manufacturer's Association Standard F-1. Provide padding covered by fabric sewed into boxed construction without welts and attached by slipping over foam cushion with zippers on least visible edge. Accurately match fabric pattern at seams. Provide double sewn seams with interlocking stitches and overlapped fabric.
1. Foam Cushions: Provide Dynamic Systems, Inc. as manufactured by Sunmate (www.sunmatecushions.com/sunmate.php). Provide medium pressure quality.
 2. Upholstery Fabric for Seat and Seat Backs: Knoll Textiles fabric "Field Day" (K124); or equal by Maharam or Guilford.

2.02 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated, FSC Certified softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Exposed Hardwood for Wood Handrails, and Elsewhere as Indicated: AWI Premium Grade, FSC Certified, White Maple, Quarter sawn.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- D. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
 1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealant applications.
- E. Plastic Glazing: Furnished under section 088000, GLAZING.

2.03 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish exposed wood components of architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, toning, cleaning, and polishing until after installation.
- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing exposed wood components of architectural woodwork, as applicable to each unit of work.

D. Transparent Finish:

1. Grade: Premium.
2. AWI Finish System: TR5-Catalyzed Vinyl.
3. Staining: Match approved sample for color.
4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.
5. Toner: Provide applications of toner as required or as field directed by Architect in order to ensure that finished Architectural Woodwork and wood doors matches in colors and tones.
6. Colors: Match Architect's samples.
- 7 Preparation for Finishing: Comply with AWI Quality Standards for sanding, filling, countersinking, sealing of concealed surfaces, and similar preparation requirements for finishing of work of this Section.

END OF SECTION

SECTION 071613 – BITUMINOUS DAMPPROOFING

1. Description of Work: Provide below-grade bituminous dampproofing at foundation walls.
2. Dampproofing Product: Asphalt-based emulsions recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.
 - a. Spray Grade: Emulsified asphalt, prepared with mineral-colloid emulsifying agents without fibrous reinforcement, complying with ASTM D 1227, Type III.
3. Protection Course: ASTM D 6506, 1/8-inch- (3-mm-) thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

-END OF SECTION-

SECTION 072100

THERMAL INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide building insulation work as indicated on Drawings, and as specified, including but not limited to:
1. Rigid extruded polystyrene foundation insulation.
 2. Stone wool exterior wall insulation
 3. Underslab insulation.
 4. Installation of Sound-Absorbing Insulation at Acoustical Metal Deck.

PART 2 PRODUCTS

2.01 RIGID EXTRUDED POLYSTYRENE INSULATION

- A. Extruded-Polystyrene Board Foundation Wall and Underslab Insulation: Provide extruded polystyrene insulation conforming to ASTM C 578, minimum 25 lbs. per sq. in. compressive strength at 0.1 in. deformation, 2.0 lbs. per cu. ft. density "K" factor of 0.185 at 40°F. and 0.20 at 75°F. per in. thickness, water vapor transmission of 1.0 perm, and water absorption by volume of 0.1%.
1. Provide one of the following products, or equal:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Pactiv Building Products Division.
 2. R-Values: Provide the following minimum R-Values:
 - a. Underslabs on Grade: Minimum R=10.
 - b. Foundation Walls: Minimum R=10.

2.02 STONE WOOL EXTERIOR WALL INSULATION

- A. Provide non-combustible, lightweight and water repellent, semi-rigid insulation board, for use in cavity wall applications. Stone wool insulation shall be in compliance with FM Global Data Sheet 1-12. Provide one of the following, or equal:
1. CavityRock® DD; as manufactured by Roxul, Inc.
 2. Rainbarrier 45; as manufactured by Thermafiber
 3. Owens-Corning equal.
- B. Mechanically Adhesively Attached, Spindle-Type Anchors (Stick-Pins): Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated.
1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square. Plate shall have 2 screws each.
 2. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
 3. Mastic adhesive shall have a VOC content not more than 80 g/L.

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END OF SECTION

SECTION 072720

AIR AND VAPOR BARRIERS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Work Included: Provide continuous air and vapor barrier system at exterior wall assemblies as indicated on the Drawings, including connections with adjacent materials and air barrier at roof.

The air and vapor barrier membrane shall be located, constructed and flashed to perform as an air and water barrier to discharge to the outside any incidental condensation or water penetration. The air and vapor barrier membrane shall accommodate movements of building materials by providing expansion and control joints, with appropriate air and vapor seal materials at such locations, changes in substrate and perimeter conditions.

PART 2 PRODUCTS

2.01 FLUID-APPLIED MEMBRANE AIR AND VAPOR BARRIER MATERIALS

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.
1. Products: Subject to compliance with requirements, provide one of the following, or equal:
 - a. Elastomeric, Modified Bituminous Membrane:
 - 1) Henry Company; Air-Bloc 06 WB.
 - 2) Meadows, W. R., Inc.; Air-Shield LM.
 - 3) Tremco Incorporated, an RPM company; ExoAir 120SP/R.
 - b. Synthetic Polymer Membrane:
 - 1) Grace, W. R., & Co. - Conn.; Perm-A-Barrier Liquid.
 - 2) Henry Company; Air-Bloc 32.
 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Maximum 0.1 perm (5.8 ng/Pa x s x sq. m); ASTM E 96/E 96M.
 - c. Ultimate Elongation: Minimum [500] <Insert number> percent; ASTM D 412, Die C.

2.02 AUXILIARY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, cross-laminated polyethylene film with release liner backing.
- D. Butyl Strip To Terminate Air Barrier to EPDM or TPO Roofing Membranes: Vapor retarding, 30 to 40 mils (0.76 to 1.0 mm) thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.
- E. Modified Bituminous Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- F. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.
- G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless-steel fasteners.
- J. Sprayed Polyurethane Foam Sealant To Fill Gaps at Penetrations and Openings: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft (24- to 32-kg/cu. m) density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- K. Modified Bituminous Transition Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- L. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- M. Preformed Seal for Openings in Wall: Manufacturer's standard system consisting of cured low-modulus silicone or fiberglass, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding to substrates.
 - 1. Products: Subject to compliance with requirements, provide one of the following, or equal:
 - 1. Dow Corning Corporation; 123 Silicone Seal.
 - 2. Momentive Performance Materials Inc.; US11000 UltraSpan.
 - 3. Pecora Corporation; Sil-Span.
 - 4. Tremco Incorporated, an RPM company; Spectrem Simple Seal or Proglaze.
- N. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.

END OF SECTION

SECTION 074233 – Phenolic Wall Panels

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exterior solid phenolic cladding panel system and accessories as required for a complete drained and back-ventilated rainscreen system.
 - 1. Wall panels.
 - 2. Horizontal soffits.

- B. National Fire Protection Association (NFPA):
 - 1. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
 - 2. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.2 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary panel products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
- B.
- C. Mock-Up: Provide a mock-up for evaluation of the product and application workmanship.
 - 1. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

1.3 WARRANTY

- A. Warranty: At project closeout, provide manufacturer's limited ten year warranty covering defects in materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Trespa International B.V.; P.O. Box 110, 6000 AC Weert
Wetering 20, 6002 SM Weert The Netherlands; www.trespa.com.

2.2 WALL PANELS

- A. Solid Phenolic Wall Panels: Trespa Meteor by Trespa International.
1. Material: Solid panel manufactured using a combination of high pressure and temperature to create a flat panel created from thermosetting resins, homogeneously reinforced with wood-based fibers and an integrated decorative surface or printed décor.
 2. Color: As selected by the Architect from manufacturer's standard color palette.
 3. Finish: Satin sheen.
 4. Panel Core: Fire retardant (FR) black core.
 5. Panel Thickness: 3/8 inch (10 mm).
 6. Fire Performance:
 - a. Flame Spread: Class A, ASTM E 84.
 - b. Smoke Development: Less than 450, ASTM E 84.
 7. Finish Performance: in conformance with the following general requirements:
 - a. Weather Exposure: Accelerated - 3000 hours in Atlas Type Weatherometer using cycle of 90 minutes light and 30 minutes diminished light and demineralized water with a maximum color change of 5 Delta E units from the original color according to ASTM D-2244,
 - b. Color Stability: The decorative surface comply with, classification, 4 - 5 measured with the grey scale according to ISO 105 A02-93 according to test method EN 438-2:29.
 - c. Microbial Characteristics: Will not support micro-organic growth (ISO 846).

- B. Mounting System:

1. TS220 - Concealed fastening over variable depth aluminum sub-framing.

C. Aluminum Sub Structure: Aluminum sub-structure designed to withstand structural loading due to wind load and the dead load of the panel, painted as required to conceal behind the open joinery of the attachment system.

1. Extrusions, including corner closures, joint closures and vent screens, formed members, sheet, and plate shall conform with the recommendations of the manufacturer.

-END OF SECTION-

SECTION 075300 – SINGLE PLY MEMBRANE ROOFING

1. Work Included: The scope of work includes:
 - a. Fully-adhered single ply, reinforced thermoply roofing membrane.
 - b. Roof flashings.
 - c. Roof insulation at membrane roofing.
 - d. Zinc-coated copper flashing.
 - e. Roof pavers.

2. Manufacturers: Provide Thermoplastic PVC Sheet, uniform, flexible sheet formed from thermoplastic PVC, and as manufactured by one of the following:
 - a. Sarnafil.
 - b. Carlisle SynTec, Inc.
 - c. Johns Manville

3. Roof System: Provide Sarnafil G410 membrane as manufactured by Sarnafil, 60-mil thick reinforced.
 - a. Provide thermoply roofing system consisting of adhered single-ply PVC sheet and mechanically-attached insulation over roof deck. Provide system conforming to UL Class A and Factory Mutual Class 1. Roof system shall conform to Factory Mutual Windstorm Resistance Classification I-90.

 - b. Membrane Color: Provide white membrane color.

4. Isocyanurate Board Roof Insulation: Provide indicated thickness of flat and tapered rigid isocyanurate foam roof insulation consisting of isocyanurate integrally laminated on top and bottom with non-reflective facer. Provide insulation conforming to Fed. Spec. HH-I-1972, and that is acceptable to roofing system manufacturer.
 - a. Rigid isocyanurate shall have minimum density of 2 lb. cu. ft., minimum compressive strength (ASTM D 1621) of 25 psi, maximum moisture vapor transmission (ASTM E 96) of 2.0 perm, "C" factor of 0.16 (1 in.) or better, and "R" value of 6.67 (1 in.).

 - b. Insulation shall be approved by Factory Mutual (FM) for Class 1 Insulated Steel Deck Construction and shall be UL listed Class A.

5. Underlayment Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, **5/8 in.**
 - a. Product: Subject to compliance with requirements, provide "Dens-Deck" by Georgia-Pacific Corporation, or designer approved equal.

6. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, **1/2 in. thick.**
 - a. Product: Subject to compliance with requirements, provide "Dens-Deck" by Georgia-Pacific Corporation, or designer approved equal.

7. Roof Vapor Retarder: Provide Griffolyn TX-1200 FR, manufactured by Reef Industries, Inc., Houston, TX 77275, or Designer approved equal.
 - a. Weight: 43 lb. per 1,000 sq. ft.; per ASTM D 2776.
 - b. Permeance: 0.035 grains; per ASTM E 96.
 - c. Tensile Strength: 100 lb./4,504 PSI; per ASTM D 882.
 - d. Puncture Strength: 36 lb.; per ASTM D 4833.

8. Membrane Flashing: Provide manufacturer's standard PVC membrane flashing material, compatible with roofing sheets.

9. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway **pads or rolls**, approximately 3/16 in. thick, and acceptable to membrane roofing system manufacturer.

-END OF SECTION-

SECTION 076200 - SHEET METAL FLASHING AND TRIM

1. Work Included: The scope of work includes:
 - a. Roof and Wall flashings.
2. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - a. Aluminum Finish: Fluoropolymer Two-Coat System; Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight; complying with AAMA 605.2.
 - 1) Color: Provide standard color, selected by Architect.
3. Formed Roof Edge Units: Provide prefabricated metal roof edge units consisting of formed hot-dip galvanized sheet steel cleats and 0.063 in. thick aluminum cap equal to "Permasnap Gravel Stops", manufactured by W.P. Hickman Co.; "Snap-Lok Gravel Stops", manufactured by MM Systems Corp.; or "AP Snap-Tight Gravel Stops", manufactured by Architectural Products Company.
4. Elastomeric Flashing: Elastomeric sheet flashing/membrane shall be polyethylene reinforced sheet flashing 60 mil thick rubberized asphalt sheet, equal to Perm-A-Barrier Wall Flashing, manufactured by W. R. Grace & Company, or approved equal.
 - a. Material shall be 40 mil thick consisting of 8 mil thick high-strength cross-laminated polyethylene integrally bonded to 32 mil thick layer of rubberized asphalt.
5. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
6. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
7. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."
8. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.
9. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
10. Fabrication, General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

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-END OF SECTION-

SECTION 078410 - THROUGH PENETRATION FIRESTOP SYSTEMS

1. Work Included: Provide firestop systems consisting of a material, or combination of materials, installed to retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, or gases through penetrations in fire-rated barriers. Firestops shall be used in locations including, but not limited to, the following:
 - a. Penetrations for the passage of duct, cable, cable trays, conduit, piping, electrical busways, and electrical raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor slabs and floor/ceiling assemblies), and vertical service shafts.
 - b. Openings between structurally separate sections of walls or floors.
 - c. Above walls or partitions extending to underside of ceiling or roof assemblies above.
 - d. Concealed furring spaces behind finishes.
 - e. Where pipes, conduits, ducts, and other items pass through fire-rated assemblies.
 - f. Openings for items mounted on or within fire-rated assemblies.
2. UL Listed Designs: Firestopping materials and systems shall be installed in each location and type of installation conforming to listed UL designs.
 - a. Firestopping materials shall be UL Classified as "Fill, Void, or Cavity Material" for use in through-penetration firestop systems.
 - b. Provide firestop systems that are UL listed with a fire-resistance rating equal to the hourly resistance rating of the fire-rated barrier being penetrated.
3. Fire-Resistance: Provide materials and construction identical to fire-rated assemblies tested in compliance with ASTM E 119, ASTM E 814, UL 263, or NFPA 251, by independent agencies acceptable to Designer and governing authorities.
4. Burning Characteristics: Provide products with maximum ASTM E 84 surface burning characteristics of flame spread 25 and smoke developed 25.
5. Firestop systems shall have been tested in accordance with ASTM E 814 or UL 1479 under a minimum positive pressure of 0.01 in. of water.

-END OF SECTION-

SECTION 079200 - JOINT SEALANTS

1. Description of Work: Work includes the following:
 - a. Joint sealing of joints in exterior construction.
 - b. Joint sealing of interior joints.

2. Self-Leveling Joint Sealants: Provide two or more part, self-leveling, polyurethane based elastomeric sealant, complying with ASTM C 920, FS TT-S-00227E Type 1 Class A, having Shore A hardness of not less than 30 when tested according to ASTM C 920, cured modulus of elasticity at 100% elongation of not more than 150 psi when tested according to ASTM D 412, and tear resistance of not less than 50 lbs./inch when tested according to ASTM D 624.
 - a. Provide one of the following products that meet or exceed specified requirements:
 - 1) Pecora Urexpan NR-200.
 - 2) Mameco Vulkem 245 or 255.
 - 3) Sika 2C, SL.
 - 4) Sonneborn Sonolastic PvJtSt.
 - 5) Tremco THC 900.
 - b. Extent: Provide self-leveling polyurethane sealant for paving and floor joints not indicated to be sealed with another type of sealant.

3. Non-Sag Joint Sealants: Provide multi-part, non-sag, polyurethane based elastomeric sealant, complying with ASTM C 920 Type M, Grade NS, Class 25, Fed. Spec. TT-S-00227E Class A, having Shore A hardness of 20 to 30, cured modulus of elasticity at 100% elongation of not more than 75 psi, and tear resistance of not less than 50 lbs./inch when tested according to ASTM D 624.
 - a. Provide one of the following products that meet or exceed specified requirements:
 - 1) Mameco International Vulkem 227
 - 2) Sika Sikaflex 2c NS.
 - 3) Sonneborn Sonolastic NP 2.
 - 4) Tremco Dymeric
 - b. Extent: Provide non-sag polyurethane sealant for all metal to metal joints, metal to concrete joints, metal to metal window joints, wood to metal joints, wood to wood joints, and other joints not indicated to be sealed with another type of sealant.

4. Silicone Rubber Sealants: Provide one part, silicone rubber based elastomeric sealant, complying with ASTM C 920 Type S, Class 25, Grade NS and Fed. Spec. TT-S-001543A Class A.
 - a. Provide one of the following products or approved equal:
 - 1) Dow 786.
 - 2) General Electric 1702 Sanitary.
 - 3) Pecora 863.
 - 4) Rhodorsil 6b White.
 - 5) Sonneborn OmniPlus.
 - 6) Tremco Proglaze.

- b. Extent: Provide silicone rubber sealant for interior joints around plumbing fixtures and tile to tile joints in ceramic tile work.
5. Acrylic Latex Sealants: Provide permanently flexible, latex rubber modified acrylic emulsion sealant, complying with ASTM C 834.
- a. Provide one of following products or approved equal:
 - 1) Pecora AC-20
 - 2) Tremco Acrylic Latex 834
 - 3) Sonneborn Sonolac
 - b. Extent: Provide acrylic latex sealant for use at mirrors, for exposed acoustical sealant, and for interior joints except where silicone rubber sealant is indicated.
6. Miscellaneous Sealant Materials: Provide as follows:
- a. Primer: Provide primer recommended by sealant manufacturer for surfaces to be adhered to.
 - b. Bond Breaker Tape: Provide polyethylene or other plastic tape recommended by sealant manufacturer to prevent three-sided adhesion.
 - c. Sealant Back-Up Rod: Closed-cell, non-gassing, polyethylene rod "Ethafom" by Dow Chemical Co. or approved equal. The diameter of the rod shall be approximately 25 percent in excess of joint width. Surface skin of rod shall be continuous and unbroken and of sufficient thickness to preclude outgassing and formation of voids in the overlying sealant.
 - d. Foamed-In-Place Sealant: Provide two-component polyurethane foam, UL Fire Hazard Classification Class I, consisting of polymeric isocyanurate and polyether polyol components, pressurized with nitrogen, and dispensed from portable, self-contained insulation frothing kit, equal to "Froth-Pak" by Insta-Foam, or equal as approved by Designer.

-END OF SECTION-

SECTION 081100 - STEEL DOORS AND FRAMES

1. Work Included: Provide steel doors and frames and related items as indicated on Drawings and as specified herein. Include, but do not limit to, the following:
 - a. Interior and exterior flush doors.
 - b. Interior and exterior steel frames.
 - c. Door louvers.
2. Fire Doors and Frames: For doors and frames installed in fire-rated assemblies and where indicated or required by authorities having jurisdiction, provide door and frame assemblies that comply with NFPA 80, and which have been tested, listed and labeled in compliance with ASTM E 152 by an independent agency acceptable to authorities having jurisdiction.
 - a. Temperature Rise Rating: Labeled fire doors within an interior exitway stairway shall have a label indicating a maximum transmitted temperature end point of not more than 450°F. above ambient at the end of 30 minutes of standard fire test exposure.
3. Hot Rolled Steel: ASTM A 568 and ASTM A 569, commercial quality, pickled and oiled.
4. Cold Rolled Steel: ASTM A 366 and ASTM 568, commercial quality carbon steel.
5. Galvanized Sheet Steel: Roller leveled commercial quality zinc coated carbon steel sheets complying with ASTM A 525, G60, mill phosphatized.
6. Exterior Work: Fabricate exterior doors and frames from galvanized sheet steel with closed tops and bottoms.
7. Faces: Fabricate exposed faces from stretcher leveled cold rolled steel.
8. Interior Doors (Non-Rated): SDI-100, Grade II, Heavy Duty, 16 gage minimum face sheets, Model 3 or 4, seamless construction.
9. Interior Doors (Fire-Rated): SDI-100, Grade II, Heavy Duty, 16 gage minimum face sheets, Model 4, with seamless mineral fiberboard composite construction.
10. Exterior Doors: SDI-100, Grade III, Extra Heavy Duty, 14 gage minimum face sheets, seamless, Model 4, maximum U-factor of 0.24 BTU/HR/FT²/°F, ASTM C 236. Frames shall be demountable at service entries.

-END OF SECTION-

SECTION 081416 - WOOD DOORS

1. Work Included: The work of this section includes, but is not limited to, the following:
 - a. Flush Wood Doors: Solid core flush wood doors with veneer faces.
 - b. Stile and Rail Wood Doors: Solid stile and rail wood doors wood panels.
 - c. Prefitting and premachining of wood doors.
2. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
3. Solid Core Wood Doors, General: AWI PC-5 construction as specified in AWI Quality Standards Section 1300-G-3. Core, stiles, and rails shall be glued together before sanding. Wood for stiles and rails shall be thoroughly seasoned, kiln-dried stock with 5% to 8% moisture content. Exposed wood door edges of stiles and rails for doors to receive transparent finish shall be same species and cut of wood to match face veneers.
 - a. Core for non-fire-rated doors shall be lumber staves, edge-glued, kiln-dried softwood lumber of single species, with horizontal joints staggered in contiguous rows.
 - b. Core for fire-rated doors shall be manufacturer's standard mineral core conforming to ANSI A208.1, Algoma Weldrok core, or approved equal.
 - c. Crossbands shall be 1/16 in. thick hardwood, full width of door, with grain at right angle to face veneer grain.
 - d. Veneers for transparent finishes shall be Premium Grade Select Quarter-Sawn FSC-Certified White Maple, at least 1/50 in. thick, adhered to 1/16 in. hardwood crossband, core, rails, and stiles by hot press method. Provide veneers book matched, balance matched, and pair matched.
4. Mineral Core Flush Wood Fire-Rated Doors: Flush wood-faced mineral core doors, 1-3/4 in. thick, five-ply, with crossbanding and face veneers bonded to both faces, of fire-rated construction, equal to Superstile Edge Architectural Wood Composite Fire Door manufactured by Algoma Hardwoods, Inc. or approved equal doors by above listed manufacturers. Provide blocking for hardware so that screws fasten into hardwood for entire length. Furnish UL Label of indicated Class and Hour rating affixed to hinge jamb of each door.
5. Solid Core Flush Interior Wood Doors: Flush type, Algoma Grade Novodor of five-ply construction with crossband and veneers bonded to both faces. Doors shall be 1-3/4 in. thick.
6. Solid Stile and Rail Interior Wood Doors: Interior doors complying with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," fabricated from FSC-Certified White Maple.
7. Factory Finishing of Wood Doors: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - a. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
 - b. Finish doors at factory.
 - c. Transparent Finish:
 - 1) Grade: Premium.

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- 2) Finish: AWI catalyzed polyurethane system.
- 3) Staining: As required to match Architectural Woodwork.
- 4) Effect: Filled finish.
- 5) Sheen: Satin.

-END OF SECTION-

SECTION 083113 - ACCESS DOORS AND FRAMES

1. Description of Work: Furnish access doors and access panels for installation under work of other Sections as indicated on Drawings and as specified.
2. Access Doors and Panels: Furnish metal access doors and panels for access to valves, damper controls, pipes, conduits, switches, regulators, etc., to the proper trades for building into the work, except that any access panels specifically specified under the Mechanical or Electrical Sections of the Specifications to be furnished by those trades are excluded from the work of this Section.
3. Furnish flush-type access doors, 18 ga. minimum thickness specially designed for each type of wall and ceiling finish and construction with which used, with factory-applied prime finish, as manufactured by Karp Associates, Inc., Birmingham Ornamental Iron Co., Miami-Carey, Babcock-Davis, or equal approved by Architect. Refer to Architectural, Mechanical, and Electrical Drawings for locations, sizes, and materials with which used.
 - a. Where installed at fire-rated walls or ceilings access panels shall be of fire-resistive construction and shall bear the U.L. 2-hr. label.
 - b. Where installed in surfaces finished with ceramic tile, access panels shall be stainless steel with No. 4 finish.
 - c. Where installed in drywall construction, access panel frames shall be flush edge-frame type, designed for drywall insert.
 - d. Access panels shall have concealed hinges.

-END OF SECTION-

SECTION 083340 - OVERHEAD COILING GRILLES

1. Work Included: Work of this Section consists of furnishing all labor, materials, equipment, and services necessary to complete the work indicated, and without limiting the generality thereof includes:
 - a. Electrically operated overhead coiling grilles.
 - b. Hand operated horizontal "curtain type" grilles
2. Overhead coiling grilles shall be linked-rod type, up-rolling, manufactured by Atlas Door Corp., Edison, NJ 08818, equivalent products of Kinneer Walter Balfour and Co., Inc., Cookson Co., or Cornell Iron Works, Inc., or approved equal.
3. Grille Curtain: Grille curtains shall be straight-linked rectangular design, constructed of horizontal aluminum rods not less than 5/16 in. diameter, continuous from jamb to jamb and spaced not more than 2 in. on center. Rods shall be held in position by aluminum links in rectangular grid pattern, spaced not more than 9 in. on center. The ends of each horizontal rod shall be secured to an end link to lock the curtain in the guides. Bottom of curtain shall be equipped with aluminum angle or tube rail.
4. Guides: Guides shall be formed of aluminum and shall be provided with wood or vinyl pipe stripping on both sides to reduce noise and friction.
5. Electrical Operation: Equip coiling grilles with manufacturer's standard electrical operator specially designed for size, type, and operation of coiling grille, operating from 208 V, 3 phase, 60 HZ power sources as indicated on Drawings. Locate operator to clear obstructions. Operator shall be UL listed. Equip each operator with remote control switch to be installed and connected under Division 26, ELECTRICAL at locations indicated on Drawings. Provide key operated controls for each grille. Keying shall be as directed by Owner.

END OF SECTION

SECTION 084113 - ALUMINUM ENTRANCES AND STOREFRONTS

1. Work Included: Provide aluminum entrances and storefront work as indicated on the Drawings and as specified herein, including, but not limited to the following:
 - a. Storefront framing systems.
 - b. Entrance and vestibule doors.
2. Manufacturers: Provide storefronts and entrance systems of one of the following manufacturers that meet or exceed requirements of these specifications:
 - a. EFCO
 - b. Kawneer Company, Inc.
 - c. Tubelite Div., Indal Inc.
 - d. United States Aluminum Corp.
3. Aluminum Members: Provide 6063-T5 alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish. Comply with ASTM B 221 for extrusions, and ASTM B 209 for sheet/plate. Provide 0.125 in. thick extrusions for door stiles and storefront framing. Provide 0.050 in. thick aluminum for glazing moldings.
4. Storefront Type: Storefront framing shall be Tri-Fab Series 451T, manufactured by Kawneer, or equal by Tubelite Div., Indal Inc.; EFCO; or approved equal.
 - a. Thermal-Break Construction: Fabricate aluminum storefront framing system with integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact. Provide manufacturer's standard construction which has been in use for similar projects for at least three years.
 - b. Framing shall be field glazed with 1 in. float glass or tempered glass (where required by law). Glass and glazing is specified as work of Section 088000, GLAZING.
5. Entrance and Vestibule Doors: Aluminum doors shall be TuffLine Series 350 Medium Stile factory-glazed aluminum doors, manufactured by Kawneer Company, Inc., or approved equal.
 - a. Aluminum doors shall be stile and rail type swing doors. Aluminum shall be extruded aluminum conforming to ASTM B 221, 0.1875 in. thick for door stiles and 0.050 in. thick for glazing molding.
 - b. Sections shall be of sizes and profiles indicated; shall present straight, sharply defined lines and arrises; and shall be free from defects impairing strength, durability, and appearance.
 - c. Corners shall be Dual-Moment welded.
 - d. Each door shall be factory glazed with 1/4 in. thick, clear tempered glass at interior vestibule doors, and 1 in. thick insulating glass at exterior doors set in neoprene glazing gasket. Glass shall conform to requirements of Section 088000, GLAZING.

6. Aluminum Finish: Fluoropolymer Two-Coat System; Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight; complying with AAMA 605.2.
 - a. Color: Provide standard color, selected by Architect.

-END OF SECTION-

SECTION 085113 - ALUMINUM WINDOWS

1. Description of Work: Furnish and install aluminum window systems, as indicated on Drawings and as specified herein. Types of aluminum windows include, but are not limited to:
 - a. Fixed windows.
 - b. Operable awning units.
 - c. Operable awning units.
2. Acceptable Manufacturers: Provide windows of one of the following manufacturers that meet or exceed specified requirements:
 - a. Oldcastle Building Envelope;
 - b. EFCO
 - c. Kawneer.
3. General: Provide High Performance, Heavy Commercial (HC) windows complying with all specified performance requirements.
4. Types: Provide the types as indicated on the Drawings.
5. Aluminum Extrusions: Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application indicated, but not less than 22,000,000 psi ultimate strength and not less than 0.125 in. thickness at any locations.
6. Fasteners: Comply with referenced standards. Provide non-magnetic stainless steel fasteners. Provide concealed fasteners to the greatest extent possible. Provide Phillips flathead screws for exposed fasteners.
7. Weatherstripping: For awning windows, provide manufacturer's standard compressible stripping of molded EPDM or neoprene.
8. Screens: Provide manufacturer's standard 18 x 16 stainless steel wire, 0.009 in. diameter mesh.
9. Low 'E' Coated Insulated Glass: Provide high-performance, clear, metallic coating, "Solarscreen VE1-2M" as manufactured by Viracon, or approved equal. Provide Low 'E' coating which has the following performance characteristics when applied to the No. 2 surface of 1 in. insulating units, exterior lite 1/4 in. clear, interior lite 1/4 in. clear:
 - a. Visible Light Transmittance: 70%.
 - b. Shading Coefficient: 0.44.
 - c. Center of Glass U-Factor: 0.29 (winter); 0.26 (summer).

10. Aluminum Finish: Fluoropolymer Two-Coat System; Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight; complying with AAMA 605.2.
 - a. Color: Provide standard color, selected by Architect.

END OF SECTION

SECTION 086200 - METAL FRAMED SKYLIGHTS

1. Work Included: Provide glazed aluminum-framed skylight work as indicated on Drawings and as specified. Include, but do not limit to:
 - a. Design and engineering of complete skylight systems.
 - b. Factory finishing of exposed aluminum members.
 - c. Flashing and counterflashing of skylight system.
 - d. Components and accessories required to complete framing for the skylight system.

2. Acceptable Manufacturers: Provide products of one of the following manufacturers that meet or exceed specified requirements:
 - a. Bohem Skylights, Inc.
 - b. EPI Architectural Systems, Inc.
 - c. Fisher Skylights, Inc.
 - d. Super Sky Products, Inc.
 - e. Wasco Products, Inc.

3. Skylight framing sections shall be extruded aluminum conforming to ASTM B 221, 6063-T5 alloy and temper. Brake-metal work shall be sheet aluminum. Alloys and tempers of aluminum shall be as recommended by manufacturer for strength, corrosion resistance, and specified finish, but of not less than 27,000 psi ultimate tensile strength and not less than 0.109 in. (framing members) and 0.094 in. (interior and exterior caps) thickness at any location for extrusions and not less than 0.062 in. thick for sheet metal.

4. Glazing Gaskets: Shall be extruded neoprene glazing with Shore A Hardness of 45 to 55 durometer.

5. Clear Tempered Glass: ASTM C1048, Condition A-Uncoated, Type I-Transparent, Flat, Class 1-Clear, Quality q3, Kind FT.

6. Sloped Insulating Glass: Provide factory assembled units of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space, complying with ASTM E 774, and as follows:
 - a. Sealing System: Dual Seal.
 - b. Primary Sealant: Polyisobutylene.
 - c. Secondary Sealant: Silicone, General Electric ISG 3204 or ISG 3100, Rhodorsil Rhodotherm 542 Or 543, or Dow Corning 982.
 - d. Spacer: Clear finish aluminum with welded, soldered, or bent corners.
 - e. Dessicant: Molecular sieve, or silica gel, or blend of both.
 - f. Air Space: 1/2 in.
 - g. Outer Pane: Clear Tempered Glass, with Low 'E' coating on #2 surface.
 - h. Inner Pane: Translucent Laminated Safety Glass.

7. Aluminum Finish: Fluoropolymer Two-Coat System; Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight; complying with AAMA 605.2.
 - a. Color: Provide standard color, selected by Architect.

END OF SECTION

SECTION 087100 - HARDWARE

1. Work Included: Provide Finish Hardware to provide correct functions for intended use. Provide related items and services as indicated on the Drawings and as specified. Furnish hardware schedules and templates as required for fabrication of doors and frames under other Sections. Provide hardware that complies with applicable codes and requirements of authorities which have jurisdiction.
2. QUALITY ASSURANCE
 - a. Hardware for Fire-Rated Openings: NFPA 80, and local requirements.
 - b. Handicapped Accessibility: ANSI A117.1, and local requirements.
 - c. Materials and Application: ANSI A156 series standards
3. PRODUCTS
 - a. Door Hardware:
 - 1) Quality Level: Commercial type.
 - 2) Locksets and Latchsets: Mortise type.
 - 3) Lock Cylinders: Interchangeable type.
 - 4) Keying: Owner's requirements keying and key control system.
 - 5) Hinges and Butts: Full-mortise type with nonremovable pins at exterior doors.
 - 6) Closers, Door Control: Barrier-free type; concealed in public areas.
 - 7) Pivots: Offset or center-hung type.
 - 8) Push/Pull Units: Through-bolted type.
 - 9) Hardware Finishes: US 32D satin stainless steel on exposed surfaces.
 - 10) Electromagnetic locks and power supply coordinated with security system.
 - 11) Exit Devices: Concealed vertical rod, typical.
 - b. Auxiliary Materials:
 - 1) Door Trim Units: Kickplates, edge trim, viewers, and related trim.
 - 2) Stops and overhead door holders.
 - 3) Door Silencers.
 - 4) Soundstripping.
 - 5) Weatherstripping and thresholds.
 - 6) Electromagnetic hold-open devices.
 - 7) Card-operated opening devices, including all entrance doors.
 - c. Power Door Operators: Door operators for power-assisted doors.
 - 1) Power Units: Two-way swing door type.
 - 2) Operator: Electromechanical operator.
 - 3) Automatic Door Control: Infrared motion detector automatic controls.
 - 4) Manual Door Control: Rail-supported switch.
 - 5) Wall push-plate switch.

END OF SECTION

SECTION 088000 - GLAZING

1. Work Included: The scope of work, includes interior glass and glazing work and exterior glass at entrances and storefronts, and includes:
 - a. Interior glass for doors, sidelights, borrowed lights, etc.
 - b. Exterior glass for aluminum entrances and storefronts.
 - c. Mirrors.
 - d. Note: Glass and glazing for skylights is specified in Section 086200, METAL FRAMED SKYLIGHTS; glass and glazing for aluminum windows are specified under Section 085113, ALUMINUM WINDOWS.
2. Clear Float Glass: ASTM C 1036 ,Type I-Transparent, Flat, Class 1-Clear, Quality q3.
3. Clear Heat Strengthened Glass: ASTM C 1048, Condition A-Uncoated, Type I-Transparent, Flat, Class 1-Clear, Quality q3, Kind HS.
4. Clear Tempered Glass: ASTM C1048, Condition A-Uncoated, Type I-Transparent, Flat, Class 1-Clear, Quality q3, Kind FT.
5. Low 'E' Coated Insulated Glass: Provide high-performance, clear, metallic coating, "Solarscreen VE1-2M" as manufactured by Viracon, or approved equal. Provide Low 'E' coating which has the following performance characteristics when applied to the No. 2 surface of 1 in. insulating units, exterior lite 1/4 in. clear, interior lite 1/4 in. clear:
 - a. Visible Light Transmittance: 70%.
 - b. Shading Coefficient: 0.44.
 - c. Center of Glass U-Factor: 0.29 (winter); 0.26 (summer).
6. Vertical Insulating Glass: Provide factory assembled units of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space, complying with ASTM E 774, and as follows:
 - a. Sealing System: Dual Seal.
 - b. Primary Sealant: Polyisobutylene.
 - c. Secondary Sealant: Silicone, General Electric IGS 3204 or IGS 3100, Rhodorsil Rhodotherm 542 or 543, or Dow Corning 982.
 - d. Spacer: Clear finish aluminum with welded, soldered, or bent corners.
 - e. Desiccant: Molecular sieve, silica gel, or blend of both.
 - f. Air Space Thickness: 1/2 in.
 - g. Outer Lite: Refer to Glazing Schedule at end of this Section.
 - h. Inner Lite: Refer to Glazing Schedule at end of this Section.
7. Mirrors: 1/4 in., Quality q2, clear float glass with silver, copper, and organic coating, and as follows:
 - a. Edges: Uniformly ground and polished.
8. General Glazing Sealant: Provide sealant with maximum Shore A hardness of 50. Provide one of the following:

- a. Dow Corning 795.
 - b. General Electric Silglaze N 2500 or Contractors SCS-1000.
 - c. Rhodorsil 3B, 5C, or 6B.
 - d. Tremco Proglaze.
9. Weather Seal Sealant: Provide non-acid curing sealant with movement range \pm 50%, ASTM C 719. Provide one of the following:
- a. Dow Corning 795.
 - b. General Electric Silpruf.
 - c. Rhodorsil 3B, 5C, or 6B.
 - d. Tremco Spectrum 2.
10. Structural Sealant: Provide one of the following structural sealants recommended by manufacturer for structural glazing applications.
- a. Dow Corning 795 or 983.
 - b. General Electric Ultraglaze SSG 4000 or SSG 4200.
 - c. Tremco Proglaze II.
11. Mirror Adhesive: Palmer's Mirro-Mastic.
12. Glass Schedule: Provide following glass types.
- a. Type 1: Storefront Glazing, 1 in. thick insulating units comprised of two 1/4 in. glass lites within 1/2 in. air space, high performance low-e coating on #2 surface.
 - b. Type 2: 1/4 in. clear annealed glass.
 - c. Type 3: 1/4 in. clear tempered glass.
 - d. Type 4: 1/4 in. mirror glass.

-END OF SECTION-

SECTION 089000 - METAL WALL LOUVERS

1. Work Included: Furnish and install metal wall louvers, as indicated on Drawings and as specified herein.
2. Metal wall louvers shall be the products of one of the following manufacturers, or approved equal:
 - a. Construction Specialties Inc., Cranford, NJ 07016.
 - b. Airolite Company, Marietta, OH, 45750.
 - c. Industrial Louvers, Inc., Delano, MN 55328.
3. Aluminum Extrusions:
 - a. ASTM B 221, alloy 6063-T52.
 - b. Minimum Thickness: 0.081 in.
4. Fabrication: Unless otherwise indicated, exterior stormproof louvers shall be 4 in. deep, continuous blade, drainable type, with 40% minimum free air area and channel frame as indicated.
5. Construction:
 - a. Assemble louvers by heli-arc welding.
 - b. Arrange louvers in full height and width panels without exposed vertical mullions.
 - c. Heads, sills, and jambs shall be one piece structural members.
 - d. Manufacturer shall provide all necessary structural supports and bracing to carry wind load of not less than 20 psf.
6. Screens: Provide louvers with 1/2 in. mesh, 0.063 in. diameter aluminum wire intercrimp bird screens secured in removable extruded aluminum frames.
7. Aluminum Finish: Fluoropolymer Two-Coat System; Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight; complying with AAMA 605.2.
 - a. Color: Provide standard color, selected by Architect.

-END OF SECTION-

SECTION 092900 - GYPSUM BOARD ASSEMBLIES

1. Work Included: Furnish and install gypsum drywall work, as indicated on the Drawings and as specified. Include, but do not limit to:
 - a. Steel suspension systems for ceilings and soffits.
 - b. Screwable steel stud interior partition framing.
 - c. Screwable steel stud framed and furred enclosures at columns and beams.
 - d. Blockings and attachments for fixture supports.
 - e. Gypsum wallboard finishes.
 - f. Concealed acoustical sealant work, and acoustical insulation of gypsum wallboard finishes at steel stud framed partitions and furrings where indicated.
 - g. Installation of access doors.
 - h. Other gypsum drywall work called for on the Drawings or reasonably required to complete the Project intent.

2. Metal Ceiling Suspension System Components: Provide components that conform to ASTM C 754 for materials and sizes, unless indicated otherwise. Provide all metal runners, hangers, studs, and channels hot-dip galvanized conforming to ASTM A 525, G60, unless noted otherwise.
 - a. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, 12 gauge minimum.
 - b. Hanger Rods: Where required for loading or by local authorities, provide mild-steel rods, sized as required, hot-dip galvanized.
 - c. Flat Hangers: Where required for loading or by local authorities, provide mild-steel flat hangers, sized as required, hot-dip galvanized.
 - d. Channels: Provide cold-rolled steel channels, minimum 16 gauge with 7/16 in. wide flanges, protected with corrosion-resistant coating, and as follows:
 - 1) Carrying Channels: 1-1/2 in. deep, 475 lb. per 1,000 lin. ft., hot-dip galvanized.
 - 2) Furring Channels: 25 ga. hot-dip galvanized, screwable, pressed steel furring channels, 7/8 in. thick, hat section.
 - 3) Steel Studs for Furring Channels: ASTM C 645, minimum 25 gage, hot-dip galvanized, with flange edges bent back 90 degrees and doubled over to form minimum 3/16 in. lip, depth as indicated.
 - 4) Resilient Channels for Mounting at Emergency Generator Room Ceiling: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical.
 - 5) Clips for attachment of steel furring channels to steel carrying channels shall be proprietary clips as recommended by manufacturer.

3. Ceiling Suspension System: Provide a complete, mechanical suspension system conforming to ASTM C 645, consisting of cold-rolled steel channel main runners, screwable steel furring channels hangers and anchors and all required clips and other components, required for complete installation.

4. Steel Stud Wall Framing Systems: Unless otherwise indicated, steel stud system for walls and partitions shall be a complete proprietary framing system consisting of prefabricated, non-load bearing, screwable 20 ga. and 25 ga. steel studs, steel track, anchors, and related items, conforming to ASTM C 645. Provide all metal runners, hangers, studs, and channels hot-dip galvanized conforming to ASTM A 525, G60, unless noted otherwise..

- a. Special system at gypsum shaft-wall construction shall be as above, except with "C-H" Type galvanized steel studs, or equivalent.
 - b. Provide minimum 20 gage steel studs at jambs of door and fixed glass frames, at open partition ends, and where the partition is to receive wall-mounted shelves, heavy fixtures, etc.
5. Gypsum Wallboard: Indicated thickness(es) by 48 in. width by lengths as required, tapered edge, paper finish, conforming to ASTM C 36. Where used in fire-rated assemblies, provide Type X fire resistant type.
 6. Water Resistant Gypsum Backer Board: Provide water resistant type gypsum backing board conforming to ASTM C 630 at locations indicated.
 7. Impact-Resistant Drywall: Where indicated, interior gypsum board partitions in public areas shall be 5/8 in. thick, tapered edge, Gold Bond Fire-Shield Type X Hi-Impact 3000 Wallboard, as manufactured by National Gypsum Co.; or equal by US Gypsum; Domtar Gypsum; or approved equal.
 8. Gypsum Shaft Wall Liner: 1 in. thick solid gypsum core, in multilayered, moisture-resistant green paper, 24 in. wide by lengths as required to eliminate end joints.
 9. Preformed Reveals: Preformed reveals and corners for gypsum wallboard partitions shall be equal to Softforms Commercial Grade Standard Extrusions, manufactured by Softforms Division, Pittcon Industries, Inc., or approved equal. Shapes shall be extruded 6063-T5 aluminum alloy 1/8 in. thick, minimum (profile areas). Shapes shall be primed; plaster and paints shall be capable of bonding to primed surface. Fire rating shall be Class A. Provide all required shapes and radii indicated or required to complete the work.
 10. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - a. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - b. Level 2: Panels that are substrate for tile.
 - c. Level 5: At all wall and ceiling surfaces that will be exposed to view unless otherwise indicated.

-END OF SECTION-

SECTION 093000 - TILING

1. Work Included: The scope of work, without limiting the generality thereof, consists of furnishing all labor, materials, plant, transportation, equipment, accessories, appurtenances, and services necessary and/or incidental to the proper completion of all tile work shown on the Drawings, described in the Specifications, or as reasonably inferred from either, in the opinion of the Architect, as being required, and includes:
 - A. Work of this Section includes but is not limited to:
 1. Floor quarry tile.
 2. Porcelain floor tile.
 3. Ceramic wall tile.
 4. Base tile.
 5. Marble thresholds
2. Tile for Thin-Set Installation:
 - a. Porcelain floor tile.
 - b. Ceramic wall tile.
 - c. Base tile.
3. QUALITY ASSURANCE
 - a. Mockups for each form of construction.
 - b. Tile Installation: ANSI 108 Series Standard Specifications and Tile Council of America, handbook for ceramic tile installation.
 - c. Tile Materials: ANSI 118 series Standard Specifications.
4. MATERIALS
 - a. Mortar: Latex-Portland cement for thin-set tile installation.
 - b. Grout: Latex-Portland cement, color as selected by Architect.
5. TILE MATERIALS
 - A. Quarry Tile: 6 in. by 6 in. by 1/2 in. thick, unglazed, natural clay quarry tile, edge ground for exact and consistent face size, with ribbed or other bonding features on back, and with non-slip abrasive grit applied to face, equal to American-Olean "Murray", Midstate Tile Co. "Quarry Tile", Summitville "Quarry Tile", or equal. Color shall be as selected by Architect.
 1. Provide matching 6 in. by 6 in. coved sanitary base with rounded or square tops as indicated.

- B. Floor Tile: 1 in. Penny-Round ceramic floor tile, equal to "Complete Tile Collection" by Penny Rounds; or approved equal as manufactured by DalTile; American-Olean, Summitville, or equal. Colors shall be as follows:
1. Color: Art White, matte.
- C. Ceramic Wall Tile: 4-1/4 in. by 12-3/4 in., ceramic wall tile, equal to DalTile "Modern Dimensions"; or approved equal as manufactured by American-Olean, Summitville, or equal. Color shall equal to DalTile "Matte Arctic White" 0790.
1. Provide bullnose trim pieces at all exposed edges and corners.
 2. Flat-Top Cove Base: 4-1/4 in. x 8-1/2 in. to match wall tile color.
- D. Ceramic Accent Tile: 1 in. Penny-Round ceramic wall accent tile, equal to "Complete Tile Collection" by Penny Rounds; or approved equal as manufactured by DalTile; American-Olean, Summitville, or equal. Colors shall be as follows:
1. CT-A1: Color 1 (Art White, gloss).
 2. CT-A2: Color 2 (Iron Azul, gloss).
 3. CT-A3: Color 3 (Rojo Coral, gloss).
 4. CT-A4: Color 4 (Amarillo).
6. Tile Installation Methods: Install and grout tile in accordance with the provisions of the standard specification and published details hereinbefore listed, generally as follows, in accordance with TCA "Recommended Uses":
- a. Floor Tile, Thinset: Latex-Portland Cement Mortar, TCA Method F113, with Latex-Portland Cement Grout.
 - b. Ceramic Wall Base: Latex-Portland Cement Mortar, Applied to Cementitious Tile Backerboard, TCA Method W244, with Latex-Portland Cement Grout.

-END OF SECTION-

SECTION 095113

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide suspended acoustical ceilings as indicated on Drawings and as specified. Work of this Section includes, but is not limited to:

1. Acoustical panel lay-in ceiling with exposed suspension system.

1.02 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build minimum 10 ft. x 10 ft. mockup of each typical ceiling area.

1.03 EXTRA MATERIAL

- A. Provide packaged, wrapped and labeled maintenance stock equal to 2% of the actual quantity installed for the following items of work:

1. Each type of ceiling tile and panel.
2. Each type of suspension system component.

PART 2 PRODUCTS

2.00 SUSTAINABILITY CHARACTERISTICS

- A. Minimum Recycled Content defined in Section 018113 "Sustainable Design Requirements".

1. Steel Products: 25%.
2. Acoustical Ceiling Panel Products: 35%

- B. Regional Content defined in Section 018113 "Sustainable Design Requirements". Report Regional Content only. No minimum requirement.

- C. VOC content limitations defined in Section 018123 "Volatile Organic Compound Limits".

2.01 SUSPENSION SYSTEM

- A. Provide products of one of the following manufacturers that meet or exceed requirements specified, or equal:

1. Chicago Metallic Corporation
 2. Donn Corporation
 3. Armstrong World Industries.
 4. National Rolling Mills
 5. Technical Ceiling Systems
- B. Narrow Exposed Suspension System: Provide manufacturers narrow exposed "Tee", commercial quality cold-rolled, electro-galvanized steel grid system, equal to Armstrong 9/16 in. Suprafine XL, complying with ASTM C 635 for "Intermediate-Duty System". Provide grid modules to match ceiling panel sizes. Provide manufacturer's standard white baked enamel finish on steel exposed surfaces.

2.03 ACOUSTICAL PANELS AND TILES

- A. Provide ceiling panel and tile products of one of the following manufacturers that meet or exceed requirements specified:
1. Armstrong World Industries, Inc.
 2. Celotex Corporation.
 3. United States Gypsum Co.
 4. CertainTeed
- B. Interior Ceiling Panels, Basis-Of-Design: Provide as follows, or approved equal:
1. Typical ACT Ceiling: Provide ACT plank system in varying sizes as shown on Drawings, equal to Armstrong World Industries "Health Zone Optima" 24 in. x 24 in. (#3216); 24 in. x 48 in. (#3217); or equal products by Celotex; United States Gypsum "Mars ClimaPlus HRC; or CertainTeed "Symphony M. System shall be designed to interface with a 9/16 in. Suprafine XL grid.
 2. Band and Chorus Rooms: Basis of Design USG Geometrix
 3. Practice Rooms: Basis of design Armstrong Ultima

END OF SECTION

SECTION 096446 - WOOD SPORTS-FLOOR ASSEMBLIES

1. Scope: Work of this Section includes, but is not limited to:
 - a. Gymnasium strip flooring system.
 - b. Field finishing of work of this Section.

2. Wood Flooring (Gymnasiums): Wood Flooring System shall be one of the following:
 - a. "Rezill Channel" system, manufactured by Connor AGA, Amasa, MI 49903;
 - b. "Bio-Channel" system as manufactured by Robbins Sports Surfaces, Cincinnati, OH, 45226;
 - c. "AcerChannel" system as manufactured by Acer Flooring, LLC, Peshtigo, WI 54157.
 - 1) Flooring system shall be tested and evaluated for Athletic Performance according to the International Standard DIN 18032, Part 2.

3. Wood Flooring Treatment And Finishing Materials: Provide as follows:
 - a. Treatment: Treat all flooring with MFMA tested and listed wood preservative. Stamp each bundle with official treating plant certificate and number.
 - b. Finish Materials: Provide Robbins Miracle Oil modified polyurethane sealer and finish, or Architect approved equal. Provide game-line paints as recommended by finishing materials manufacturer to be compatible with finish.
 - 1) Provide game lines and solid painted areas in layouts indicated, or if not indicated, as recommended by MFMA Ref. 3.
 - 2) Game Line and Solid Painted Area Colors: Provide game lines and solid painted areas in colors selected by Architect. Five different colors will be selected. Match Architect's color chip for each color selected.

END OF SECTION

SECTION 096500

RESILIENT FLOOR TILE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide resilient flooring and related items, as indicated on the Drawings and as specified herein. Work of this Section includes, but is not limited to:

1. Vinyl composition tile flooring.
2. Mastics and leveling compounds.

1.02 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):

D 570 Test Method for Water Absorption of Plastics

D 638 Test Method for Tensile Properties of Plastics

D 2047 Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces

E 84 Surface Burning Characteristics of Building Materials

2. Federal Specifications (Fed. Spec.):

SS-T-312B Tile, Floor, Asphalt, Rubber Vinyl, and Vinyl Composition

SS-W-40 Wall Base; Rubber and Vinyl Plastic.

1.03 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every type, color, and pattern of floor tile installed.

PART 2 PRODUCTS

2.01 VINYL COMPOSITION FLOORING

- A. Acceptable Manufacturers: Provide products of one of the following manufacturers that meet or exceed specified requirements:
1. Armstrong World Industries, Inc.
 2. Tarkett .
 3. Johnsonite.
- B. Basis-Of-Design Vinyl Composition Tile Type: 1/8 in. thick, 18 in. by 18 in. "Excelon Stonetex" Series, manufactured by Armstrong World Industries, Inc. or approved equal manufactured by Johnsonite or Tarkett. Tile shall meet or exceed Fed. Spec. SS-T-312B, Type IV.
1. Colors: Provide colors as follows to create patterns:
 1. VCT1 = Limestone Beige 52139
 2. VCT2 = Chamotte 52172
 3. VCT3 = Spanish Moss 52180
 4. VCT4 = Hermit Shale 52186
 5. VCT5 = Golden Bamboo 52170
 2. Layout: Layout of tile shall be running bond.

2.02 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealant applications
 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Floor Polish: Provide protective liquid acrylic floor polish products as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

3.03 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.

3.04 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply three coats.
- C. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 096513 - RESILIENT BASE

1. Work Included: Work includes the following:
 - a. Rubber base.
2. Rubber Base: Smooth-surface, toeless carpet type at carpeted floors and set-on cove type at other floor conditions, as indicated, 0.125 in. thick, 4 in. high, with rounded tops. Include preformed internal and external corners. Base of toe of cove type base shall conform to floor variations of 1/8 in.
3. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - a. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1) Floor Adhesives: Not more than 60 g/L.

-END OF SECTION-

SECTION 097112

CEMENTITIOUS WOOD FIBER WALL PANELS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide cementitious wood fiber wall panels as indicated on Drawings and as specified.

PART 2 PRODUCTS

2.01 ACOUSTICAL PANEL SYSTEM

- A. System: For purposes of establishing a standard of quality and not for the purposes of limiting competition, the basis of the specification is Tectum Standard Interior Wall Panels, as manufactured by Tectum, Inc., or equal, and as follows:
 - 1. Material: Aspen wood fibers bonded with inorganic hydraulic cement.
 - 2. Thickness: 1 in.
 - 3. Widths: 3 standard widths; to be field cut and beveled where other than standard widths apply (corners). Match patterns indicated on Drawings.
 - 4. Lengths: Varies, as indicated on Drawings.
 - 5. Edge Condition: Beveled design, square ends.
 - 6. Color: Factory painted white.
- B. Mounting Style: 'A'; provide all fasteners.

END OF SECTION

Section 09 72 33
DRY-ERASE WALL COVERING

PART 1 – GENERAL

1.1 SUMMARY

- A. The work of this Section consists of dry-erase wall coverings where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following scope.
- B. Furnish and install the following:
 - 1. Dry-erase surface.
 - 2. Accessories.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
 - 1. Koroseal Interior Products, Fairlawn, OH.
 - 2. OptiMA, Inc., Shrewsbury, MA.
 - 3. Smarter Surfaces, Dublin, Ireland.

2.2 MAGNETIC/PROJECTABLE DRY ERASE WRITING SURFACE

- A. Basis of Design: Basis of Design: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Koroseal Interior Products, Fairlawn, OH, "Walltalkers" series, product: "Projectable Mag-rite", model "M2PR," of sizes indicated on Drawings.
 - 1. Description: Dry erase writing surface, having scrim backing, impregnated with ferrous powder, pigmented vinyl capped with dry erase film.
 - 2. Characteristics:
 - a. Conforming to ASTM E-84, Class A Flammability Testing.
 - b. Roll width: 47/48 inches (1.19/1.22m) width.
 - c. Fabric: Woven Polyester
 - d. Laminate thickness: 24 mils.
 - e. Tensile strength, (warp x fill): 80 by 80 pounds.
 - f. Surface: Matte finish.
 - g. Colors: As selected by the Architect from manufacturer's full range of options.

2.3 ACCESSORIES

- A. Trim and marker tray:
 - 1. Cap Wallcovering Trim: Clear satin, anodized aluminum, low profile trim.

2. J-Trim: 1/4 inch extruded aluminum, clear anodized.
3. Marker Tray: Clear anodized aluminum marker tray, continuous along full width of dry erase wallcovering.

PART 3 - EXECUTION

3.2 INSTALLATION

- A. Comply with manufacturer's printed installation instructions.
- B. For seamed applications, using a seam and strip cutter remove the factory edge of one sheet. Using the same tool, overlap and trace cut the mating edge of the second sheet. Repeat this step for as many sheets as required for the job.
- C. Scribe, cut, and fit material to butt tightly to adjacent surfaces, built-in casework, and permanent fixtures and pipes.

End of Section

SECTION 097625 - FIBERGLASS-REINFORCED PLASTIC PANELS (FRP)

1. Scope of Work: Provide FRP wall panels as indicated on Drawings and as specified.
2. Panels: Provide FRP panels as manufactured by The Kemlite Company; or approved equal.
 - a. Nominal Thickness: Not less than 0.12 inch (3.0 mm).
 - b. Surface Finish: Smooth.
 - c. Panel Color: As selected by Architect.
3. Trim Accessories: Manufacturer's standard two-piece, snap-on vinyl extrusions designed to cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
 - a. Color: Match panels.
4. Adhesive: As recommended by plastic paneling manufacturer.
 - a. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
5. Sealant: Single-component, mildew-resistant, acid-curing silicone sealant recommended by plastic paneling manufacturer.
 - a. Sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

END OF SECTION

SECTION 097713

FABRIC-WRAPPED TACKABLE PANELS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Work of this Section consists of furnishing all labor, materials, equipment, and services necessary to furnish and install acoustical metal wall panels as indicated, as follows:
1. Fabric wrapped tackable panels, Type 1 and Type 2.

PART 2 PRODUCTS

2.01 TYPE 1 FABRIC-WRAPPED TACKABLE PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide The H.I.R. #1 Tackable Panels, as manufactured by Decoustics Limited; or comparable product by one of the following, or equal:
1. Armstrong World Industries.
 2. Decoustics Limited; a CertainTeed Ceilings company.
 3. Kinetics Noise Control, Inc.
- B. Requirements of Regulatory Agencies: Acoustical wall panels shall comply with the fire-resistant requirements for interior finish and shall be classified as Class I material.
1. Maximum flame spread: 0-25
 2. Testing: ASTM E 84
- C. Noise Reduction:
1. NRC: For 1-1/8 in. panel NRC shall be 0.90 minimum.
- D. Fabric-Wrapped Wall Panel: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.
1. Mounting: Back mounted with manufacturer's standard adhesive.
 2. Core: Manufacturer's standard glass-fiber board.
 3. Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density board.
 4. Edge Construction: Manufacturer's standard resin hardened core.
 5. Edge Profile: Square.
 6. Facing Material: Fabric from same dye lot; color and pattern as selected by Architect from manufacturer's full range].
 7. Nominal Overall Panel Thickness: 1-1/8 inches.
 8. Panel Width: As indicated on Drawings.
 9. Panel Height: As indicated on Drawings.

2.02 TYPE 2 FABRIC-WRAPPED TACKABLE PANELS

- A. Acceptable Manufacturer: Homasote Company, P.O. Box 7240, West Trenton, NJ 08628-0240; ASD. Tel: (609) 883-3300, Fax: (609) 530-1584, Internet address: <http://www.homasote.com>; or equal.
- B. Provide Class A Panels: Homasote DesignWall(tm) Interior Panels, or equal.
1. Substrate: NCFR(R) fiberboard manufactured from 100 percent recycled wood fiber material; physical properties as follows:
 - a. Thickness: 1/2 inch (13 mm).
 - b. Density: 34-40 pcf (545-640 kg/cubic m).
 - c. Water Absorption by volume (2 hour immersion): 5 percent maximum.
 - d. Expansion, 50 to 90 percent relative humidity: 0.30 percent.
 - e. NRC: 0.20.
 - f. Flame Spread: 25, per ASTM E 84.
 - g. Smoke Developed: 20, per ASTM E 84.
 - h. Fuel Contributed: 10.
 - i. Classification: Class A, per NFPA.
 2. Fabric: FR 701(R), as manufactured by Guilford of Maine or equal, physical properties as follows:
 - a. Content: 100 percent polyester.
 - b. Weight: 16.0 +/- 0.5 oz./lin. yard (50 kg +/-16 g/m).
 - c. Colorfastness to Light: No less than Grade 4 after 40 hours, per AATCC 16, Option A.
 - d. ASTM E 84: Class A.
 - e. NFPA-701: Passes.
 - f. UL Test No. 214: Passes.
 - g. FAA (PARA.25.853B): Passes.
 - h. Boston Fire Code BFD IX-1: Passes.
 - i. State of Massachusetts 527 CMR 21.00: Passes.
 - j. Color: As selected by Architect from manufacturer's standard range.
 3. Fabrication: Wrap fabric around long edges of panel to back side and laminate to substrate.

END OF SECTION

SECTION 099100 - PAINTING

1. Work Included: The scope of work consists of all painting work shown on the Drawings, described in the Specifications, or as reasonably inferred from either, in the opinion of the Architect, as being required, and includes:
 - a. Surface preparation and field painting of the following:
 - 1) Exposed exterior items and surfaces;
 - 2) Exposed interior items and surfaces;
 - 3) Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surfaces treatments specified in other sections.
 - b. Paint exposed surfaces whether or not colors are designated in "schedules", except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint same as similar adjacent materials or surfaces. If color or finish is not selected, the Designer will select colors or finishes from manufacturer's available choices.
 - 1) Painting work of this Section includes field painting exposed bare and covered pipes and conduits (including color coding), hangers, exposed steel and iron work, and metal surfaces of athletic, mechanical, and electrical equipment.
2. Latex and Alkyd Based Paints: Provide products of one of the following manufacturers that meet or exceed specified requirements, or approved equal:
 - a. Benjamin Moore and Co. (Moore).
 - b. Pratt & Lambert. (P & L).
 - c. The Sherwin Williams Company (S-W)
3. High Performance Paint Coatings: Provide products of one of the following manufacturers that meet or exceed specified requirements, or approved equal:
 - a. Tnemec Corporation (Tnemec).
 - b. International Protective Coatings (IPC).
 - c. Ameron Corporation (Ameron).
4. Interior Gypsum Wallboard for Eggshell, or Satin Finish:

One Coat	<ol style="list-style-type: none">1. Benjamin Moore; Eco-Spec Interior Latex Primer: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).2. Duron Equal3. S-W Equal
Two Coats	<ol style="list-style-type: none">1. Benjamin Moore; Eco-Spec Latex Eggshell Enamel: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).2. Duron Equal3. S-W Equal
5. Interior Gypsum Wallboard Ceilings for Flat Finish:

One Coat	<ol style="list-style-type: none">1. Benjamin Moore; Eco-Spec Interior Latex Primer:
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- Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
2. Duron Equal
 3. S-W Equal
- Two Coats
1. Benjamin Moore; Eco-Spec Latex Flat: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
 2. Duron Equal
 3. S-W Equal
6. Interior Finish Carpentry, for Satin-Gloss Paint Finish (softwoods, paint grade hardwoods, MDO, and hardwood veneers):
- One Coat
1. Benjamin Moore; Eco-Spec Interior Latex Primer: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
 2. Duron Equal
 3. S-W Equal
- Two Coats
1. Benjamin Moore; Eco-Spec Latex Eggshell Enamel: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
 2. Duron Equal
 3. S-W Equal
7. Interior Finish Carpentry for Satin Transparent Finish (all hardwoods and hardwood veneers, except paint grade and factory-finished items):
- Sand
- 120 grit sandpaper.
- Sand
- 220 grit sandpaper.
- Stain
1. Moore Interior Wood Finishes Penetrating Stain
 2. Devoe Equal
 3. S-W Equal
- Two Coats
1. Moore Benwood Polyurethane Finish
 2. Devoe Equal
 3. S-W Equal
8. Interior Metals not Specified to Receive other Coating Systems:
- One Coat
1. Approved primer, in shop under other Sections (where specified)
- One Coat
- Field Primer (only where shop primer is not specified):
1. S-W Universal metal primer.
- Two Coats
1. S-W Acrylic Enamel.
9. Interior Mechanical and Electrical Work (Paint all exposed items throughout the interior project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork visible through grilles and registers):

Same as specified for other interior metals, hereinabove.

10. Exterior Galvanized Steel for Acrylic Polyurethane Finish (exterior handrail and railing assemblies, steel bollards):

One Coat 1. Epoxy Primer in fabricator's shop, under other Sections.

Finish Coat 1. Urethane top coats in fabricator's shop, under other Sections.

11. Exterior Galvanized Steel Doors and Frames for Acrylic Polyurethane Finish:

One Shop Coat 1. Shop Primer in fabricator's shop, under Section 081100.

After Installation:

Barrier Coat: 1. As recommended by manufacturer for compatibility between shop coats and field coats.

First Field Coat 1. Tnemec "No. N69 Hi-Build Epoxoline" Epoxy
2. IPC Equal
3. Valspar Equal

Second Field Coat 1. Tnemec "No. 1081 Endura-Shield III"
(dry film 1.5 to 2. IPC Equal
2.0 mils) 3. Valspar Equal

12. Exterior Finish for Wood Siding, Trim, and Trellis Work:

Two Coats 1. Benjamin Moore Exterior Finish Deck and Siding Translucent Alkyd (#326).

13. Interior Steel Doors and Frames for Acrylic Polyurethane Finish:

One Shop Coat 1. Shop Primer in fabricator's shop, under Section 081100.

After Installation:

Barrier Coat: 1. As recommended by manufacturer for compatibility between shop coats and field coats.

First Field Coat 1. Tnemec "No. N69 Hi-Build Epoxoline" Epoxy
2. IPC Equal
3. Valspar Equal

Jonathan Levi Architects
266 Beacon Street
Boston, Massachusetts

FULLER MIDDLE SCHOOL
Framingham, Massachusetts

Second Field Coat
(dry film 1.5 to
2.0 mils)

1. Tnemec "No. 1081 Endura-Shield III"
2. IPC Equal
3. Valspar Equal

END OF SECTION

SECTION 101400 - SIGNAGE

1.1 SUMMARY

A. Section Includes:

1. Provide wall and door plaques as scheduled.
2. Provide cut-out metal letters.
3. Provide occupancy signs in spaces required by code or local ordinance.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Melamine Plastic: Material shall be "self-extinguishing" and furnished with a "life-of-building" warranty. Material shall be as manufactured by Westinghouse, Wilson, General Electric, or approved equal in thickness required for intended use.
- B. Bronze Plate: ASTM B 36/B 36M, Alloy UNS No. C22000 (commercial bronze).
- C. Paint: Water based aliphatic polyurethane, as manufactured by Tnemec, IPC, or PPG.
- D. Vinyl Die-Cut Letters and Film: Opaque, non-reflective vinyl film. 0.0035 in. minimum thickness, with pressure sensitive adhesive backing, suitable for exterior use as well as interior applications.
- E. Aluminum: Provide aluminum sheet and tubing of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

2.2 DIMENSIONAL CHARACTERS

- A. Cutout Characters: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
 - a. APCO Graphics, Inc.
 - b. ASI Sign Systems, Inc.
 - c. Gemini Incorporated.
 - d. Matthews International Corporation; Bronze Division.
 - e. Metal Arts; Division of L & H Mfg. Co.
 - f. Nelson-Harkins Industries.
 - g. Southwell Company (The).

2. Character Material: Sheet or plate bronze.
3. Character Height: As indicated.
4. Thickness: 0.25 inch.
5. Finishes:
 - a. Integral Metal Finish: As selected by Architect from full range of industry finishes.
6. Mounting: Projecting studs.
7. Typeface: As indicated.

2.3 INTERIOR ROOM SIGNS

- A. Provide raised tactile ADA complying signage meeting the following:
 1. Solid-Sheet Sign: Bronze sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
 - a. Thickness: 0.125 inch (3.18 mm).
 - b. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
 2. Surface Finish and Applied Graphics:
 - a. Integral Metal Finish: As selected by Architect from full range of industry finishes.
 3. Mounting: Surface mounted to wall with concealed anchors or fasteners.

2.4 OCCUPANCY SIGNS

- A. Frame for occupancy certificate, maximum occupancy and Building signs shall be bronze, satin finish, with one side of frame removable.
- B. For size of frame see Drawings, minimum ½ in. face width.
- C. Provide ¼ in. plywood backing in the frames.
- D. Secure frames to walls using tamperproof devices suitable for intended substrate.
- E. Text shall be white lettering on a bronze background and shall be as follows: "Maximum Occupancy" (3 in. high, ¾ in. stroke)
"Not to Exceed" (2 in. high, ½ in. stroke)
"XXX Persons" (3 in. high, ¾ in. stroke)

END OF SECTION

SECTION 102113 - PLASTIC LAMINATE TOILET COMPARTMENTS

1. Work Included: The work of this Section consists of providing plastic laminate toilet compartments including related accessories, hardware, and related items, including, but not limited to:
 - a. Plastic laminate toilet partitions and urinal screens, completely erected.
 - b. Related mounting brackets, fastening devices, and anchors.
 - c. Related finish hardware and accessories, as specified.
2. Manufacturer: Provide products of the following that meets or exceeds specified requirements:
 - a. Model: Classic Series.
3. Partitions, Stiles, Screens, and Doors:
 - a. Plastic Laminate: Shall be high pressure laminated plastic, NEMA LDS-19 minimum thickness 0.0625 in., color as selected by Architect from complete range of standard and standard special colors offered by manufacturer. No limit is placed on the number of colors to be used, and will vary from floor to floor.
 - b. Core:
 - 1) Stiles: three ply resin impregnated particle board bonded to each side of an 11 gauge steel reinforcing core.
 - 2) Panels, doors, and wall post: three ply resin impregnated particle board, Type II, Grade DB, 45 lb. density.
4. Adhesives: Shall be type which will prevent delamination from heat and moisture in public washrooms.
5. Hardware and Fittings:
 - a. Metal: Stainless steel, Type 304.
 - b. Finish: Stainless steel: No. 4 Satin finish.
6. Leveling Device: Shall be 3/8 in. by 1 in. steel bar.
7. Fasteners:
 - a. Hinge and Latch: Shall be factory installed threaded steel inserts and stainless steel one-way machine screws; latch track factory installed thread T-nuts.
 - b. Door Hardware: Shall be stainless steel one-way sheet metal screws.
 - c. Mounting Brackets: Shall be stainless steel phillips head sheet metal screws.

- d. Leveling Device: Shall be 3/8 in. threaded rod, nuts, and sleeve anchor.
- 8. Stile Shoes: Shall be one piece, 4 in. high, Type 304, stainless steel with No. 4 Satin finish.
- 9. Configuration:
 - a. Toilet partitions shall be floor supported, overhead braced.
 - b. Screens shall be wall hung.
- 10. Stiles, Partitions, Screens, and Doors:
 - a. Bonded high pressure plastic laminated to core material with adhesive specially formulated to prevent delamination in moist, warm areas of public washrooms. Bond edges prior to bonding face sheets. Make no splices or joints in faces or edges.
 - b. Install threaded steel inserts for mounting hinge and latch.
 - c. Pre-drill screw holes for coat hook and keeper.
 - d. Finish thickness - 1 in. for uniform flush front.
- 11. Anchoring and Leveling Devices: Continuously weld anchoring and leveling device to steel reinforcing core of stile.
- 12. Door Hardware:
 - a. Hinge: Shall be self-lubricating balanced hinge adjustable hold open feature.
 - b. Latch: Shall be combination slide latch and bumper equipped for emergency access, without use of tools.
 - c. No hardware for brackets will be permitted on the outside of compartment except on compartments with outswinging doors.
- 13. Accessories:
 - a. One combination coat hook and bumper shall be installed on each toilet enclosure door, and shall be manufacturer's standard, subject to Architect's approval.

-END OF SECTION-

SECTION 102800 - TOILET ACCESSORIES

1. Work Included: Furnish and install all toilet accessories as required to complete the work of the Contract.
2. Manufacturers: Accessories shall be manufactured by Bobrick Washroom Equipment Company; American Specialties, Inc.; Bradley Corporation Washroom Specialties Division; or approved equal.
3. Toilet Accessories:
 - a. Lavatory mirror: Bobrick B-290 1830
 - b. Soap dispenser: Bobrick B-2111
 - c. Towel dispenser/waste receptacle: Bobrick B-36903
 - d. Toilet paper dispenser: Bobrick B-2888
 - e. Sanitary napkin/tampon disposal: Bobrick B-254
 - f. Grab bars (HC toilet): Bobrick B-5806.99 x 42, 2 per stall

-END OF SECTION-

SECTION 104400 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

1. Work Included: Furnish and install fire extinguishers, cabinets, and accessories as required to complete the work of the Contract. Include, but do not limit to:
 - a. Fire extinguishers.
 - b. Fire extinguisher cabinets.
 - c. Mounting brackets.
2. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.
3. Fire Extinguisher Cabinets and Accessories: Subject to compliance with requirements, provide products of one of the following manufacturers; Catalog designations of Larsen's Manufacturing Company cabinets are specified herein to establish standard of quality.
 - a. Larsen's Manufacturing Company, Minneapolis, MN 55432.
 - b. J. L. Industries.
 - c. Muckle Manufacturing, Division of Technico, Inc.
 - d. Profile International, Inc.
4. Fire Extinguishers: General Fire Extinguisher Co., Multi-Purpose Dry Chemical Type (4A-60BC-FE): UL-rated 4-A:60-B:C, 10 lb. nominal capacity, in enameled steel container, for Class A, Class B, and Class C fires; No substitutions will be permitted.
5. Fire Extinguisher Cabinet, Fully Recessed Type at all Public Spaces: Larsen Model #2409, with the following features:
 - a. Break glass door.
 - b. Red fire handle.
 - c. Bronze finish.
 - d. Rough Opening: 24-1/2 in. x 10-1/2 in. x 6-1/4 in.
6. Fire Extinguisher Cabinet, Semi-Recessed: Larsen Architectural Series Model #2409-R2 for fully-recessed cabinets; and Model 2409-6R for semi-recessed cabinets, with vertical duo door style, with the following features:
 - a. Tempered glass in door.
 - b. Red fire handle.
 - c. Bronze finish.
 - d. Tub, 6 in. id.
 - e. 2 hr. fire rated where installed in rated walls.
7. Cabinet Construction: Manufacturer's standard enameled steel box as required, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.
8. Wall Brackets: Where cabinet is not required, provide extinguisher manufacturer's recommended standard wall mounting bracket, sized to fit extinguisher.

-END OF SECTION-

SECTION 106520 - OPERABLE PANEL PARTITIONS

1. Work Included: Provide manually operated, individual folding panel partition assemblies.
2. Sound Transmission Classification (STC): Provide units which have STC rating of at least 51 (NSSEA Class G) when tested according to ASTM E 90.
3. Manufacturers: Provide products of one of the following manufacturers if they meet or exceed the requirements of these specifications:
 - a. Advanced Equipment.
 - b. Hufcor, Inc.
 - c. Modernfold Division of American Standard Co.
4. Operations: Single panel operation of individual panels, manually operated, flat steel panels, top supported with individual crank or level operated seals.
5. Panel Construction: All steel construction, nominal 4 in. thick in manufacturers standard panel widths, with trimless vertical joints.
6. Suspension Systems and Tracks:
 - a. For Panels:
 - 1) Overhead track and suspension system (aluminum or steel). If aluminum with steel running surfaces.
 - 2) Trolleys shall be all steel; with four (4) formed ball bearing, all steel wheels.
7. Sound Seals: Airtight closure around the perimeter of each panel with retractable floor seals.
8. Accessories:
 - a. Pass Doors with hardware and exit sign, if required.
 - b. Pocket Doors of same construction as panel.
9. Finish Surface:
 - a. Apply porcelain-enamel steel "white-board" writing surface, on both sides of panels.

END OF SECTION

SECTION 111320 - PROJECTION SCREENS

1. Work Included: Work of this Section includes, but is not limited to:
 - a. Electrically operated projection screens.
2. Manufacturers: Provide products from one of the following manufacturers, or Architect approved equal:
 - a. Bretford Manufacturing Co., Schiller Park, IL 60176
 - b. Da-Lite Screen Co., Inc., Warsaw IN 46580
 - c. Draper Shade and Screen Co., Inc., Spiceland, IN 47385-0425
3. Manufacturer and Type: Provide "BoardRoom" Electrically Operated Projection Screen, manufactured by Da-Lite Screen Company, Inc., or approved equal from another specified manufacturer.
4. Description: Provide projection screen with glass beaded surface on flame and mildew resistant fabric, with 2 in. black masking borders. Provide screen electrically operated, ceiling recessed, and mounted on a roller of rigid metal, minimum 3 in. diameter, mounted on vibration and sound absorbing supports in a wood case with a metal-lined wiring compartment, complete with metal bracket hangers. Electrical operation shall be three wire, quick reverse type with accessible pre-set limit switches to stop screen automatically in up and down positions, with motor within roller. Motor shall be suitable for 115 volt, 60 Hz electric current. Unit shall be UL-listed.
5. Include remote three-position control switch to be installed and wired by electrical trade.

-END OF SECTION-

SECTION 116653 - GYMNASIUM EQUIPMENT

1. Scope: Furnish and install the athletic equipment work, as indicated on the Drawings and as specified herein. Include but not be limited to:
 - a. Basketball backstops, backboards and goals.
 - b. Sleeves and floor plates for badminton and volleyball uprights.
 - c. Protective wall padding

2. Folding Basketball Backstops: Provide as required forward folding backstop assemblies. Folding backstop assemblies shall be overhead structure supported with supplemental framing and shall include tempered glass backboards and collapsible goals, as manufactured by Porter Athletic Equipment Company (Porter), or approved equal as manufactured by Proline Athletic, or Performance Sports Systems; or approved equal. Porter catalog designations are specified to establish standard of quality for performance and materials. All backstop assemblies shall be suitable for basketball competition play in accordance with the requirements of NCAA Basketball. All backstop framing and supplemental framing shall be painted flat (matte) white. Provide capacity in backstop and supplemental framing to support shot clocks where such are indicated to be backstop mounted.
 - a. Forward Folding Backstops: Provide where indicated Porter Model 950 series Center-Strut Ceiling Suspended, Forward-Fold, Front Braced, Bent Mast Backstop.
 - b. Provide each backstop with backboard. Backboard shall be Porter Model 00208-000 rectangular tempered glass backboard with aluminum faced tubular steel frame. Backboard shall be 72 inch wide by 42 inch high with fused target and boarder markings. Marking color shall be white.
 - c. Provide each backboard with Porter Model 00326-000 Bolt-On Backboard Safety Padding. Color shall be manufacturer's standard medium gray.
 - d. Provide goal with net at each backstop. Goal shall be Porter Model 00250-500 Torq-Flex at each backstop. Provide each goal properly mounted to transfer goal loads directly to backstop without loading backboard.
 - e. Provide each backstop with electrically operated winch. Winch shall be Porter Model 00706-000 1/2 horsepower or model 00707-000 3/4 horsepower as required by backstop and applied loads. Winch shall be prewired with 54 inch long rubber covered cable with polarized plug attached. Provide keyed switch with cover plate for each winch. Keyed switch shall be located within room as directed by Designer unless indicated otherwise.
 - f. Provide each backstop with safety lock. Safety lock shall be Porter Model 10797-100 Saf-Strap basketball safety lock.
 - g. Conduit, outlet receptacles, connectors, and wiring shall be provided as a part of the work of Division 26, ELECTRICAL.

3. Control Center: Provide one (1) Porter Model 2500 Control Center for each Gymnasium.

4. Badminton Floor Plates and Sleeves: Provide cast brass nominal 0.20 in. thick flush-mount floor plate with hinged door, suitable for use of badminton uprights, with pre-drilled holes for

anchors. Plates shall be Type KA 25 S manufactured by Senoh and distributed by Sports Imports Incorporated, Columbus, OH 43221, or approved equal.

- a. Sleeves shall be 3 in. internal diameter steel barrel with 0.14 in. thick walls and top screw-down flange. Sleeve shall be approximately 9 in. Base of sleeve barrel shall be flanged for setting into asphaltic concrete slab.
5. Volleyball Floor Plates and Sleeves: Provide volleyball floor plate and sleeve Schelde model 62107 sleeve and Model 62126 Oversized Floor Plate. Cover to be solid brass with hinged access cover, set flush in wood floor. Floor plate to be 7-7/16 inch outside diameter. Sleeve to have pre-drilled flanges for fastening of cover plate. Sleeve shall be 12-3/8 in. long. Inside diameter of the sleeve shall be 4 in.
6. Corner and Wall Padding: Provide as follows:
- a. Wall protection mats shall be polyester reinforced solid vinyl, 14 oz. minimum, with 2 in., thick urethane foam padding. Mats shall have fire retardant covering. Sizes shall be as indicated on the Drawings.
 - b. Wall Pad: Porter No. 00355-600, 6' - 0" wall pad with Velcro attachment strips, manufactured by Porter Athletic Equipment Co., or approved equal.
 - c. Column Pad: Porter No. 00356-600, 6' - 0" column pads with Velcro attachment strips, manufactured by Porter Athletic Equipment Co., or approved equal.
 - d. Wrap Around Column Pad: Porter No. 97060-000, wrap around column mat, manufactured by Porter Athletic Equipment Co., or approved equal.
 - e. Color of matting and padding shall be selected by Architect from manufacturer's standard colors.
7. Tennis Net System: Provide floor mounted tennis net systems Porter Athletic Equipment Corporation model 02991-042 (net), 00947-00 (posts/standards), and 00875-200 (floor sleeves) or equal.
8. Batting Cage: Provide ceiling suspended, retractable batting cage, Porter Athletic Equipment model 90920. Batting cages shall be electrically operated from basketball goal control location.

END OF SECTION

SECTION 124813 - ENTRANCE MATS AND FRAMES

1. Work Included: The work of this Section includes, but is not limited to:
 - a. Entrance mats
2. Basis-Of-Design Products: Provide Grate Mat XT foot grille by Mats Inc., PO Box 839, 37 Shuman Avenue, Stoughton, MA, 02072; telephone 800-628-7462 or 781-344-1536; fax 781-344-1537; www.matsinc.com.
3. Exposed hinge rail connectors shall be vinyl hinge only complete with perforations for drainage. Tread rails shall be manufactured from aluminum, complete with co-extruded soft-durometer cushions, supplied in mill finish.
4. Tread Insert Options: Carpet shall meet the Carpet and Rug Institute's standard for indoor air quality. Fibers shall include a minimum of 100, 12 mil monofilament fibers per square inch and colorfast, solution dyed nylon. Available in one of 11 standard colors as offered by manufacturer. Each carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths. Carpet weight shall be 33 oz./sq. yd.
5. Framing for Aluminum Foot Grille: Aluminum frame shall be a 1 in. deep recessed frame in 6063-T5 aluminum alloy with 1/8 in. wide exposed surface. Frame color shall be mill finish.

-END OF SECTION-

SECTION 125220 - ROLLER SHADES

1. Description of Work: Work of this Section includes, but is not limited to:
 - a. Electrically operated window shades
 - b. Manually operated window shades
2. Electrically Operated Window Shades: Provide Mecho Electri-Shades, as manufactured by Mecho Shade Systems, Inc., or approved equal as manufactured by Nysan. Provide shade fabrics and features as follows:
 - a. Shade Cloth: Provide "EcoVeil" non-PVC shade cloth, color shall be as indicated on Drawings.
3. Manually Operated Shades: Provide Mecho Shades SlimShades, as manufactured by Mecho Shade Systems, Inc., or approved equal as manufactured by Nysan. Provide shade fabrics and features as follows:
 - a. Shade Cloth: Provide "EcoVeil" non-PVC shade cloth, color shall be as indicated on Drawings.

END OF SECTION

Section 126100
FIXED AUDIENCE SEATING

PART 1 - GENERAL

1.1 SUMMARY

- A. The work of this Section consists of furnishing and installing fixed audience seating where shown on the Drawings, as specified herein, for a complete and proper installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design (Specified Manufacturer): To establish a standard of quality, design and function desired, Drawings and specifications have been based on KI Furniture and Seating (KI):
1. Seating Style: KI "Lancaster" Series.
 2. Wood species: KI "Standard Wood" series, color "Kensington Maple on Maple".
 3. Laminate: KI "Seating Laminates" series, color: "Kensington Maple".
- B. Acceptable manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
1. KI Furniture and Seating, Green Bay, WI.
 2. Sedia Systems, Chicago IL.
 3. American Seating, Grand Rapids, MI.

2.2 MATERIALS - GENERAL

- A. Steel standards and back wings: All steel shall have smooth surfaces and be of sufficient gauge thickness and designed to withstand strains of normal use and abuse.
- B. Padding material: Seat and back padding material shall be of new (prime manufacture) polyurethane foam. Padding material shall comply with the flammability requirements outlined in California Technical Information Bulletin No. 117, Resilient Cellular Materials, Section A and D, dated February 1975, when tested in accordance with Federal Test Method Standard 191, Method 5903.2.
1. Padding shall be securely adhered to plywood inner shell.
 2. Thickness: 2 inches.
- C. Wood: Plywood, exposed or concealed, hardwood, made with adhesive containing no added urea formaldehyde (NAUF).
- D. Upholstery Fabric: Fabric shall meet class 1 flammability requirements of US Department of Commerce Commercial Standard 191 per California Technical Bulletin No. 117.

1. Treat fabric for fire retardance to comply with Massachusetts Fire Code Regulation FPR 20 and California Technical Fire Safety Bulletin 117 Section E, NFPA 701 and as additionally required by City of Boston Fire Marshall.
 2. Fabric color and pattern shall as selected by Architect, acceptable manufacturers include the following or approved equal.
 - a. KI Furniture and Seating, Green Bay, WI.
 - b. CF Stinson, Rochester Hills, MI.
 - c. Mayer Fabrics (Mayer-Paetz Inc.), Indianapolis, IN.
- E. Injection molded plastic: one-piece high-impact, linear polyethylene with built-in ultraviolet light inhibitors to retard fading. Plastic shall have a burn rate of 1 inch per minute when tested in accordance with ASTM D635 or the Department of Transportation Motor Vehicle Safety Standard No. 302. Color shall be selected from manufacturer's standard color range.

2.3 SEATING

- A. General: Floor attached type chairs, 19 to 23 inch widths, consisting of an attached inner upholstered back and hinged fully upholstered seat which automatically returns to an upright three-quarter fold position.
1. Not more than 15 percent of all seating may be 19-inch width. No 19-inch width seats shall be placed adjacent to another 19-inch width seat. 19-inch width seats shall be randomly distributed throughout the auditorium and lecture halls in the widest possible dispersion pattern.
 2. Provide armless seats in compliance with accessibility requirements, where indicated on the Drawings.
 3. Provide transfer seats in compliance with accessibility requirements.
 4. Provide accessible locations as indicated.
- B. Standards: Floor mounted formed steel.
1. Standards: The standards shall be pedestal design made by a rectangular tube, nominally 1 by 3 inches, with heavy gauge steel. A reinforced bracket for seat pan attachment shall be integrated into the standard which has an inlay at midpoint for resistance upon force.
 2. Aisle Standards-Rectangular-3/4 size design: The aisle standards shall be fabricated in the same manner as the center standards with a formed panel of 16 gauge steel welded to the column to accept a decorator panel:
 - a. Rectangular shaped end standard shall be painted with epoxy powder finish.
- C. Chair backs: Manufacturer's optional wood back panel with 3/8 inch thick veneer core and 1/16 inch thick maple veneer face, attached to 7/16 inch thick molded plywood inner structure bonded with 2 inches of 1.8 pcf density urethane foam.
- D. Seat assembly: Self-lifting seat, padded and upholstered with one-piece injection molded outer panel and hardwood inner upholstery panel.
1. Counter Balance: The seat pan shall rotate on two solid steel rods with lifetime lubricated nylon shoulder bushings. The rear area of the pan shall be weighted to create a counterbalance that allows the seat to return to 90 degree vertical position by means of gravity.

2. Provide seat numbers and locate them on the front edge of the seat pan.
- E. Armrests: Solid wood, 3/4 inch thick by 2-1/4 inches wide and 12 inches long, steamed, kiln dried, with translucent finish.
 1. Finish:
 - a. Stain: Color as selected by the Architect.
 - b. Finish coats: 2 coats factory applied polyurethane.
 2. ADA swing-up armrests to hinge with cantilevered end standards to allow equal access for disabled patrons. Accessible chairs shall include the universal handicapped symbol on the cantilevered end aisle standard for clear identification.
 - a. Provide not less than eight seats or 1 percent of total seating whichever is greater with ADA transfer armrests.
 - b. Provide at each ADA companion seat:
 - 1) Manufacturer's signage for companion seating adjacent to all seats with ADA transfer armrests at locations as indicated on the Drawings and in compliance with all applicable laws, regulations, and codes.
- F. Aisle Lights (locate as indicated on approved shop drawings): UL listed, pre-wired and finished complete with utility box, light socket, LED lamp and detachable lens plate, located under arms.
 1. Provide 1 light per riser/step to be on side of seating areas coordinate with Division 26 – Electrical.
- G. Number and letter plates: 5/8 by 1-5/8 inch brushed aluminum finished plates with Helvetica Medium letter and numerals.
 1. Attach plates with escutcheon pins with matching finish.

2.4 FINISHES

- A. All exposed metal, including bolted connections shall have a baked enamel finish in color selected by Architect.

PART 3 - EXECUTION

3.2 INSTALLATION

- A. Install chairs in locations indicated on reviewed and accepted shop drawings in accordance with manufacturers written instructions.
 1. Check all dimensions against shop drawings and make necessary adjustments for discrepancies in layout.

End of Section

SECTION 126600 - TELESCOPING BLEACHERS

1. Work Included: Provide all labor, materials, equipment, and services necessary to complete the work indicated, and without limiting the generality thereof includes:
 - a. Retractable bleacher seating – wall attached, motorized telescoping wood bleachers (w/ plastic seats) with all associated hardware and railings.
2. Product: Provide Hussey Maxam Series Telescopic Gym Seat System or approved equal and as follows:
 1. Manufacturer: Hussey Seating Company, U.S.A.
Address: North Berwick, Maine, 03906
Telephone: (207) 676-2271; Fax: (207) 676-9690
 2. Model: MXM26 Series Telescopic Gym Seats, adjustable row spacing in two inch increments from 22 inches [559] to 26 inches [660].
 - 1) Aisle Type: foot level aisles, intermediate aisle steps.
 - 2) Seat Type: MVP (plastic seat module).
 - 3) Seat color finish: manufacturers 15 standard.
 - 4) Rail Type: Self-storing rail, aisle hand rails
 - 5) Operation: electrical power
 - 6) Electrical Power System: Integral power with pendant control.
 3. Product Description/Criteria:
 - 1) Bank Length: (2) banks @ 96'-6" long
 - 2) Aisle Widths: 4'6 wide
 - 3) Number of Tiers: 10 tiers
 - 4) Row Spacing(s): 26"
 - 5) Row Rise: 9 5/8"
 - 6) Open Dimension: 20'-7"
 - 7) Closed Dimension: 3'-7"
 - 8) Overall Unit Height: 7'-10"
 4. Miscellaneous Product Accessories: end panels, seat number's, row letters.
 5. Handicap Seating Provisions: Provide first tier handicap cutouts per requirements of (ADA) Americans with Disability Act located as indicated.
 6. Special Seating Graphics: Provide contrasting or matching seat top or seat base colors to create graphic pattern as indicated.
3. Lumber: ANSI/Voluntary Product 20, B & B Southern Pine
4. Plywood: ANSI/Voluntary Product PS1, APA A-C Exterior Grade.
5. Structural Steel Shapes, Plates and Bars: ASTM A 36.

6. Uncoated Steel Strip (Non-Structural Components): ASTM A569, Commercial Quality, Hot-Rolled Strip.
7. Uncoated Steel Strip (Structural Components): ASTM A570 Grade 33, 40, 45, or 50, Structural Quality, Hot-Rolled Strip.
8. Uncoated Steel Strip (Structural Components): ASTM A607 Grade 45 or 50, High-Strength, Low Alloy, Hot-Rolled Strip.
9. Galvanized Steel Strip: ASTM A653 Grade 40, zinc coated by the hot-dip process, structural quality.
10. Structural Tubing: ASTM A500 Grade B, cold-formed.
11. Polyethylene Plastic: ASTM D 1248, Type III, Class B; molded, color-pigmented, textured, impact-resistant, structural formulation; in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
12. Fasteners: Vibration-proof, of size and material standard with manufacturer.
13. Frame System:
 - a. Wheels: Not less than 5" diameter by 1-1/4" with non-marring soft rubber face to protect wood and synthetic floor surfaces, with molded-in sintered iron oil impregnated bushings to fit 3/8" diameter axles secured with E-type snap rings.
 - b. Lower Track: Continuous Positive Interglide System interlocks each adjacent CPI unit using an integral, continuous, anti-drift feature and through-bolted guide at front to prevent separation and misalignment. Each CPI unit shall contain a Low Profile Posi-Lock LX to lock each row in open position and allow unlocking automatically. Provide adjustable stops to allow field adjustment of row spacings.
 - c. Slant Columns: High tensile steel, tubular shape.
 - d. Sway Bracing: High tensile steel members through-bolted to columns.
 - e. Upper Guide: High tensile steel through-bolted to nose and riser. Interlocks with adjacent upper tier to prevent separation and misalignment. Provide adjustable stops to allow field adjustment of row spacings.
 - f. Deck Support: Securely captures decking for entire length of section.
14. Deck System:
 - a. Section Lengths: Each bank shall contain sections not to exceed 25'-6" in length with a minimum of two supporting frames per row, each section.
 - b. Nosing and Rear Riser: Continuous roll formed galvanized steel members.
 - c. Attachment: Through-Bolted fore/aft to deck guides, and frame cantilevers.
 - d. Decking: 5/8", AC grade, tongue & groove, transversely oriented plywood, interior type with exterior glue, 5-ply, all plies Southern Pine with plugged crossbands, produced in accordance with National Bureau of Standards PS-1-83. Longest unsupported span: MXM 26, 21-1/2"; MXM 33, 28 1/2".
 - e. Deck End Overhang: Not to exceed frame support by more than 5'-7".
15. MVP Seat System:
 - a. Seat Modules: 18" long unitized, interlocking, engineered, high density polyethylene modules providing scuff resistant textured 10" wide anatomically contoured seat surface. 1/2" minimum interlock on seat and face.
 - b. Profile: Designed with internal reinforcement ribs and cantilevered to the rear to provide not less than 3" smooth toe space beneath the seat.

- c. **Seat Support:** Each seat support module shall be secured against fore/aft movement by not less than (2) two longitudinally sited steel fasteners spaced no less than 2 1/4" on center, creating a steel to steel connection, tying the structure firmly to the steel nosing.
 - d. **Number Plates:** Seat module shall be designed to accept seat number plates.
 - e. **End Caps:** Each end of row shall be enclosed with matching end caps. End caps shall be designed with concealed attachment and provide indent for row letters. Color to match seat top.
16. **Integral Power:** Furnish and install Hussey (PF 1, 2, 3, or 4), an integral automatic electro-mechanical propulsion system, to open and close telescopic seating. Integral Power and Control System shall be Underwriters Laboratories, Inc. (UL) approved and listed.
- a. Operation shall be with a removable pendant control unit which plugs into seating bank for operator management of stop, start, forward, and reverse control of the power operation.
 - b. Each Powered Frame unit shall consist of output shaft gear reducer with 6" diameter x 4" wide wheels covered with non-marring 1/2" thick composite rubber. Reducers shall be fitted with induction motors which will provide an average operating speed of (46/25) f.p.m.
 - c. **Operating Loads:** Each Powered Frame provides (220 / 550) lbs pull force which equals approximately (28 / 35) lbs psi lateral force on the floor.
 - d. **Limit Switches:** Furnish and install both open and closed limit switches for the integral power system. The limit switches will automatically stop integral power operation when seating has reached the fully extended or closed position.
17. Power operation shall utilize a combination of contactors and limit switches to insure the wiring is not energized except during operation. Straight wired electric system is not allowed.
- a. **Motion Monitor:** Provide flashing light with self-contained warning horn rated at 85 db at 10' mounted under telescopic seating for audio and visual warning during integral power operation.
 - b. **Electrical:** Seating Manufacturer shall provide all wiring within seating bank including pendant control.
 - 1) Each unit is power operated by a 1/2 horsepower, 1725 R.P.M., 208 Volts, 50/60 Hz., three phase 1.25 service factor motor. This motor draws a full load current of 2.2 amperes. Power supply required shall be 120/208 volts three phase 4 wire plus ground service with 20 amps. Motors, housing, and wiring shall be installed and grounded in complete accord with the National Electric Code.
 - 2) The electrical contractor shall provide required power source with no greater than 4% voltage drop at the seatings junction box. The electrical contractor shall perform all wiring connections in junction box that are attached to or a part of the building.
18. **Flex-Row:** Provide first ROW modular units to be utilized by persons in wheelchairs and able bodied persons. Each Flex-Row unit shall have an unlock lever for easy deployment if wheelchair access is needed. Unlock lever shall lock the bleacher seats into position when fully opened.
- a. Provide a black full surround skirting 1/2" off the floor for safety and improved aesthetics.

- b. Provide a black injection molded end cap for the nose beam for safety and improved aesthetics.
 - c. Provide a mechanical positive lock when the Flex-Row system is in the open and used position.
 - d. Flex-Row modular units are designed to achieve multi-use front row seating to accommodate team seating, ADA requirements and facility specific requirements. Flex-Row units are available in modular units from 2 - 7 seats wide as well as full section widths.
19. Provide a removable belt barrier with or without signage for the rear of each recoverable Flex-Row module to assist with seating identification.
20. Front Aisle Steps: Provide at each vertical aisle location front aisle step. Front steps shall engage with front row to prevent accidental separation or movement. Steps shall be fitted with four non-skid rubber feet each 1/2" in diameter. Blow molded end caps shall have full radius on all four edges. Quantity and location as indicated.
21. Non-Slip Tread: Provide at front edge of each aisle locations an adhesive-backed abrasive non-slip tread surface.
22. Foot Level Aisles: Provide deck level full width vertical aisles located as indicated.
23. Intermediate Aisle Steps: Intermediate aisle steps shall be of boxed fully enclosed type construction. Blow molded end caps shall have full radius on all four edges. Step shall have non-skid on surface. Quantity and location as indicated.
24. Intermediate Aisle Handrails: Provide single pedestal mount handrails 34" high with terminating mid rail. Handrails shall be attached to the socket and shall rotate 90° for easy storage in socket. Aisle handrails that are detached from the socket for storage are unacceptable.
25. End Panel: Provide closure end panels for stack position at each exposed bank ends. End panels shall be constructed of 5/8" Southern pine plywood or Polydeck.
26. Self Storing End Rails: Provide steel self-storing 42" high above seat, end rail with tubular supports and intermediate members designed with 4" sphere passage requirements.
27. Seat Numbers: Provide each plastic seat module with a 1-3/4" x 1 1/4" oval etched Lexan plate. Easy to read black numerals will be on the plate fitted in a vandal resistant recess
28. Row Letters: Provide at each row end of plastic seat a 1 3/4" x 1 1/4" oval etched Lexan plate with black numerals. Plates to be fitted flush in vandal resistant end cap recess.
29. Poly Deck: Shall be a high-density polyethylene overlay panel fabricated with a skid-resistant textured top surface of 100% moisture barrier bonded to a plywood substrate with an exterior glue. Panel thickness shall be 5/8" with top polyethylene surface colored weathered gray.

END OF SECTION

SECTION 142400 - HYDRAULIC ELEVATORS

1. Work Included: Provide as follows:
 - a. Hydraulic passenger elevator.
 - b. Electrical work to provide power and telephone wiring from disconnect switch in equipment room to hoistway and elevator.
2. Comply with the requirements of ANSI A17.1.
3. Comply with NFPA codes relating to electrical work, elevators, and fire-resistance ratings of hoistway entrances. Comply with NFPA 80 and provide UL labeled entrances with 30 minute temperature rise labels.
4. Comply with MDPS regulations when in conflict with ANSI A117.1 and ANSI A17.1. Where conflicts exist between codes and standards, MDPS Elevator Code shall take precedent.
5. Manufacturers: Provide products of one of the following manufacturers that meet or exceed requirements specified:
 - a. Dover Elevator Co.
 - b. Montgomery Elevator Co.
 - c. Otis Elevator Co.
 - d. Schindler Elevator Corp.
 - e. U. S. Elevator Co.
6. Product: Provide pre-engineered, packaged or custom hydraulic elevator unit that fulfill the Specification requirements and have the features and characteristics scheduled.
7. Single Car Elevator Control: Provide solid state "Selective Collective Automatic Operation", as defined by ANSI A17.1, for each hydraulic elevator.
8. Passenger Elevator:

Quantity:	One
Type:	Passenger
Elevator No.:	1
Speed:	100 fpm
Capacity:	2,500 lb.
Landings Served:	Two
Number of Openings:	Two
Operation:	Simplex Selective Collective
Door Operation:	Single Speed Side Opening
Power Supplied:	480 volts, 3-phase, 60 hertz
Car Enclosure:	Stainless steel panels on walls and ceilings
Door Finish:	Stainless steel on cab and hoistway doors

END OF SECTION

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FIRE PROTECTION SYSTEMS

NARRATIVE REPORT

The following is the Fire Protection system narrative, which defines the scope of work and capacities of the Fire Protection system, as well as, the Basis of Design.

1. CODES

- A. All work installed under Section 210000 shall comply with the MA Building Code and all state, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

- A. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Fire Protection work and all items incidental thereto, including commissioning and testing.

3. GENERAL

- A. In accordance with the provisions of the Massachusetts Building Code, a school building of greater than 12,000s.f. must be protected with an automatic sprinkler system.

4. DESCRIPTION

- A. The new School will be served by a new 8 inch fire service, double check valve assembly, wet alarm valve complete with electric bell, and fire department connection meeting local thread standards.
- B. System will be a combined standpipe/sprinkler system with control valve assemblies to limit the sprinkler area controlled to less than 52,000 s.f. as required by NFPA 13-2013.
- C. Control valve assemblies shall consist of a supervised shutoff valve, check valve, flow switch and test connection with drain. Standpipes meeting the requirements of NFPA 14-2013 shall be provided in the egress stairwells and in the Stage area. Roof manifolds will be provided at each standpipe.
- D. All areas of the building, including all finished and unfinished spaces, combustible concealed spaces, all electrical rooms and closets will be sprinklered.
- E. All sprinkler heads will be quick response, pendent in hung ceiling areas and upright in unfinished areas.
- F. Fire department valves and cabinets will be provided on each side of the Stage in the Building.

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5. BASIS OF DESIGN

- A. The mechanical rooms, kitchen, science classrooms, and storage rooms are considered Ordinary Hazard Group 1; stage is considered Ordinary Hazard Group 2; all other areas are considered light hazard.
- B. Required Design Densities:
- | | |
|-------------------------|--------------------------|
| Light Hazard Areas | 0.10 GPM over 1,500 s.f. |
| Ordinary Hazard Group 1 | 0.15 GPM over 1,500 s.f. |
| Ordinary Hazard Group 2 | 0.20 GPM over 1,500 s.f. |
- C. Sprinkler spacing (max.):
- | | |
|------------------------|----------|
| Light Hazard Areas: | 225 s.f. |
| Ordinary Hazard Areas: | 130 s.f. |
- D. A flow test will be performed to determine if there is adequate water to serve the project without a fire pump.

6. PIPING

- A. Sprinkler piping 1-1/2 in. and smaller shall be ASTM A-53, Schedule 40 black steel pipe. Sprinkler/standpipe piping 2 in. and larger shall be ASTM A-135, Schedule 10 black steel pipe.

7. FITTINGS

- A. Fittings on fire service piping, 2 in. and larger, shall be Victaulic Fire Lock Ductile Iron Fittings conforming to ASTM A-536 with integral grooved shoulder and back stop lugs and grooved ends for use with Style 009-EZ or Style 005 couplings. Branch line fittings shall be welded or shall be Victaulic 920/920N Mechanical Tees. Schedule 10 pipe shall be roll grooved. Schedule 40 pipe, where used with mechanical couplings, shall be roll grooved and shall be threaded where used with screwed fittings. Fittings for threaded piping shall be malleable iron screwed sprinkler fittings.

8. JOINTS

- A. Threaded pipe joints shall have an approved thread compound applied on male threads only. Teflon tape shall be used for threads on sprinkler heads. Joints on piping, 2 in. and larger, shall be made up with Victaulic, or equal, Fire Lock Style 005, rigid coupling of ductile iron and pressure responsive gasket system for wet sprinkler system as recommended by manufacturer.

9. DOUBLE CHECK VALVE ASSEMBLY

- A. Double check valve assembly shall be MA State approved, U.L./F.M. approved, with iron body bronze mounted construction complete with supervised OS & Y gate valves and test cocks. Furnish two spare sets of gaskets and repair kits.

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B. Double check valve detector assembly shall be of one of the following:

1. Watts Series 757-OSY
2. Wilkins 350A-OSY
3. Conbraco Series 4S-100
4. Or equal

10. SPRINKLERS

- A. All sprinklers to be used on this project shall be Quick Response type and shall be stamped with date of manufacture and temperature rating. Temperature ratings shall be determined by the location of the heads per NFPA 13-2013, section 8.3.2.5, and shall be minimum 155 degrees F. throughout except in special areas around heat producing equipment, skylights, and attics in which case use temperature rating to conform with hazard as specified in NFPA 13-2013. Orifice diameter and K factor shall be appropriate to meet the hydraulic design criteria, the available water supply, and NFPA Standards.
- B. Furnish spare heads of each type installed located in a cabinet along with special sprinkler wrenches. The number of spares and location of cabinet shall be in complete accord with NFPA 13-2013.
- C. Sprinklers shall be manufactured by Tyco, Victaulic, Viking, or equal.
- D. Upright sprinkler heads in areas with no ceilings shall be Tyco Model "TY-FRB" Quick Response, upright natural brass finish heads. Include heavy duty sprinkler guards in all mechanical rooms, storage rooms, and gymnasium. In pool equipment area, all heads shall be stainless steel.
- E. Sidewall heads shall be Tyco Model "TY-FRB" Quick Response with white polyester head and escutcheon.
- F. Pendent wet sprinkler heads shall be Tyco Model "TY-FRB" Quick Response recessed adjustable escutcheon, white polyester finish.
- G. Concealed heads shall be Tyco Model "RFII" Quick Response concealed type, 1-1/2 inch adjustment white cover plate. In special areas, as may be noted on the Drawings, provide alternate cover plate finishes (5 custom colors).

11. ROOF MANIFOLD

- A. Roof manifold shall be Croker #6820 polished brass 2-way fire department outlet connection assembly – 2-1/2" x 2-1/2" x 4".
- B. Roof Manifold shall be manufactured by Croker, Potter Roemer, Elkhart or equal.

12. FIRE STANDPIPE EQUIPMENT

- A. Fire Department Valves shall be Croker Series 5015 Fire Department Valves fitted with 2-1/2 inch x 1-1/2 inch reducer, caps and chains all conforming to Local Fire Department thread standard. Valves shall be polished chrome plated and shall be mounted in a recessed cabinet as indicated on Drawings.

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- B. Cabinets for the Fire Department Valves shall be Croker model 1710 - 18 inch x 18 inch x 10 inch deep. cabinet, fully recessed, solid door, prime painted steel. Include graphic and door catch.
- C. Provide 32 inch x 32 inch access panels at floor control locations or recessed cabinets as appropriate to the wall construction. Provide graphic.

DOCUMENT 000120

OUTLINE SPECIFICATION

SCHEMATIC PHASE- CONSTRUCTION ASSEMBLIES AND SYSTEMS

D. SERVICES

D40: FIRE PROTECTION

D4010 - Sprinklers

General

All materials and equipment furnished under this Subcontract shall be new, unused, first quality of a manufacturer of established reputation. Each valve, fitting, section of pipe, piece of equipment, etc., shall have cast or indelibly stamped thereon the manufacturer's name, pressure rating where applicable, type, etc.

- Drains and test connections shall be provided in the systems.

Scope

General Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to work of this Section.

Codes:

All work installed under this Section shall comply with NFPA 13, NFPA 14, NFPA 25 and all local, state, county, and federal codes, laws, statutes, and authorities having jurisdiction. Include any and all permits, connection, and/or inspection fees in the bid.

Scope of Work:

The work covered by this Section includes all Labor, Materials, and Operations in connection with the provision of a complete and operable Fire Protection System. Without limiting the generality thereof, the work includes, but is not necessarily limited to, the following:

- Fire Service from 10' outside building.
- A hydraulically designed combination automatic sprinkler system to provide 100% protection for the building. Prepare Working Drawings for approval of the Architect, the local authority having jurisdiction, and the owner's insurance company under stamp of an independent Registered Professional Engineer.
- Double check valve assembly.
- Fire department connections, pipe and fittings, valves, hangers, sprinkler heads, and system identification.
- Flushing and testing of the entire system.

Related Work:

The following related work is to be performed under other Sections of the Specifications:

- Excavation and backfill – DIVISION 33
- Fire services to 10' outside foundation wall – DIVISION 33

Record Drawings:

Maintain on the site at all times one (1) set of black or blue line on white drawings which shall at all times be accurate, clear, and complete, showing the actual location of all piping and equipment as installed in colored pencil.

Operating Instructions and Maintenance Manual:

Provide operating instructions to the Owner's designated representative. At the completion of the project, turn over to the Architect two (2) complete manuals.

Shop Drawings and Material Schedules:

Submit as outlined in Division 1 including working drawings and hydraulic calculations.

Guarantee:

Guarantee all work free from defects in workmanship or materials for a period of one (1) year from the date of final acceptance of the building.

Sprinkler Piping:

Schedule 40 black steel pipe for 1-1/2" and smaller and Schedule 10 for 2" and larger.

Sprinklers:

Upright sprinkler heads in areas with no ceilings shall be Reliable Model "F1FR" Quick Response, upright natural bronze finish heads.

Sidewall heads shall be Reliable Model "F1FR" Quick Response with chrome plated head and escutcheon.

Pendent wet sprinkler heads shall be Reliable Model "F1FR" Quick Response recessed adjustable escutcheon, bright chrome plated.

Concealed heads shall be Reliable Model "G4A" Quick Response concealed type, 1-1/2" adjustment white cover plate. In special areas, as may be noted on the Drawings, provide alternate cover plate finishes.

Pendent dry sprinkler heads shall be Reliable Model "G3FR" Quick Response dry type, chrome plated adjustable escutcheon.

Dry sidewall heads shall be Reliable Model "G3FR" dry horizontal sidewall heads, bright chrome plated.

Temperature ratings shall be determined by the location of the heads per NFPA 13-2013, Section 8.3.2.5, and shall be minimum 155 degrees F. throughout except in special areas around heat producing equipment, skylights, kitchen and attics in which case use temperature ratings to conform to Hazard as specified in NFPA 13-2013.

Alarm Facilities:

The wet system alarm device shall be Reliable or equal Model 'E' alarm valve with "E1" trimmings package to include Model 'C' water motor alarm and electric sprinkler alarm switch.

Backflow Preventer:

Double check valve assembly shall be State approved, U.L./F.M. approved, with iron body bronze mounted construction complete with supervised OS & Y gate valves and test cocks. Furnish two (2) spare sets of gaskets and repair kits.

Double check valve assembly shall be of one of the following:

- Watts Series 757-OSY
- Wilkins 350A-OSY
- Conbraco Series 4S-100

D4090 – Other Fire Protection Systems

Workmanship and Installation Methods

All work shall be installed in a first-class manner consistent with the best current practices.

- All piping shall be installed true to line and grade, shall be grouped together, be parallel to each other. Utilize gang hangers wherever feasible. Group all valves together where feasible.

Cleaning and Protection:

Protect all materials and equipment during shipment and installation, and properly handle and store at the job site so as to prevent damage, and upon completion of this work, clean all fixtures and equipment and replace damaged parts.

END OF SECTION

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PLUMBING SYSTEMS

NARRATIVE REPORT

The following is the Plumbing system narrative, which defines the scope of work and capacities of the Plumbing system as well as the Basis of Design. The Plumbing Systems shall be designed and constructed for **LEED v4 for Schools** where indicated on this narrative.

1. CODES

- A. All work installed under Section 220000 shall comply with the MA Building Code, MA Plumbing Code and all state, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

- A. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Plumbing work and all items incidental thereto, including commissioning and testing.

3. GENERAL

- A. The Plumbing Systems that will serve the project are cold water, hot water, tempered water, sanitary waste and vent system, grease waste system, special waste system, storm drain system, and natural gas.
- B. The Building will be serviced by Municipal water and Municipal sewer system.
- C. All Plumbing in the building will conform to Accessibility Codes and to Water Conserving sections of the Plumbing Code.

4. DRAINAGE SYSTEM

- A. Soil, Waste, and Vent piping system is provided to connect to all fixtures and equipment. System runs from 10 feet outside building and terminates with stack vents through the roof.
- B. A separate Grease Waste System starting with connection to an exterior concrete grease interceptor running thru the kitchen and server area fixtures and terminating with a vent terminal through the roof. Point of use grease interceptors are to be provided at designated kitchen fixtures. The exterior grease interceptor is provided under Division 33 scope.
- C. Storm Drainage system is provided to drain all roofs with roof drains piped through the building to a point 10 feet outside the building.

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- D. Drainage system piping will be service weight cast iron piping; hub and spigot with gaskets for below grade; no hub with gaskets, bands and clamps for above grade 2 in. and larger. Waste and vent piping 1-1/2 in. and smaller will be type 'L' copper.
- E. A separate Special Waste System shall be provided starting with a connection to an interior limestone chip acid neutralizer, running thru the building to collect science classroom fixtures and terminating with vent terminals through the roof. Special Waste and Vent piping will be Schedule 40 electric heat fused polypropylene piping, fittings and traps, flame retardant above grade and non-flame retardant below ground.
- F. In existing buildings, existing drainage piping may be reused if adequately sized for intended use. Integrity of existing piping will be confirmed via video inspection.

5. WATER SYSTEM

- A. New 4 inch domestic water service from the municipal water system will be provided. A meter and backflow preventer will be provided.
- B. Cold water distribution main is provided. Non-freeze wall hydrants with integral back flow preventers are provided along the exterior of the building.
- C. Domestic hot water heating will be provided with a combination of gas fired, high efficiency, condensing water heater (800,000 BTUH input), with separate storage tank (300 gallon). System is to be equipped with thermostatically controlled mixing devices to control water temperature to the fixtures.
- D. A pump will re-circulate hot water from the piping system. Water temperature will be 120 deg. to serve general use fixtures. A 140 deg. F hot water will be supplied to the kitchen dishwasher.
- E. Water piping will be type 'L' copper with wrought copper sweat fittings, silver solder or press-fit system. All piping will be insulated with 1 in. thick high density fiberglass.
- F. A dedicated non-potable cold and hot water system will be provided to Science Classrooms. Water system will be protected with a reduced pressure backflow preventer. A dedicated tank type water heater will be provided to deliver hot water to all Science Classroom sinks.
- G. Tepid (70 deg. F – 90 deg. F) water will be provided to the emergency shower/eyewash fixtures in Science Classrooms as required by code.

6. GAS SYSTEM

- A. Natural gas service will be provided for the building and will serve the boilers, domestic water heaters, kitchen cooking equipment, roof top equipment.
- B. Gas piping will be Schedule 40 black steel pipe with threaded gas pattern malleable fittings for 2 in. and under and butt welded fittings for 2-1/2 in. and larger.

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7. **FIXTURES *LEED v4 for Schools Credit WEp1 & WEc3***

- A. Furnish and install all fixtures, including supports, connections, fittings, and any incidentals to make a complete installation.
- B. Fixtures shall be the manufacturer's guaranteed label trademark indicating first quality. All acid resisting enameled ware shall bear the manufacturer's symbol signifying acid resisting material.
- C. Vitreous china and acid resisting enameled fixtures, including stops, supplies and traps shall be of one manufacturer by Kohler, American Standard, or Sloan, or equal. Supports shall be Zurn, Smith, Josam, or equal. All fixtures shall be white. Faucets shall be Speakman, Chicago, or equal.
- D. Fixtures shall be as scheduled on drawings.
 - 1. Water Closet: High efficiency toilet, 1.28 gallon per flush, wall hung, vitreous china, siphon jet. Manually operated 1.28 gallon per flush-flush valve.
 - 2. Urinal: High efficiency 0.13 gallon per flush urinal, wall hung, vitreous china. Manually operated 0.13 gallon per flush-flush valve.
 - 3. Lavatory: Wall hung/countertop ADA lavatory with 0.35 GPM metering mixing faucet programmed for 10 second run-time cycle.
 - 4. Sink: ADA stainless steel countertop sink with gooseneck faucet and 0.5 GPM aerator.
 - 5. Drinking Fountain: Barrier free hi-low wall mounted electric water cooler, stainless steel basin with bottle filling stations.
 - 6. Janitor Sink: 24 x 24 x 10 Terrazo mop receptor Stern-Williams or equal.
 - 7. Laboratory Sinks: Faucets with vacuum breakers and 0.74 GPM aerators.
 - 8. Emergency Shower/Eyewash: Recessed barrier free eye wash and shower safety station with ceiling mounted exposed shower and "in wall" drop-down eye wash with drain pan.

8. **DRAINS**

- A. Drains are cast iron, caulked outlets, nickaloy strainers, and in waterproofed areas and roofs shall have galvanized iron clamping rings with 6 lb. lead flashings to bond 9 in. in all directions. Drains shall be Smith, Zurn, Josam, or equal.

9. **VALVES**

- A. Locate all valves so as to isolate all parts of the system. Shutoff valves 3 in. and smaller shall be ball valves, solder end or screwed, Apollo, or equal.

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10. INSULATION

- A. All water piping shall be insulated with snap-on fiberglass insulation Type ASJ-SSL, equal to Johns Manville Micro-Lok HP.

11. CLEANOUTS

- A. Cleanouts shall be full size up to 4 in. threaded bronze plugs located as indicated on the drawings and/or where required in soil and waste pipes.
- B. Cleanouts for Special Waste System shall be Zurn #Z9A-C04 polypropylene cleanout plug with Zurn #ZANB-1463-VP nickel bronze scoriated floor access cover.

12. ACCESS DOORS

- A. Furnish access doors for access to all concealed parts of the plumbing system that require accessibility. Coordinate types and locations with the Architect.

13. WATER HEATER

- A. Gas fired, high efficiency, condensing water heaters (800,000 BTUH input), with separate storage tank (300 gallon).

14. GREASE INTERCEPTOR

- A. The kitchen Grease Waste System shall be a completely separate system beginning at the exterior grease interceptor through the kitchen and vented individually through the roof. Do not connect soil lines to the grease waste nor sanitary vents to the grease vent. Furnish and install the cast iron tees and associated piping within the grease trap including 5-foot length on the outlet. All the piping within the grease trap shall be made up with caulked and leaded joints. Install an exterior cleanout as detailed at the point where the line leaves the kitchen area. Grease trap is furnished and set in place including manhole access covers by the General Contractor.

PLUMBING
OUTLINE SPECIFICATION
SCHEMATIC DESIGN

D. SERVICES

D20: PLUMBING

D2010 - Plumbing Fixtures

Fixtures:

Furnish and install all fixtures, including supports, connections, fittings, and any incidentals to make a complete installation.

Fixtures shall bear the manufacturer's guaranteed label trademark indicating first quality. All acid resisting enameled ware shall bear the manufacturer's symbol signifying acid resisting material.

Vitreous china and acid resisting enameled fixtures, including stops, supplies and traps shall be of one manufacturer by Kohler, American Standard, or Eljer. Supports shall be Zurn, Smith, or Josam. All fixtures shall be white. Faucets shall be Toto, Speakman, Symmons, or Chicago.

Fixtures shall be as scheduled on drawings.

- Water Closet: High efficiency toilet, 1.28 gallon per flush, wall hung, vitreous china, siphon jet. Battery operated 1.28 gallon per flush-flush valve.
- Urinal: High efficiency 0.13 gallon per flush urinal, wall hung, vitreous china. Battery operated 0.13 gallon per flush-flush valve.
- Lavatory: Wall hung/countertop ADA lavatory with 0.35 GPM metering mixing faucet.
- Sink: ADA stainless steel countertop sink with Chicago 201A faucet and 0.5 GPM aerator.
- Drinking Fountain: Barrier free hi-low wall mounted electric water cooler, stainless steel basin with bottle filling stations.
- Janitor Sink: 24 x 24 x 10 Terrazo mop receptor Stern-Williams or equal.
- Laboratory Sinks: Faucets with vacuum breakers and 0.74 GPM aerators.

D2020 – Domestic Water Distribution

Valves:

Locate all valves so as to isolate all parts of the system.

Shutoff valves 3" and smaller shall be ball valves, solder end or screwed.

Fuel gas valves shall be ball valves with tee handle, screwed end for 2-1/2" and smaller, and lubricated iron body plug cocks for 3" and larger.

Valves shall be by Apollo, Nibco, Watts or Rockwell.

Insulation:

All water piping shall be insulated with snap-on fiberglass insulation Type ASJ-SSL, equal to Certainteed 850 System, Owens Corning or Knauf.

Water Heater:

Condensing Gas-fired, tank-type water heater with storage tank. Equipment to be manufactured by HTP Products, Lochinvar, Laars, or approved equal.

D2030 – Sanitary Waste

Piping and Fitting:

Soil, Waste and Vent, Kitchen Waste and Vent, and Storm drainage piping to 10' outside shall be hubless cast iron pipe and fittings for 2" and above and shall be Type 'L' copper with cast D.W.V. type fittings for 1-1/2" and smaller.

Special Waste & Vent Schedule drainage piping to 10' outside the building shall be Schedule 40 electric heat fused non-flame retardant poly-propylene piping, fittings shall be Schedule 40 polypropylene fittings with electrical resistance heat fusion joints.

Potable and Non-Potable cold and hot water system water piping shall be Type 'L' hard tempered copper tubing with wrought copper fittings and silverbrite lead-free solder joints.

Fuel gas piping shall be Schedule 40, ASTM A-53, black steel with threaded malleable iron gas pattern fittings for gas piping.

Cleanouts:

Cleanouts shall be full size up to 4"; threaded bronze plugs located as indicated on the drawings and/or where required in soil, waste and storm pipes.

Drains:

Drains shall be cast iron, caulked outlets, nickaloy strainers, and in waterproofed areas and roofs shall have galvanized iron clamping rings with 6 lb. lead flashings to bond 9" in all directions. Drains shall be Smith, Zurn, or Josam.

D2090 – Other Plumbing Systems

Workmanship and Installation Methods:

All work shall be installed in a first-class manner consistent with the best current practices.

All piping shall be installed true to line and grade, shall be grouped together, be parallel to each other. Utilize gang hangers wherever feasible. Group all valves together where feasible.

Guarantee all work free from defects in workmanship and materials for a period of one year from the date of final acceptance of the Building.

Cleaning and Protection:

Protect all materials and equipment during shipment and installation, and properly handle and store at the job site so as to prevent damage, and upon completion of this work, clean all fixtures and equipment and replace damaged parts.

Sleeves and Escutcheons:

Furnish and install in masonry walls and floors, galvanized steel sleeves as required.

Testing:

Test all work in the presence of the Architect and/or Engineer and as required by local codes.

Chlorination:

Upon completion of the plumbing work, thoroughly chlorinate the entire domestic water system before putting same in service.

Access Doors:

Furnish access doors for access to all concealed parts of the plumbing system that require accessibility. Coordinate types and locations with the Architect.

END OF SECTION

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HVAC SYSTEMS

NARRATIVE REPORT

The following is the HVAC Systems narrative, which defines the scope of work and capacities of the HVAC systems, as well as, the Basis of Design for the proposed Middle School.

1. CODES

All work installed under Division 230000 shall comply with the Massachusetts State Building Code, IMC 2012, IECC 2015, and all local, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

The work of Division 230000 is described within the narrative report. The HVAC project scope of work shall consist of providing new HVAC equipment and systems as described here within. All new work shall consist of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Heating, Ventilating and Air Conditioning work and all items incidental thereto, including commissioning and testing.

3. BASIS OF DESIGN

Project weather and Code temperature values are listed herein based on weather data values as determined from ASHRAE weather data tables and the International Energy Conservation Code.

Outside: Winter 5 deg. F, Summer 88 deg. F DB 73 deg. F WB

Inside: 70 deg. F +/- 2 deg. F for heating, 75 deg. F +/- 2 deg. F (50% +/- 5%RH) for cooling for [classroom, administration, auditorium, cafeteria and gymnasium] areas with full air conditioning. 80 deg. F +/- 2 deg. F (55% RH) for cooling for [locker and kitchen] areas with partial air conditioning/dehumidification ventilation. Unoccupied temperature setback will be provided at 60 deg. F (adj.) for heating and 80 deg. F. (adj.) for cooling.

Generally outside air is provided at the rate of 15 cfm/person in all classrooms and large group spaces, and 15 cfm/person for the combination Auditorium, Gymnasium and Cafeteria. In all cases ASHRAE guide 62.1-2013 and the International Mechanical Code will be met as a minimum. All occupied areas will be designed to maintain 800 PPM carbon dioxide maximum.

The building HVAC system shall be designed as a high efficiency HVAC system that shall meet the related HVAC system requirements of LEED for Schools v4, with a minimum goal of Silver level certification.

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4. SYSTEM DESCRIPTION

A. Central Heating Plant:

Heating for the entire building will be through the use of a high efficiency gas-fired condensing Boiler Plant.

The Boiler Plant shall be provided with (3) 2,700 MBH input boilers and (2) end suction base mounted pumps with a capacity of 790 GPM each which will be located in a mechanical room. In addition to new boilers and pumps, new hot water accessories including air separators and expansion tanks shall be provided.

The Boiler Plant will supply heating hot water to heating equipment and systems located throughout the building through a two-pipe fiberglass insulated schedule 40 black steel piping system. The Boiler Plants shall supply a maximum hot water temperature of 160 deg F on a design heating day and the hot water supply water temperature will be adjusted downward based on an outside temperature reset schedule to improve the overall operating efficiency of the power plants. Primary and standby end suction base mounted pumps will be provided with variable frequency drives for variable volume flow through the water distribution system for improved energy efficiency.

Combustion air for each boiler will be directly ducted to each boiler through a galvanized ductwork distribution system. Venting from each boiler shall be through separate double wall aluminized stainless steel (AL29-4C) vent system and shall discharge approximately 12 feet above the roof level. Final venting height will be dependent on the location of building intake air locations and adjacent roofs.

B. Central Cooling Plant:

Chilled water cooling for the majority of the building will be through the use of a high efficiency air cooled chiller plant.

The chiller plant shall be provided with (2) high efficiency oil-less magnetic compressor air cooled design chillers and (2) chilled water end suction base mounted pumps with VFD drives. The chillers will be mounted on the roof and the pumps and chilled water accessories will be located in a penthouse mechanical enclosure. In addition to new boilers and pumps, new chilled water accessories including air separators and expansion tanks shall be provided.

The chiller plant will supply chilled water to air conditioning air handling unit equipment located throughout the building through a two-pipe fiberglass insulated schedule 40 black steel piping system. Primary and standby end suction base mounted pumps will be provided with variable frequency drives for variable volume flow through the water distribution system for improved energy efficiency.

The chiller plant shall be provided with (2) 175 ton chillers and (2) chilled water end suction base mounted pumps with a capacity of 800 GPM each.

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- C. Mechanical Equipment Rooftop Enclosure: The Hot water heating plant including all boilers, hot water heating pumps, air separator, expansion tanks, accessories and plant controllers shall be installed in a mechanical equipment rooftop enclosure. The Rooftop enclosure shall also contain the building chilled water pumps, expansion tanks, air separator, accessories and chiller plant controller, building DHW heater, main DHW circulators and DHW controller. Refer to HVAC Outline specifications and narratives for specific equipment and material product and installation requirements.
- D. Classroom Heating and Ventilation (General Classrooms, including SPED, Art, Music, Maker Space, Fab Lab, Tech, Learning Commons/Cafeteria, and Media Center areas):

Rooftop air handling units, with roof penthouse service enclosure, supply and return fan with VFDs, static plate type energy recovery section, hot water heating section with modulating capacity control, chilled water cooling coil with modulating capacity control, static plate reheat section, MERV 13 filtration, variable air volume and carbon dioxide controls which will reduce outside air as allowed maintaining a maximum of 800 PPM and will be provided to serve a full air conditioning displacement ventilation system. Supply air will be provided to the space through a galvanized steel supply duct distribution system and shall be connected to VAV (variable air volume) terminal boxes and wall mounted displacement ventilation diffusers located within the classrooms. Return air will be drawn back to the units by ceiling return air registers located within the classroom and will be routed back to the rooftop unit by a galvanized sheetmetal return air ductwork distribution system. Supplemental hot water radiation heating will be provided along exterior walls.

Classrooms with Displacement Ventilation and Full Air Conditioning:

The classroom space temperature would be controlled to 75 deg. F. +/- 2 deg F, based on a design cooling day of 88 deg F db/73 deg f. wb.

The following rooftop air handling equipment will be required to serve the Classroom areas to provide full air conditioning:

Four (4) air handling units with a capacity of 22,000 CFM (70 tons cooling, 680 MBH heating)

- E. Gymnasium:

The Gymnasium will be served by a rooftop air handling unit, with roof penthouse service enclosure, supply and return fan with VFDs, static plate type energy recovery section, hot water heating section with modulating capacity control, chilled water cooling coil, static plate reheat section, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed maintaining a maximum of 800 PPM and will be provided to serve a full air conditioning displacement ventilation system. Supply air will be provided to the space through a galvanized steel supply duct distribution system and shall be connected to wall mounted displacement ventilation diffusers located within the Gymnasium. As levels of carbon dioxide drop, generally relating to a reduction in population, the variable frequency drive located in the rooftop unit will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the unit by ceiling return air registers located within the Gymnasium and will be routed back to the rooftop unit by a galvanized sheetmetal return air ductwork distribution system. Supplemental hot water radiation heating will be provided along exterior walls.

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The Gymnasium will be served by (1) one rooftop air handling unit that will have a capacity of 15,000 CFM (40 Tons Cooling, 500 MBH Heating).

F. Locker Rooms and PE/Health Offices:

The Locker Rooms and adjacent office areas will be provided with new roof-mounted air handling units, with roof penthouse service enclosure, of the 100% outside air design with static plate energy recovery section. The unit will be approximately 3,500 CFM and will include a supply and exhaust fan with VFDs, 200 MBH hot water heating section with modulating capacity control, chilled water cooling for dehumidification, static plate type energy recovery and reheat sections and MERV 13 filtration.

Supply air ventilation will be provided to each space through new galvanized supply duct which will travel throughout the area to a series of ceiling mounted supply registers. New exhaust air ductwork and air distribution devices shall be installed and shall be routed from the rooms to the new air handling units.

G. Auditorium and Stage:

The Auditorium and Stage will be provided with a new roof-mounted air handling unit, with roof penthouse service enclosure, of the recirculation design capable of providing 100% outside air variable volume fully air conditioned displacement ventilation air distribution to the Auditorium and Stage areas. The Auditorium unit will be approximately 12,000 CFM and will include supply and return fans with VFDs, 600 MBH hot water heating section with modulating capacity control, 40 ton cooling coil with modulating capacity control, static plate energy recovery and reheat sections, and MERV 13 filtration.

Supply air ventilation to the Auditorium will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers under the seating. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population, the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the unit by return air registers located high on walls within the space or near the ceiling of the space. Supplemental hot water radiation heating will be provided along exterior walls.

H. Administration Area, Guidance Offices and adjacent Lobby/Circulation areas

Spatial heating and air-conditioning for the Administration area and Guidance offices will be served by variable volume air system with perimeter radiant heating panels. The system will be of a recirculation design with CO2 demand ventilation capable of providing 100% outside air (economizer) and variable air volume operation full air conditioning displacement ventilation air distribution.

One (1) rooftop unit will be provided; the rooftop unit will be approximately 6,000 CFM and will include roof penthouse service enclosure, supply and return fans with VFDs, 300 MBH hot water heating section with modulating capacity control, static plate type energy recovery and reheat sections, MERV 13 filtration, 21 ton capacity chilled water cooling coil with modulating capacity control, and exhaust air energy recovery section. Supply air

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ventilation will be provided to each space that will satisfy building code requirements based on population.

It is proposed that spatial heating and air-conditioning for zones will be provided by a full air conditioning displacement air ventilation system with CO2 demand ventilation controls. Supplemental hot water radiation heating will be provided along exterior walls.

I. Kitchen:

The Kitchen areas shall be provided with a new Kitchen exhaust air fan and make-up air rooftop unit with hot water heating. The Kitchen will be heated by a roof mounted heating and ventilation make-up air handling unit with hot water heating and chilled water dehumidification (partial cooling).

A variable volume Kitchen exhaust hood control system consisting of Kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives, and associated controller will be provided by the Kitchen Equipment Vendor. This system installation shall be field installed and coordinated with the ATC and Electrical Contractors.

J. Lobby, Corridor, and Entry Way Heating:

New hot water convectors, cabinet unit heaters and fin tube radiation heating equipment shall be installed to provide heating to these areas. Corridors shall be ventilated from adjacent air handling unit systems.

K. Custodial Support / Mechanical Room / Adjacent Storage Areas:

Custodial support areas will be heated and ventilated by an indoor hot water heating and ventilation unit. The heating and ventilation unit will have an estimated capacity of 3,500 CFM. Storage areas will be heated by hot water radiation heating equipment. Horizontal type unit heaters will heat areas adjacent to the loading dock. All custodial closets will be exhausted by exhaust air fan systems.

L. Utility Areas:

Utility areas will be provided with exhaust air fan systems for ventilation, and will typically be heated with horizontal type ceiling suspended unit heaters.

The Main Electric Rooms and IDF Rooms will be air conditioned by high efficiency ductless AC cooling units.

M. Atrium Smoke Exhaust System

A smoke exhaust and control evacuation system will be provided for the atrium. The system, including all equipment and control components, shall be interlocked to the building fire alarm system and shall be powered by emergency power. The system shall consist of roof mounted smoke exhaust duty rated fans, ductwork, dampers and associated controls. The system shall be designed to purge smoke exhaust from the top of the Atrium. Make-up air shall be provided at the lower first and second floor levels through the use of operable doors and/or windows with automatic operators that shall

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also be connected to the smoke control system.

The Atrium smoke control system design shall be modeled and reviewed by a third-party consultant. As part of the third party's design review CFD and fire dynamic modeling shall be performed to determine the proper smoke exhaust system equipment sizing. After the system is installed, the smoke control system operation shall be tested and verified by a third-party consultant to ensure proper system operation.

N. Testing, Adjusting, Balancing & Commissioning:

All new HVAC systems shall be tested, adjusted, balanced and commissioned as part of the project scope.

O. Automatic Temperature Controls – Building Energy Management System:

A new DDC (direct digital control) automatic temperature control (ATC) and building energy management (BEMS) system shall be installed to control and monitor building HVAC systems. The building lighting control system shall also be integrated into the new building energy management system. Energy metering shall be installed to monitor the energy usage of building HVAC systems and utilities (fuel, gas, water). A building energy dashboard system and kiosk shall be provided to display building energy and water usage. The new building energy management system shall be provided by Advanced Energy Management Systems.

HVAC

OUTLINE SPECIFICATION

SCHEMATIC DESIGN

D. SERVICES

D30: HVAC

D3000 – General Requirements

Codes

All work installed under the HVAC Section shall comply with the City of Framingham Building Code and all state, county, and federal codes, laws, statutes, and authorities having jurisdiction.

Design Intent and System Description

The work of this Section is shown on the drawings. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Heating, Ventilating and Air Conditioning work and all items incidental thereto, including commissioning and testing.

Capacities of systems and equipment are indicated in the attached HVAC system narrative.

General

Materials and equipment furnished under this section shall be new, unused, first quality of a manufacturer of established reputation.

D3020 - Heat Generating Systems

Boilers:

High efficiency gas fired condensing hot water boilers. Power burners shall be fully modulating. Boiler shall have a minimum efficiency of 93% per DOE 10 CFR 431.86 testing procedures for commercial packaged boilers

Manufacturer: Subject to compliance with the above, provide high efficiency gas fired condensing boiler of one of the following:

- Lochinvar
- Aerco
- Fulton
- Or equal

Auxiliary Equipment:

Pumps:

Base mounted bronze fitted with high efficiency electric motor. Provide primary and stand-by pump for each system with automatic alternator and VFDs.

Available Manufacturers: Subject to compliance with the contract documents provide pumps of the following manufacturer:

- Bell & Gossett
- Taco
- Armstrong
- Or equal

Piping and Fittings:

Hydronic piping shall be Schedule 40 ASTM A-53, black steel pipe with butt welded ends and fittings on 3" and above and threaded ends and fittings on 2-1/2" and smaller. At the contractor option type "L" copper may be used on all 2-1/2" and smaller.

Valves:

All valves shall be bronze, brass, or cast iron as system design requires. Locate all valves so as to isolate all parts of the system and as required for normal system operation.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide valves of the following manufacturer:

- Milwaukee
- Stockham
- Nibco
- Or equal

System Identification:

Provide markers on all piping, equipment, and ductwork. Tag all valves in system with corresponding valve lists.

Insulation:

All piping shall be insulated with snap-on fiberglass insulation with all service jacket. Fittings shall be insulated with snap on pre-molded covers with loose fill fiberglass insulation.

All HVAC supply and return ductwork shall be insulated with 1.5" thick fiberglass blanket (min. R-6 insulation) with a foil vapor barrier. All outside air intake ductwork shall be insulated with 2" (min. R-8 insulation) rigid fiberglass with foil vapor barrier.

D3030 – Cooling (Chilled Water) Generating Systems

Air Cooled Chillers:

High efficiency oil-less compress design Mag-Lev/TurboCor or equal compressor design chillers with turn down to 15% of cooling load.

Manufacturer: Subject to compliance with the above, provide high efficiency gas fired condensing boiler of one of the following:

- Smardt
- MultiStack
- ArticChill
- Or equal

Auxiliary Equipment:

Pumps:

Base mounted bronze fitted with high efficiency electric motor. Provide primary and stand-by pump for each system with automatic alternator and VFDs.

Available Manufacturers: Subject to compliance with the contract documents provide pumps of the following manufacturer:

- Bell & Gossett
- Taco
- Armstrong
- Or equal

Piping and Fittings:

Hydronic piping shall be Schedule 40 ASTM A-53, black steel pipe with butt welded ends and fittings on 3" and above and threaded ends and fittings on 2-1/2" and smaller. At the contractor option type "L" copper may be used on all 2-1/2" and smaller.

Valves:

All valves shall be bronze, brass, or cast iron as system design requires. Locate all valves to isolate all parts of the system and as required for normal system operation.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide valves of the following manufacturer:

- Milwaukee
- Stockham
- Nibco
- Or equal

System Identification:

Provide markers on all piping, equipment, and ductwork. Tag all valves in system with corresponding valve lists.

Insulation:

All piping shall be insulated with snap-on fiberglass insulation with all service jacket. Fittings shall be insulated with snap on pre-molded covers with loose fill fiberglass insulation.

D3035 – Mechanical Equipment Rooftop Enclosure

The Hot water heating plant including all boilers, hot water heating pumps, air separator, expansion tanks, accessories and plant controllers shall be installed in a factory fabricated mechanical equipment rooftop enclosure. The Rooftop enclosure shall also contain the building chilled water pumps, expansion tanks, air separator, accessories and chiller plant controller, building DHW heater, main DHW circulators and DHW controller.

Refer to HVAC Outline specifications and narratives for specific equipment and material product and installation requirements.

The mechanical enclosure shall meet the following requirements:

All mechanical and related electrical equipment shall be housed inside a factory fabricated double wall enclosure that incorporates a structural steel base, wall and roof framework.

The components of the enclosure shall meet the following requirements:

Floor: shall be a minimum of 3/16 in. steel checker plate.

Exterior Panels: Wall and roof panels shall be fabricated from 16ga. satin coat steel and sealed with an individual strip of ½ in. x 3/8 in. tape sealer. Wall panel shall be 2 in. thick with seams turned inward to provide flush exterior finish. Exterior roof panels shall be 4 in. thick. Wall and roof exterior panels shall wrap around wall and roof structural framework to ensure thermal break.

Structural Steel Base: When used with an enclosure, the perimeter members shall be, at a minimum, 8 in.x6 in.x0.188 in. hollow structural steel tube (HSS) and shall enable the installing contractor to shim the unit at 12 foot spans on site. The use of a c-channel or flanged steel perimeter is permitted provided the base is at least 12 in. deep.

Wall and Roof Structural Steel Framework: an integral structural steel framework of hollow structural steel shall support the walls and roof. The framework members shall be, at a minimum, 3 in.x3 in.x0.188 in. HSS at 10-foot centers. The roof steel shall also support all pipe in the Packaged System higher than four feet from the floor or base level. The framework shall be primed and finish painted using the paint system described in this section. Color selection by architect. Color as selected by Architect

Roof Mounted Lifting Lugs: If an enclosure is required and the package is to be split for shipping, then the wall and roof structural steel framework will be extended through the roof of the enclosure and incorporate lifting lugs so that the entire package can be lifted from the roof – no exceptions.

Interior Wall Panels: Interior walls panels shall be a minimum of 2 in. thick fabricated from a minimum of 22 ga. galvanized steel. The wall interior panel joints shall run horizontal (or 90 deg. to the exterior panels) to provide an acoustic break, and overlapped to be suitable for washing with a pressure washer or steam cleaned without risk of wetting the insulation. The wall panel shall be installed over top of the floor water dam such that any water run-off will drip onto the water-tight floor.

Insulation: Wall and roof shall be insulated with no less than 4 in. of 4.5 Lb/cu.ft density rigid or semi-rigid board type insulation equivalent to R-16. Floor insulation thickness will be no less than (i) the smallest structural steel member used to support the floor or (ii) 4 in., and shall have a minimum insulating value of R-16. All insulation shall be rated non-combustible for continuous service at 1200F and shall be non-wicking with a moisture absorption rating of <1 percent.

Roof Covering: The roof covering shall be standing seam panels.

The enclosure shall have the following structural ratings:

A minimum snow/ sand load rating of 40 pounds per square foot.

A minimum wind load rating of 150MPH.

The enclosure panels shall be acoustically designed with a sound Transmission Loss (TL) rating. The TL values must be rated across the eight octave bands. Sound pressure levels shall be predictable from any distance from the enclosure when sound power levels from the sound generating equipment are known. Calculations that support the sound data shall be provided on request.

All bases, enclosure floors and exteriors are to be factory painted. Enclosure paint shall have weather resistant finish that will withstand 500 hour exposure to the salt spray test specified in ASTM B 117. Paint shall be applied and allowed to dry for a sufficient amount of time before shipping. The paint shall be a non-isocyanate enamel that produces a durable, chemically resistant coating similar to urethane. The vehicle type shall be a cross-linked acrylic with an oxygenated and aromatic hydrocarbon solvent. All exterior surfaces shall be wiped down with thinners and prepared with a zero induction epoxy primer before applying paint. All interior surfaces shall be prepared with a high build epoxy primer before applying paint.

Ventilation louver and damper: Install stationary, storm proof louver and motorized damper for forced ventilation of the enclosure. Louvers shall be 6 inches deep with extruded aluminum blades and frame and 19 gauge galvanized ½ in. x ½ in. bird screen. Damper blades shall be 4 inches deep, thermally broken with high-density polyurethane CFC injected insulation. Air leakage through a 48 in. x 48 in. damper shall not exceed 10.5 CFM/SQFT against 4 in. w.g. differential static pressure at standard air. Operating temperature range shall be -40 deg. to +200 deg.F. Supply an actuator to modulate the damper open or close.

Exhaust Fan: Exhaust fan system shall be installed for proper enclosure ventilation. Fan shall be enclosed in minimum 18 gauge galvanized steel wall housing with factory installed shutter and inlet guard.

Unit Heater: A hot water unit heater(s) shall be installed to maintain a minimum enclosure temperature of 70 deg F (adj) on a design heating day of 5 deg F.

AUTOMATED CONTROL SYSTEM

Provide clearance for ATC control panels.

ATC contractor shall furnish control valves, isolation valves, and bypass valves mounted in piping to enclosure manufacturer. Enclosure manufacturer shall install valves provided by ATC contractor.

ATC contractor to coordinate location of thermo wells. Enclosure manufacturer shall provide thermo wells at location determined by the ATC contractor.

Manufacturer: Subject to compliance with requirements, provide mechanical enclosure system of one of the following:

- EAS
- Epsilon
- MAFNA
- Or equal

D3040 - Distribution Systems

Air Distribution Systems:

Ductwork:

All ductwork shall be galvanized steel with all seams sealed. Entire ductwork system shall be fabricated and installed per SMACNA LOW PRESSURE DUCT CONSTRUCTION STANDARDS. All high velocity ductwork, between air handling unit and VAV box (where applicable), shall be spiral wound round and flat oval.

Displacement Diffusers:

All devices shall be steel welded construction with perforated face and intermittent baffle for equalization and shall have a baked enamel finish.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide displacement diffusers of the following manufacturer:

- Price
- Metalaire
- Titus

Exhaust Fans:

Exhaust fans shall be galvanized steel construction with centrifugal fan and belt or direct drive motor. Each roof unit shall be provided with 18" high pre-fab curb with motor operated damper in curb.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide exhaust fans of the following manufacturer:

- Greenheck
- Cook
- Twin City
- Or equal

Atrium Smoke Exhaust System

A smoke exhaust and control evacuation system will be provided for the atrium. The system, including all equipment and control components, shall be interlocked to the building fire alarm system and shall be powered by emergency power. The system shall consist of roof mounted smoke exhaust duty rated fans, ductwork, dampers and associated controls. The system shall be designed to purge smoke exhaust from the top of the Atrium. Make-up air shall be provided at the lower first and second floor levels through the use of operable doors and/or windows with automatic operators that shall also be connected to the smoke control system.

The Atrium smoke control system design shall be modeled and reviewed by a third-party consultant. As part of the third party's design review CFD and fire dynamic modeling shall be performed to determine the proper smoke exhaust system equipment sizing. After the system is installed, the smoke control system operation shall be tested and verified by a third-party consultant to ensure proper system operation.

Insulation:

All HVAC supply and return ductwork shall be insulated with 1.5" thick fiberglass blanket (min. R-5 insulation) with a foil vapor barrier. All outside air intake ductwork shall be insulated with 2" (min. R-8 insulation) rigid fiberglass with foil vapor barrier.

D3045 – Air Handling Units

Indoor and Rooftop Air Handling Units (HVAC 100% O.A.)

All units shall be of the draw thru 100% outdoor air design and shall be provided with hot water heating coil, chilled water cooling coil, static plate type total energy recovery section, static plate type reheat section, filters (MERV-14), dampers, and centrifugal supply and return air fan with motor.

Outdoor units shall be provided with a pre-fabricated penthouse with service corridor manufactured by the unit manufacturer.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:

Annexaire
Haakon
EAS
Or equal

Make-Up Air Units:

All units shall be of the draw thru 100% outdoor air design and shall be provided with filters (MERV-13), dampers, and centrifugal supply and return air fan with motor.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:

Annexaire
Valent
Greenheck
Or equal

D3050 - Terminal & Package Units

VAV (Variable Air Volume) Terminal Boxes:

VAV Terminal Boxes shall be single duct style with three foot sound trap.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:

- Price
- Metalaire
- Nailor
- Or Equal

Radiant Heating Panels:

Radiant panel shall be manufactured utilizing extruded aluminum strips of approximately 0.115 overall thickness. The strips shall have a minimum 0.495 I.D. copper tube firmly attached to aluminum extrusion under all operating temperature conditions. Ends of tubes shall be swaged to 0.569 I.D. for proper soldering fit of ½ inch Type "L" soft copper tubing.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide fin-tube radiation of the following manufacturer:

- Rittling
- Sterling
- TWA
- Or equal

Unit Heaters:

Horizontal or cabinet type with exact locations to be determined. All units shall be provided with fan and aquastat control.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide unit heaters of the following manufacturer:

- Rittling
- Sterling
- Price
- Or equal

Wall Mounted Radiators:

Commercial radiators are manufactured of cold rolled low carbon steel, fully welded and consisting of header pipes at each end, connected by flat oval water tubes. Radiator shall have a baked enamel factory finish. All units shall be provided with end covers, and splice pieces for a complete installation.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide fin-tube radiation of the following manufacturer:

- Sterling
- Runtal
- Rittling
- Or equal

Fin Tube Radiation:

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide fin-tube radiation of the following manufacturer:

- Vulcan
- Sterling
- Rittling
- Or equal

D3060 - HVAC Instrumentation & Controls

Automatic Temperature Controls:

System shall be an open protocol (BACNet based), we accessible, direct digital control and building energy management system with front end to provide complete automatic temperature control and monitoring of newly installed HVAC system with integration into the City's School building energy management system

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide automatic temperature controls of the following manufacturer:

- Components (Honeywell, Distech, or Equal)
- BMS System (American Energy Management, or Equal)
- Or Equal

D3070 - Systems Testing & Balancing

Testing, Adjusting, Commissioning, and Balancing:

Requirements include measurement and establishment of the quantities of the mechanical systems as required to meet specifications, and recording and reporting the results. Test, adjust and balance the following mechanical systems:

- Supply air systems.
- Return air systems.
- Exhaust air systems.
- Outside air systems.
- Hydronic heating systems.
- Verify temperature control system operation.

Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders.

An independent testing, adjusting, and balancing agency certified by the AABC or NEBB as a Test and Balance Engineer in those testing and balancing disciplines required for this project.

D3090 - Other Special HVAC Systems and Equipment

Workmanship and Installation Methods

All work shall be installed in a first-class manner consistent with the best current practices.

All piping shall be installed with slope for proper drainage shall be grouped together, and be parallel to each other. Utilize gang hangers wherever feasible. Group all valves together where feasible.

Cleaning and Protection

Protect all materials and equipment during shipment and installation, and properly handle and store at the job site so as to prevent damage, and upon completion of this work, clean all fixtures and equipment and replace damaged parts.

Sleeves and Escutcheons

Furnish and install in masonry walls and floors, galvanized steel sleeves as required. Provide escutcheons where sleeves and pipe penetrations are exposed to view.

Firesafing

At all sleeved walls and floors provide firesafe caulking, packing, blanket etc., for a completely tight system to prevent the passage of smoke and fire.

Operation Manuals and Maintenance Manuals:

Refer to the contracts specifications for a complete outline of all requirements of operations and maintenance data.

Record Drawings and Control Documents:

Refer to the contracts specifications project record documents for a complete description of all requirements of recording as built record documents.

END OF SECTION

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ELECTRICAL SYSTEMS

NARRATIVE REPORT

The following is the Electrical Systems narrative, which defines the scope of work and capacities of the Power and Lighting systems, as well as, the Basis of Design. The Electrical systems shall be designed and constructed for **LEED v4** where indicated on this narrative. This project shall conform to LEED Silver rating.

1. CODES

All work installed under Section 260000 shall comply with the International Building Code (IBC) as amended by Massachusetts and all local, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

The work of Section 260000 is indicated in this narrative report. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Electrical work and all items incidental thereto, including commissioning and testing.

3. SEQUENCE OF OPERATIONS AND INTERACTIONS

- A. Classroom and Corridor lighting will be controlled via “addressable relays”, which is achieved through programming networked controls. The control of the relays will be by automatic means, such as an occupancy sensor in each classroom. The system will have a BacNet gateway and will be interfaced with the DDC control system for schedule functions. The controllability shall be in conformance with associated LEED credit in indoor environmental quality.
- B. Automatic control of receptacles based on occupancy will be provided for at least 50% of the receptacles. Installed in private offices, open offices, and computer classrooms. Controlled receptacles will be marked per NEC 406.3 (E).
- C. Exterior lighting will be controlled by photocell “ON” and “scheduled” for “OFF” operation. The parking area lighting will be controlled by “zones” with dimmable capability.
- D. Emergency and Exit lighting will be run through life safety panels to be “ON” during normal power conditions, as well as, power outage conditions. The emergency lighting system will have time control so that lights are “ON” only when building is occupied.

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4. DESCRIPTION OF THE SYSTEMS

A. Electrical Distribution System:

1. Service ratings for the building are designed for a connected load of 10 watts/S.F. The service capacity will be sized for 2,500 Amperes with a 100% rated main breaker. The main buss will be sized at 3,000 Amperes and will have an available space provision at the end of the gear to accommodate a future grid connected photovoltaic array. The switchboard will be furnished with a service entrance transient voltage surge protection device (SPD) rated at 240 kA and digital metering unit to monitor voltage, current, power factor, demand KW and with a data communication port for interface with BMS. Main switchboards short circuit rating with a data communication port for interface with BMS. Main switchboards short circuit rating will be coordinated with the Utility Company but it is estimated to be 65 KAIC.

B. Interior Lighting System:

1. Classroom lighting fixtures consist of ceiling mounted indirect LED luminaires with dimming drivers. The fixtures will be pre-wired for dimming control where natural daylight is available and also for multi-level switching. Office lighting fixtures will consist of similar fixtures to classrooms. Offices on the perimeter with windows shall have daylight dimming controls.

In general, lighting power density will be 30 percent less than IECC 2015. The power density reduction relates to **LEED v4 for Schools**.

2. Lighting levels will be approximately 30 foot candles in classrooms and offices. The daylight dimming footcandle level will be in compliance with **LEED v4 for Schools**.
3. Gymnasium lighting will be comprised of indirect LED fixtures with dimming drivers. The fixtures will be provided with protective wire guards. The light level will be designed for approximately 50 foot candles.

Daylight dimming will be provided within 15 feet of skylights or glazing. Daylight dimming controls will be similar in operation to classrooms.

4. Corridor lighting will be comprised of linear indirect lighting using LED light source. The corridor light level will be designed for approximately 15 foot candles. Corridor lighting will be on a schedule through the DDC system control and only "on" during occupied hours. The corridor lighting will have two level control.
5. Auditorium lighting will be cove pendant LED fixtures with DMX dimming drivers. The light levels will be designed for approximately 20 foot candles.
6. Cafeteria lighting will consist of cove mounted LED linear fixtures with dimming drivers.

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7. Kitchen and Servery lighting will consist of recessed 2 ft. x 2 ft. lensed gasketed LED panels. Light levels will be approximately 50 foot candles.
 8. Library lighting will consist of indirect LED fixtures and dimming drivers. Light levels will be approximately 30 foot candles.
 9. Each area will be locally switched and designed for multi-level controls. Each classroom, office space and toilet rooms will have an occupancy sensor to turn lights off when unoccupied. Daylight sensors will be installed in each room where natural light is available for dimming of light fixtures. Corridors will have occupancy sensors for shutdown of lighting, similar to classrooms.
 10. The entire school will be controlled with an automatic lighting control system using the DDC control system for schedule programming of lights.
- C. Emergency Lighting System:
1. An exterior roof mounted 250 kW natural gas fueled emergency generator with sound attenuated housing will be provided. Light fixtures and LED exit signs will be installed to serve all egress areas such as corridors, intervening spaces, toilets, stairs and exit discharge exterior doors. The administration area lighting will be connected to the emergency generator.
 2. The generator will be sized to include life safety systems, legally required systems (smoke evacuation) and optional standby systems including boilers and circulating pumps, communications systems and kitchen refrigeration.
- D. Site Lighting System:
1. Fixtures for area lighting will be pole mounted cut-off 'LED' luminaries in the parking area and roadways. The exterior lighting will be connected to the automatic lighting control system for photocell on and timed off operation. The site lighting fixtures will be dark sky compliant. The illumination level is 1.0 fc for parking areas.
 2. Building perimeter fixtures will be wall mounted cut-off over exterior doors for exit discharge.
- E. Wiring Devices:
1. Each classroom will have a minimum of (2) duplex receptacles per teaching wall and (2) double duplex receptacles on dedicated circuits at classroom computer workstations. The teacher's workstation will have a double duplex receptacle also on a dedicated circuit.
 2. Office areas will generally have (1) duplex outlet per wall. At each workstation a double duplex receptacle will be provided.
 3. Corridors will have a cleaning receptacle at approximately 25 foot intervals.

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4. Exterior weatherproof receptacles will be installed at exterior doors. The outlets will automatically be switched off from schedule.
5. A system of computer grade panelboards with double neutrals and transient voltage surge suppressors will be provided for receptacle circuits.

F. Fire/Mass Notification System:

1. A fire/mass notification system and detection system will be provided with 60 battery back-up. The system will be of the addressable type where each device will be identified at the control panel and remote annunciator by device type and location to facilitate search for origin of alarms. The notification system will be in conformance with NFPA 72 Chapter 24 emergency communications systems.
2. Smoke detectors will be provided in open areas, corridors, stairwells and other egress ways.
3. The sprinkler system will be supervised for water flow and tampering with valves.
4. Speaker/strobes will be provided in egress ways, classrooms, assembly spaces, open areas and other large spaces. Strobe only units will be provided in single toilets and conference rooms.
5. Manual pull stations will be provided at exit discharge doors.
6. The system will be remotely connected to automatically report alarms to fire department via an approved method by the fire department.

G. Addressable Dual Speaker/Strobe Units for Fire and Mass Notification application:

1. One-way Tone/Voice Communication:
 - a. The evacuation alarm and alert signals shall be capable of being initiated automatically from the fire alarm control panel (FACP) and transmitted to any speaker circuit, selected speaker circuits or all speaker circuits.
 - b. The alarm signal, alert signal and live and pre-recorded voice announcements shall be capable of manual transmission from the FACP to any speaker circuit, selected speaker circuits or all speaker circuits by manual selection of the associated speaker circuit control switches.
 - c. Live voice announcements, via the hand-held microphone or patched in external source, by use of speaker control switches, shall take priority over all previously activated alarm inputs. In addition to NFPA 72 requirements, the system shall be capable of priority live voice announcements over subsequent alarm conditions. In no case shall subsequent alarms disrupt emergency live voice announcements. Mass notification activation is the only condition allowed to override the fire alarm event.
 - d. Addressable Visual Unit (Xenon Strobe) and Visual/Fire/MNS unit:
 - 1) Combination white/amber strobe/MNS units - Provide Truealert Synchronized white strobe (fire)/yellow strobe (MNS event) all in one unit. Unit shall be red with "FIRE" in white lettering. Yellow strobe shall include "ALERT" in white lettering.

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- 2) Provide candela rating indicated on drawings and in accordance with NFPA requirements.
 - 3) Adjacent to all combination visual units shown on drawings provide an addressable speaker
 - 4) Systems that require separate wiring and control modules to support the specified functionality shall be provided at no additional cost.
 2. Addressable Textual Notification Appliance (MNS): Textual Notification Appliance is to operate on a compatible Signaling Line Circuit (SLC) and is to provide a high visibility, multi-color LED text message display.
- H. Uninterruptible Power Supply (UPS):
1. Two (2) 24 kW, three (3) phase centralized UPS systems will be provided with 8-minute battery back-up.
 2. The system will provide conditioned power to sensitive electronic loads, telecommunication systems, bridge over power interruptions of short duration and allow an orderly shutdown of servers, communication systems, etc. during a prolonged power outage.
 3. The UPS systems will also be connected to the stand by generator.
- I. Lightning Protection System:
1. A system of lightning protection devices will be provided.
 2. The lightning protection equipment will include air terminals, conductors, conduits, fasteners, connectors, ground rods, etc.
 3. The facility will be issued a UL Master Label Certificate.
- J. Renewable Energy System Provisions:
1. The base project will include:
 - a. Electrical provisions will be made for a roof mounted renewable energy system for a grid connected photovoltaic PV system intended to reduce the facilities demand for power.
- K. Two-way Communication System:
1. A Two-Way Communications System will be provided at the elevator lobbies that do not have grade access. Area of rescue assistance call boxes will be provided at Elevator Lobbies with no grade access. The call boxes connect to a main panel located adjacent to the Fire Alarm annunciator panel.

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L. Distributed Antennae System (DAS):

1. A public safety radio distributed antenna system (DAS) which consists of bi-directional amplifiers (BDA), donor antennas, coverage antennas, coax cable, coax connectors, splitters, combiners and couplers. These devices will be used as part of a system for in-building public safety 2-way radio system communication.

M. Closed-Circuit TV System(CCTV):

1. A Closed-Circuit TV system will consist of computer servers with image software, computer monitors and IP based closed circuit TV cameras. The head end server will be located in the head end (MDF) room and will be rack mounted. The system can be accessed from any PC within the facility or externally via an IP address. Each camera can be viewed independently. The network video recorders (SAN) will record all cameras and store this information for 45 days at 30 images per second (virtual real time).
2. The location of the cameras is generally in corridors and exterior building perimeter. The exterior cameras are 360 degree multi-sensor type.
3. The system will fully integrate with the access control system to allow viewing of events from a single alarm viewer. Camera images and recorded video will be linked to the access system to allow retrieval of video that is associated with an event.

N. Intrusion System:

1. An intrusion system will consist of security panel, keypads, motion detectors and door contacts. The system is addressable which means that each device will be identified when an alarm occurs. The system is designed so that each perimeter classroom with grade access will have dual tech sensors along the exterior wall and corridors, door contacts at each exterior door.
2. The system can be partitioned into several zones. Therefore, it is possible to use the Gym area while the remainder of the school remains alarmed.
3. The system will include a digital transmitter to summons the local police department in the event of an alarm condition
4. The intrusion system will be connected to the automated lighting control system to automatically turn on lighting upon an alarm.

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O. Card Access System:

1. A card access system includes a card access controller, door controllers and proximity readers/keypads. Proximity readers will be located at various locations. Each proximity reader will have a distinctive code to identify the user and a log will be kept in memory. The log within the panel can be accessed through a computer.
2. The alarm condition will also initiate real time recording on the integrated CCTV System. The system may be programmed with graphic maps allowing the end-user to quickly identify alarm conditions and lock/unlock doors.
3. The system is modular and may be easily expanded to accommodate any additional devices.

5. TESTING REQUIREMENTS

The Electrical Contractor shall provide testing of the following systems with the Owner and Owner's Representative present:

- Lighting and power panels for correct phase balance.
- Emergency generator.
- Lighting control system (interior and exterior).
- Fire alarm system.
- Security system.
- Lightning protection system.

Testing reports shall be submitted to the Engineer for review and approval before providing to the Owner.

6. OPERATION MANUALS AND MAINTENANCE MANUALS

When the project is completed, the Electrical Contractor shall provide operation and maintenance manuals to the Owner.

7. RECORD DRAWINGS AND CONTROL DOCUMENTS

When the project is completed, an as-built set of drawings, showing all lighting and power requirements from contract and addendum items, will be provided to the Owner.

8. COMMISSIONING

The project shall be commissioned per Section 018000 of the specifications.

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9. SITE UTILITIES

The Electric, Telephone and Cable TV utilities will be underground for each system provided. Existing town network services shall be maintained.

DOCUMENT 000120

OUTLINE SPECIFICATION

SCHEMATIC PHASE- CONSTRUCTION ASSEMBLIES AND SYSTEMS

D. SERVICES

D50:ELECTRICAL

D5000 – General Requirements

General Provisions

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.

Time, Manner and Requirements for Submitting Sub-Bids: Section 01116 – INVITATION TO BID and Section 002216 – INSTRUCTIONS TO BIDDERS.

The Filed Sub-Bidder for the work of this SECTION 260000 shall list, in Paragraph E, of the FORM FOR SUB-BID, the name of each person, firm, or corporation, whom he proposes to use to perform the following classes of work or part thereof, at the bid price therefore:

If Sub-Bidder intends to perform with persons of his own staff the classes of work listed above, he must nevertheless list his own name therefore, under Paragraph E, of the FORM FOR SUB-BID.

General Requirements

Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.

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.

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.

Refer to Division 01 for alternates which may affect the work of this Section.

Refer to Section 012300, Alternates, for alternates, which may affect the work of this Section.

Codes, Ordinances, And Permits

Codes and Ordinances:

All material and work provided shall be in accordance with the following codes and standards as most recently amended.

- Commonwealth of Massachusetts Building Code
- Massachusetts Electric Code, 2017 Edition
- State Department of Public Safety
- NFPA 101 "Life Safety Code"

- NFPA Standards
- Standards of the Underwriters Laboratories (UL)
- Occupational Safety and Health Act (OSHA)
- Americans with Disabilities Act (ADA)
- Energy Conservation Code
- City of Framingham

Where contract documents indicate more stringent requirements than codes, the contract documents shall take precedence.

Permits: Be responsible for filing documents, and securing of inspection and approvals. Pay all local connection & permit fees. Utility Company backcharges related to permanent service will be paid directly by the City. Costs related to temporary service, refer to Section 015000.

D5010 - Electrical Service And Distribution

Electrical Power Equipment:

Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of "factory assembled" control panel will be provided under section supplying equipment to be controlled but connected under this section.

Provide motor terminal boxes for each motor not furnished with same.

Disconnect Switches:

- Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three pole toggle switches are not acceptable as substitute for disconnect switches.
- Acceptable Manufacturers:
General Electric
Westinghouse
Square D/Groupe Schneider
Siemens
Allen Bradley
Or equal

Fuses:

- Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses, unless noted otherwise on electrical drawings.
- Acceptable Manufacturers:
Bussmann, Division of McGraw
Gould/Shawmut
GEC-ALSTHOM
Or equal

Main Building Switchboard:

- Main building switchboard shall be constructed in accordance with UL 891 and ANSI standards and of the required number of vertical sections bolted together to form one metal enclosed rigid structure. The front shall be accessible. Buses shall be aluminum.
- Switchboard shall be arranged for operation as follows:
Voltage - 480Y/277 volts
Frequency - 60 cycles
Service - 3 phase, 4 wire, ampere capacity as indicated on drawings.
Neutral - full capacity
Available short circuit current at line terminals - 65,000 RMS amperes symmetrical.
Integrated equipment rating - 65,000 AIC
Copper ground bus, full length
UL service entrance label

Panelboards:

- Panelboards shall be dead-front, door in door safety type equipped with single or multi-pole circuit breakers suitable for 120/208 volt or 277/480 volt, 3 phase, 4 wire operation.
- Buses shall be copper. Panelboards shall have a circuit directory card mounted in a frame with plastic cover on inside of door. Panelboards to have a copper ground bus with terminals for each circuit. Panelboards serving isolated ground receptacles shall have a separate ground bus for terminations of the isolated grounds. The isolated ground bus shall be mounted to the panel tub via non-conducting means with a separate grounding conductor run to the normal panel ground bus.
- Panelboards and distribution panels shall be of same manufacturer as switchboard.

Dry-Type Transformers:

- Dry-type transformers shall be 480 volt, 3 phase, delta connected primary and 120/208 volt, 3 phase, 4 wire wye connected secondary with grounded neutral. They shall be of the KVA size, voltage rating, and characteristics as shown on the drawings. Transformers 75KVA and larger shall have minimum impedance of 4-1/2%. Transformers feeding panels with surge suppressors shall be K-13 rated.
- Provide grounding of separately derived systems in accordance with Code Article 250-26.
- Transformers shall be of same manufacturer as switchboard.

Electric Service:

- Primary, secondary and low tension ductbanks, manholes, handholes, etc.
- Secondary distribution equipment, including secondary switchboard and metering, motor controls, dry-type transformers, distribution panels, and panelboards, including feeders and subfeeders.
- Excavation and backfill within building foundation walls for any underground raceways.
- Coordinate and cooperate with Utility Co., with respect to providing service and metering.
- Provide all primary system raceways, elbows, pull wires and all pad grounding. Utility company will provide vault type transformers and primary conductors including making up of all terminations and connections.
- Metering: All usage will be on one secondary meter. Utility Company will furnish current transformers and potential transformers to be installed in switchboard by contractor. Empty raceway with pull wire from the C/T compartment to the meter backboard shall be provided. Meter shall have KYZ output.

Raceways and Fittings:

Raceways - General:

- No raceway shall be used smaller than 3/4" diameter and shall have no more than four (4) 90 deg. bends in any one run, and where necessary, pull boxes shall be provided. Only rigid metal conduit or intermediate metal conduit is allowed for in-slab work. Cable systems, if allowed to be used by other sections of this specification, shall not be used exposed or in slabs, whether listed by "UL" for such use or not.
- Rigid metal conduit, may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in penthouse for drops down to equipment from elevations above eight feet and also where raceway may be subject to mechanical damage.
- Electrical Metallic Tubing (EMT), may be used in masonry block walls, stud partitions, above furred ceilings, where exposed but not subject to mechanical damage, and shall be used for fire alarm work.
- Surface metal raceways shall be used where raceways cannot be run concealed.
- Flexible metal conduit shall be used for final connections to recessed lighting fixtures from above ceiling junction boxes and for final flexible connections to motors and other rotating or vibrating equipment. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include an insulated grounding conductor.

- Rigid non-metallic conduit may be used at the contractors option for underground electric and telephone services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40, 90oC. If option of rigid non-metallic conduit is exercised, underground runs outside the foundation wall shall be concrete encased at electrical contractors expense.
- PVC Schedule 40 may also be used for below slab circuits within building confines and site lighting branch circuits. Below slab rigid non-metallic conduits do not require concrete encasement. Rigid non-metallic conduits shall not be used for exterior feeders, in slabs, nor for elbows which penetrate slabs. Raceways and fittings shall be produced by same manufacturer.
- Acceptable manufacturers:
Pittsburgh Standard Conduit Company
Republic Steel and Tube
Youngstown Sheet and Tube Company
Carlson
Or equal

Outlets, Pull and Junction Boxes:

Outlets:

- Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations or surface mounted shall be of the cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction. Thru the wall boxes are not permitted.
- Acceptable manufacturers:

Appleton
Crouse Hinds
Steel City
RACO
Or equal

Pull and Junction Boxes:

- Where indicated on plans, and where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code.

- Acceptable Manufacturers:

Brasch
Hoffman
Keystone
Lee Products Co.
McKinstry Inc.
Eldon Inc.
Or equal

Conductors:

- All conductors shall be a minimum size of #12 AWG except for control wiring and fire alarm wiring where #14 AWG may be used. For all exit sign circuits, normal/emergency and/or emergency only circuits, exterior lighting circuits, and also where distance from panelboard to first outlet exceeds 80' for 120 volts and 150' for 277 volts, #10 AWG shall be minimum size wire allowed. All feeder and branch circuit conductor shall be color coded as follows:

1.	208Y/120V	Phase A	Black
2.	208Y/120V	Phase B	Red
3.	208Y/120V	Phase C	Blue
4.	480Y/277V	Phase A	Brown
5.	480Y/277V	Phase B	Orange
6.	480Y/277V	Phase C	Yellow
7.	Grounded Conductor	120/208	White
		277/480	Grey
8.	Equipment Ground	120/208	Green
		277/480	Green with Yellow Trace

- All conductors not installed in accordance with color scheme shall be replaced. All conductors larger than #6 AWG must be identified with colored tape.

- Connections throughout the entire job shall be made with solderless type devices.

1. For #10 AWG and smaller: spring type.
2. For #8 AWG and larger: circumferential compression type.
3. Acceptable manufacturers:

3M "Scotchlock"
IDEAL "Wingnut"
BURNDY
MAC
Or equal

4. Any splices made up in ground mounted pull boxes shall be resin cast waterproof type or waterproof pressure type, as manufactured by King Technology, St. Louis, MO.

- Conductors shall be copper, soft drawn, and annealed of 98% conductivity. Conductors larger than #10 AWG shall be stranded; #10 AWG and smaller shall be solid. Conductors shall be insulated for 600 volts and be of following types:
 1. All conductors shall have heat/moisture resistant thermoplastic insulation type THHN/THWN (75°C) except as follows:
 - In sizes #1 AWG and larger: Crosslinked polyethylene insulation type XHHW (75 deg. C – 90 deg. C) may be used.
 - Fire alarm system conductors shall be #14 AWG, type THHN, solid. Color coding of fire alarm conductors shall be in accordance with fire codes.
 - Fixture whips #16AWG type "SF".
- Stranded conductors for all wiring systems except fire alarm will be allowed if installed and terminated as specified under Execution Section.
- Mineral-Insulated Metal-Sheathed Fire-Resistive Cables (Type MI) - Cables shall consist of a factory assembly of one or more solid copper conductors insulated with highly-compressed magnesium oxide and enclosed in a seamless, liquid-and-gas-tight continuous copper sheath. Cables shall be rated for 600 volts and less. Cables shall comply with Article 330 of the National Electrical Code. Cables shall be classified by Underwriters Laboratories, Inc. as having a 2-hour fire resistive rating. Cable terminations shall be made with UL listed mineral-insulated cable fittings. Approved Manufacturer - Pyrotenax USA, Inc., or equal.
- Type MC cable may be used for concealed branch circuits in hollow spaces where allowed by code if installed and terminated as specified under Execution Section. Armor to be galvanized steel, and shall be UL listed for 2 hour thru-wall fire penetration.
- Acceptable manufacturers:

American Flexible Conduit Company
American Wire & Cable
Anaconda
Cerro
Cornish
Crescent
Essex
Okonite
Rome
Or equal

D5020 – Lighting and Branch Wiring

Sleeves, Inserts, and Openings:

- Sleeves: Provide sleeves of proper sizes for all openings required in concrete floors and walls. Sleeves passing through floors shall be set with top of sleeve 1" above finished floor. Core drilling will also be acceptable if in accordance with any structural standards. Any unsleeved openings shall be waterproofed.

Floor Outlets (Flush Type):

- All flush floor outlets shall be Steel City 640 or 840 series cast iron, watertight type. The 640 series shall be used generally, and the 840 series used where shallow depth is required.
- Whenever floor outlets for different services are indicated in the same location, they shall be ganged together.
- Covers shall be brass series P64. Duplex receptacle covers shall be lift lid type P64DS. Low tension covers shall be series P64 3/4 2 with 3/4" diameter and 2" diameter plugs. Flush floor outlets located in carpeted areas shall be provided with P64 CP carpet plates of the number of gangs required.
Acceptable Manufacturers:
 - Steel City
 - Hubbell
 - Thomas & Betts Corporation
 - Or equal

Wiring Devices:

- Receptacles: Receptacles shall be flush mounted. All standard 20 ampere devices to be of same manufacturer
Acceptable Manufacturers:
 - Twenty (20) ampere duplex grounding type NEMA 5-20R,
Arrow Hart 5739SI,
Cooper
Hubbell
Or equal
 - Thirty (30) ampere, 250 volt NEMA 10-30R complete with plate,
Arrow Hart 9344,
Cooper
Hubbell
Or equal
- Switches: 20 ampere,
 - Arrow Hart 1991 series,
 - Cooper
 - Hubbell
 - Or equal
- Composition material of wiring devices to be nylon with white finish.
- Coverplates: White metal finish.

Provide gaskets on all wiring device plates where devices are on walls separating conditioned and non-conditioned spaces.
- Blank coverplates shall be steel, paintable.

- Dimmer Controls:
 - All devices shall be UL listed specifically for the required loads (i.e., incandescent, fluorescent, magnetic low voltage, electronic low voltage). Manufacturer shall provide file card upon request. Universal dimmers are not acceptable.

Lighting Fixtures:

- Provide lighting fixtures complete with LED sources, drivers, and other devices as required for a first class installation. Furnish Ceiling Subcontractor with instructions concerning openings necessary, and provide frames for NEMA standard ceiling types or special mounting frames, as may be required. Fixtures shall be supported independently of hung ceiling construction.
- LED Assemblies
 - LED luminaires shall conform to UL 1598 and to UL 8250 – Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products.
 - Products shall be lead and mercury free.
 - Photometric characteristics shall be established using IESNA LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products.
 - Color characteristics of LED luminaires shall be as follows in accordance with ANSI C78.377 – Specifications for the Chromaticity of Solid State Lighting Products.
 - LED and driver cooling system shall be passive and shall resist the buildup of debris.
 - LED luminaire output after 50,000 hours of operation shall be not less than 70 percent of the initial lumen output when determined in accordance with IESNA LM-80-08 – IESNA approved Method for Measuring Lumen Maintenance of LED Lighting Sources
- Provide universal arrows on all exit signs and punch out directions as shown on floor plans.
- Pendant mounted fixtures shall be suspended by means of air craft cable with aligner and canopy in finished areas or threaded rods in non-public areas. Length of suspension method to be as required to mount fixtures at the elevations called for or as otherwise shown on drawings or architectural elevations.
- Fixture types shall be as scheduled.

Automated Lighting Control System:

- The lighting control “system” shall include a fully distributed WAN/LAN network of global controller/routers, individually addressable System Field Devices, sensors, switches, relays and other ancillary devices required for a complete and operable system.
- The basis of system design shall utilize non-propriety industry standard 0-10V dimming or fixed output ballasts and/or 0-10V LED drivers, occupancy sensors, and daylight sensors
- Shall provide an Interactive, Web-based graphical user interface (GUI) showing floor plans and lighting layouts that are native to the lighting control software. The only means required to program and operate the lighting control system shall be programmed and operated from a user interface that is based on a plan view graphical screen on the user’s computer or the lighting control system’s main computer
- All programming, assignments of lighting loads to control strategies, lighting status and lighting energy reporting shall be native to the software and executed from this GUI. Editing shall be available from this GUI in a drag and drop format or from drop down menus without the need for any third party software. The GUI shall continuously indicate the status of each connected device on the system and a warning indicator on the software if a device goes offline.
- The system software shall provide a web based energy dashboard to show real time energy savings data and carbon footprint reductions

Dual Technology Ceiling Occupancy Sensors:

- Dual technology occupancy sensors shall be capable of detecting occupants within the coverage area designated via detection of a doppler shift in the transmitted ultrasonic sound wave and a change in the infrared heat present. Major motion and minor motion shall cause the controlled load to switch to the “ON” mode.
- The dual technology passive infrared sensor shall use a multi-level 100 segment Fresnel lens and four pyroelectric detectors to insure adequate PIR coverage of the intended area.
- Dual technology sensors shall have on override to “ON” bypass logic key in the event of sensor failure.
- Sensors are to be ceiling mounted using a back mounting plate and standard electrical outlet boxes.
- Dual technology sensors shall cover up to 2000 sq. ft. for walking motion, with a field of view of 360 degrees.
- Dual technology sensors shall be compatible with electronic ballasts, compact fluorescent, and inductive loads.

D5030 – Communications & Security

Security System:

- Furnish a complete addressable Security and Detection and Alerting system to be connected, tested and left in first-class operating condition.
- The security alarm system shall monitor the integrity of all alarm initiating circuits.
- System Operation:
 - The system shall be completely addressable. System shall be continually supervised by a microprocessor.
 - The system shall be armed, disarmed, reset, monitored and altered by the use of the remote multiplexed type alpha numeric keypads. The system shall be capable of arming or disarming by zone/partition.
 - Actuation of any device shall cause the following to occur.
 - Activate telephone dialer, seize the protected premises telephone line and automatically report the alarm to a remote location.
 - Indicate the alarm condition at the remote keypad.
 - Record device alarm on the access control computer and activate the sound system for alarm tones over the entire PA System.
 - Call up the closed circuit camera in the area and record at 30 frames per second.
- Provide equipment of Detection Systems, Inc. or equal.

Closed Circuit Television (CCTV):

- Provide a complete UL Listed CCTV system as shown on drawings and herein specified. All system components shall be from a single manufacturer.
- Cameras: Camera installations shall be securely attached to mounting surface.
- The Closed Circuit TV System shall consist of computer servers with image software, computer monitors and IP based closed circuit TV cameras. The head end server will be located in the head end MDF room and will be rack mounted. The system will be accessed from any PC within the facility or externally via an IP address. Each camera can be viewed independently. The network video recorders NVR's will record all cameras and store information for 45 days at 30 images per second (virtual real time).
- The location of the cameras is on exterior building perimeter. The exterior cameras will pan-tilt-zone type.

- Cameras shall be solid state and have automatic iris control and shall be for interior or exterior use under normal and low light conditions of illumination and shall be provided with a weatherproof or tamper-proof housing as specified.
- Weatherproof-tamper proof housing for fixed cameras shall be constructed of aluminum and finished with a weatherproof, heat reflecting paint. Housing shall be internally insulated. Hinged cover shall be secured in place with tamper proof bolts.
- Interface system with card access, intrusion and intercom systems. Activation of system alarms shall call up the appropriate camera. Activation of a door intercom station shall also call up the appropriate camera.

Card Access:

- Furnish and install a complete access control system as specified herein and shown on the drawings. The system shall include a head end computer with 17" monitor, keyboard, mouse and printer. Furnish and install S2 controllers with 4 hour battery backup.
- Controller: Unit shall be able to accept 16 doors complete with card reader request to exit and door position switch. Controllers shall provide 400 event buffer.
- Card Readers: Furnish and install proximity readers as shown on drawings. Devices shall have a 6" – 10" read range. Devices shall be flush mounted.
- Cards: Provide 250 proximity cards. Cards shall be the size of a standard credit card in both thickness and dimension.
- Interface the access control system with the closed circuit TV system for alarm call up and allow for CCTV images to be viewed from the access control computer. Interface system with the intrusion alarm system to annunciate alarms (by device) on the access control computer. All intrusion alarms shall be recorded on the access computer and printed on system printer.

Telephone/Data Systems

- Telephone system instruments and interconnecting wiring will be provided by the ITS Contractor. Data system outlets and interconnecting wiring will be provided by the ITS Contractor.
- For each telephone outlet or data outlet indicated on the drawings, provide a 4" square flush outlet box. In insulated partitions, provide a 1" raceway stubup terminating with bushing to above nearest accessible hung ceiling.

Fiber Innerduct:

- DESCRIPTION: From the MDF to IDF, segments of optical fiber innerduct shall be installed.
 - Quantities Required: Innerduct runs do not have to be continuous throughout, breaks are expected at the pull boxes. Contractor is responsible for determination of actual lengths of innerduct required. Enough innerduct shall be provided and installed to extend from the fiber service loop in the MDF to the fiber service loop in each IDF. If the route passes through a pull box, the segments of innerduct shall extend twelve inches into the pull box. If the route passes through an enroute HC, each segment of innerduct shall extend at least twelve inches beyond the end of the service conduit.

Fiber Distribution:

- DESCRIPTION: From the MDF to each IDF a continuous segment of fiber cable shall be provided.
 - Product: 12 strands multi-mode 50/125 UM and 6 strands single-mode 8.3/125 UM.
 - Quantities Required: The contractor is responsible for determination of actual segment lengths.

Work Station Cable:

- DESCRIPTION: From each MDF or IDF, 4-pair enhanced Category 6 cables shall be routed to each work station (data outlets). Category 6A shall be provided for wireless access points.

Intermediate Distribution Facilities:

- DESCRIPTION:
 - Products and Quantities:
 - Equipment Rack: Panduit CMR19x84, 19 X 84", floor-mounted.
 - Fiber Interconnect: Panduit FRME2, 12 Port Rack Mount Fiber Patch Panel.
 - Modular Patch Panels: Panduit DP48688TG, 48-port Category 6 Patch Panel. One (1) Port for each workstation served from the MC with a minimum of 12 spare ports are required. If the number of workstation cables, plus required spare count (12) is greater than 48, then a second 48 port patch panel is required.
 - Manufacturers: Hubbell, Ostronics, Panduit or equal.

Testing and Documentation:

- TESTING: Contractor shall test each fiber strand and each pair of each twisted-pair copper cable. The Owner reserves the right to have a representative present during all or a portion of the testing process. If the Owner elects to be present during testing, test results will only be acceptable when conducted in the presence of the Owner.
- DOCUMENTATION: Contractor shall provide documentation to include test results and as-built drawings.
 - Fiber Test Results: The results of the fiber testing shall be entered into the attached form "10 Fiber Attenuation Test Results". Hand written results are acceptable provided the text is neat and legible. Copies of test results are not acceptable. Only original signed copies will be acceptable.
 - Work Station Cable: The results of the work station cable tests shall be provided in the form of print-outs from the test equipment.

Integrated Sound, Public Address, & Wireless Master Clock System:

- General:
 - Provide all equipment, accessories, and materials in accordance with these specifications and related documents to provide a complete and operating Integrated, Sound, Intercom and Master Clock System. General paging shall include IP speakers in corridors. Paging in all rooms shall be done through phone system.
- System Description:
 - This Section includes requirements for programmable Integrated and Video System components including, but not limited to, the following:
 - Integrated Communications System Computer and Software.
 - Telephone System Integration Requirements.
 - Controls, Amplifiers, and Terminal Equipment.
 - Power Supplies.
 - Battery Backup for System Programming.
 - Accessories.
 - Wireless Master and Secondary Clock Systems

D5050 - Electrical System Controls and Instruments

- Provide a complete power system consisting of branch circuits, motor disconnect switches, pushbutton stations, motor starters, and other devices to connect up and leave in operating condition each piece of electrically operated equipment provided either under this section or other Divisions.
- All control wiring not indicated in the electrical specifications or not shown on electrical drawings will be provided by Temperature Control Subcontractor.

D5090 – Other Electrical Systems

General:

- Connections for all building equipment, including mechanical, plumbing, fire protection, elevator, and the like.
- Drilling, coring, and cutting of holes (where the largest dimension thereof does not exceed 12 inches) for electrical conduit systems, and equipment.
- Systems Identification.
- Scaffolding, Rigging, and Staging required for all Electrical Work.
- Fire stopping shall be performed by this contractor.
- Provide Seismic Restraints for all Electrical Systems conforming to the requirements of State Code.
- Coordination Drawings.
- Provide cable tray, 120 volt power sources, raceways and backboxes for Paging System, Clock System, Voice, Data and Video Systems, etc. as specified in Section 270000 and 120 volt power sources, raceways and backboxes for Security/Intrusion System, Closed Circuit TV (CCTV) System, Card Access System, etc. as specified in Section 280000..
- Temporary Power and Lighting.

Identification

- Equipment shall be marked for ease of identification as follows.
 - Provide screw-on nameplates on switchboards, panelboards, F.A. terminal cabinets, starters, and disconnect switches. Nameplates to be of black phenolic with white engraving. For starters and disconnect switches lettering shall be minimum of 1/4" high.
 - Space neatly typed directory cards listing circuit designations shall be fastened inside the cover of panelboards. Spare circuits shall be penciled.
 - Wiring device plates on devices connected to normal-emergency circuits shall be red in color.
 - All conductors in boxes larger than standard outlet boxes, in all wireways, trench headers, etc. shall be grouped logically and be identified.
 - Grounding conductors and neutrals shall be labeled in panels, wireways, etc. as to circuits associated with.

Grounding System:

- All equipment and systems shall be grounded. Refer especially to NEC Section 250 Requiring Connections to Building Steel, Foundation, Water Service, and Interior Piping. Provide transformer pad grounding to be in accordance with utility company standards.

Standby Electrical System

- Provide one 250 KW, 312.5 KVA at .8 PF standby power rated natural gas generator set mounted in perfect alignment on an all welded, fabricated steel sub-base which shall allow for attachment of all necessary engine and generator accessories.

Acceptable Manufacturers:

Caterpillar
Onan
Kohler
Or equal

- Generator: 250 KW, 312.5 KVA, 277/480 volt, 3 phase, 4 wire, 60 Hz, 1800 RPM revolving field type main generator with brushless exciter. Voltage regulation $\pm 1\%$.

- Generator Control Panel:

To completely control operation of engine generator set. Panel to have automatic start control, AC volt meter, AC ammeter, pointer type frequency meter, volt meter, ammeter and selector switch.

- Automatic Transfer Switch:

Provide automatic transfer switches for operation on 277/480 volts, 3 phase, 4 wire operation. Unit to be housed in a NEMA 1 enclosure. Entire switch shall be listed under UL 1008.

Acceptable Manufacturers:

Russ Electric RMTD (4 Pole)
ASCO (with overlapping neutral contacts)
Onan
Kohler
Or equal

- Remote Annunciator Panel: A flush mounted panel shall include a visual signal that battery charger is functioning properly and both audible and visual signals. Annunciator shall meet NFPA 110 Standards.
- Generator shall be housed in a weatherproof sound attenuated aluminum enclosure.

Access Panels:

- Provide access panels for access to concealed junction boxes and to other concealed parts of system that require accessibility for operation and maintenance. In general, electrical work shall be laid out so access panels are not required.
- Access panels shall be prime painted and equipped with screwdriver operated cam locks.

- Acceptable manufacturers:
Inland Steel Products Company - Milcor
Miami Carey
Walsh-Hannon-Gladwin, Inc. - Way Locator
Or equal

Specific types:

- Acoustical Tile Ceiling "Milcor Type AT"
- Plastered Surfaces "Milcor Type K"
- Masonry Construction "Milcor Type M"
- Drywall Construction "Milcor Type DW"

Fire Alarm and Detection System: (Voice evacuation required with integral amplifiers, signal circuits and power supplies – no remote booster panels). System design is based on a main FACP serving multiple floors with local mode transponders remotely located, also serving multiple floors. Refer to system riser diagram. System specification is based upon the Notifier NFS640 panel.

- Description:
 - This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
 - The fire alarm system shall comply with requirements of latest NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
 - The fire alarm manufacturer shall be of the highest caliber and insist on the highest quality. The system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
 - The FACP and peripheral devices shall be manufactured 100 percent by a single U.S. manufacturer (or division thereof) wherever possible.
 - The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be in compliance with the UL listing.
 - Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication
 - The system supplier shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out, perform all head end panel connections and to ensure the systems integrity.
 - FACP shall contain digital amplifiers for proper voice message requirements.

Addressable Speaker/Strobe Units for Fire and Mass Notification application:

- One-way Tone/Voice Communication:
 - The evacuation alarm and alert signals shall be capable of being initiated automatically from the fire alarm control panel (FACP) and transmitted to any speaker circuit, selected speaker circuits or all speaker circuits.
 - The alarm signal, alert signal and live and pre-recorded voice announcements shall be capable of manual transmission from the FACP to any speaker circuit, selected speaker circuits or all speaker circuits by manual selection of the associated speaker circuit control switches.
 - Live voice announcements, via the hand-held microphone or patched in external source, by use of speaker control switches, shall take priority over all previously activated alarm inputs. In addition to NFPA 72 requirements, the system shall be capable of priority live voice announcements over subsequent alarm conditions. In no case shall subsequent alarms disrupt emergency live voice announcements. Mass notification activation is the only condition allowed to override the fire alarm event.
 - Alarm speaker amplification equipment shall be sized, at 1 watt for every speaker location shown.
 - As a minimum, alarm speaker amplification equipment shall be sized to provide the above indicated wattage of input power to each location type of alarm speaker shown on the Drawings, plus 20 percent (20 percent) spare capacity to permit the addition of future alarm speakers. Include one back up amplifier for every 100 watts of primary power supplied.
 - Within the individual assembly occupancies in this project, an alarm received during a program occupancy shall sound an alert alarm at a constantly attended location and perform the following actions:
 - Deliver a field programmable, digitized custom evacuation message to the occupants, detailing evacuation instructions.
 - A simultaneous message shall be delivered via all alarm speakers installed in remainder of the building directing evacuation using exits other than the assembly occupancy exit path.
 - Perform all control functions as detailed elsewhere in this specification
 - An automatic announcement or tone evacuation signal shall be capable of interruption by the operation of the system microphone to give voice evacuation instructions overriding the pre-programmed sequences
 - Addressable Visual Unit (Xenon Strobe) and Visual/Fire/MNS unit:
 - Combination white/amber strobe/MNS units - Provide Truealert Synchronized white strobe (fire)/yellow strobe (MNS event) all in one unit. Unit shall be red with "FIRE" in white lettering. Yellow strobe shall include "ALERT" in white lettering.
 - Provide candela rating indicated on drawings and in accordance with NFPA requirements.
 - Adjacent to all combination visual units shown on drawings provide an addressable speaker
 - Systems that require separate wiring and control modules to support the specified functionality shall be provided at no additional cost.

- Mass Notification Local Operator Console:
 - Local Operator Console is designed for indoor use with the Autocall 4100ES control panel for mass notification applications. The LOC shall contain an A100-9814 InfoAlarm Command Center with 320 X 240 LCD display, In addition to the switches and controls provided inherently with the Command Center, Provide an additional eight black push on/push off illuminated push buttons for speaker circuit selection, 8 illuminated push buttons for message selection, and a microphone for live messages. The speaker circuits shall be fully user defined and not be contingent on circuit wiring. Circuits shall be defined through system software. Controls shall be installed in a cabinet with glass door and magnetic lock. Panel shall be labeled "Emergency Communications". The controls shall be fully replicated at the main FACP in the vent that office personnel are unable to initiate emergency messages.
 - Standard features:
 - 24I/O Module
 - 16 illuminated push buttons
 - Magnetic latch
 - 16.5 in. w x 12.63 in. h x 4 in. d 16 ga CRS enclosure
 - Indoor, surface or semi-flush mount
 - Platinum powder coat finish with white silk screened lettering
- Remote Microphone Assembly
 - The remote microphone assembly uses power from the panel of the LED. All other interfaces do not draw any additional power other than what is already accounted for on the host interface, which is used for supervising the keyswitch, push-to-talk (PTT), and microphone wiring.
 - Operating Voltage
 - 24V as provided by 4003 or 24 Point I/O Module.
 - 24V battery current drawing - 25mA max.
 - Environmental Operating Rang
 - 32 deg. F to 120 deg. F (0 deg. C to 49 deg. C)
 - 90 deg. (32 deg. C) at 10 percent to 93 percent relative humidity (non-condensing).
- Addressable Textual Notification Appliance (MNS): Textual Notification Appliance is to operate on a compatible Signaling Line Circuit (SLC) and is to provide a high visibility, multi-color LED text message display.
 - Textual Notification Appliance shall be Listed to UL 1638 Visual Signaling Appliances.
 - Appliance shall be capable of up to thirty two (32) pre-programmed message selections that can be activated in response to pre-defined emergency situations or linked to specific system point status conditions.
 - Textual Notification Appliance shall be capable of displaying dual or single line emergency instructions. Instructions can show as static, flashing, or scrolling with a variety of appearance/transition options. Instructions shall be capable of displaying using multi-colors to emphasize instructions content.
 - Textual Notification Appliance shall be capable of providing non-emergency information during non-emergency conditions. Emergency conditions will override non-emergency message/instructions and display emergency instructions.
 - Textual Notification Appliance shall be capable of scrolling instructions of at least 512 characters in length.

- Textual Notification Appliance shall be viewable from a distance of 100 feet.
- Textual Notification Appliance shall be powered by the fire alarm MNS power supply at 24VDC with battery back-up included if system battery calculations.
- Textual Notification Appliance shall be capable of wall or ceiling mounting options.
 - Accessories: The contractor shall furnish the necessary accessories.

Surge Protective Devices:

- Furnish and install surge protective devices with ratings of 120,000 amperes on the secondary side of the main service overcurrent device and 80,000 amperes on panelboards feeding computer equipment.

Ladder Tray:

- Provide 12" wide aluminum ladder tray with 9" rung spacing with 6" side rail. Ladder tray shall be as manufactured by B-Line. "Ladder Type". Provide all hangers required.

Lightning Protection System

General Summary:

- Furnish all labor, components and items of service required for the completion of a functional and unobtrusive lightning protection system.
- If any departures from the contract drawings are deemed necessary by the contractor, submit details of such departures and reasons as soon as possible to the architect for approval. No such departures shall be made without the prior written approval of the architect.

Equipment:

- All components shall be aluminum and of the size, weight and construction to suit the application where used in accordance with requirements for Class I structures.
- Roof conductors shall be aluminum, 24 strands 14-gauge, 98,600 circular mils, net weight 110 lbs. / 1000 ft.
- Down conductors shall be copper, 29 strands 17-gauge, 65,600 circular mils, net weight 190 lbs./1000ft.
- Air terminals shall be solid round aluminum bar 1/2" x 12" minimum, and shall project 10" minimum above the object to be protected.
- Air terminal bases shall be aluminum with bolt pressure cable connectors and shall be securely mounted with stainless steel screws or bolts.
 - Offset type bases shall be used at parapets and secured with stainless steel screws or anchors.
 - Adhesive type bases shall be secured with an adhesive compound which is compatible with the roofing system. The roofing manufacturer shall approve the adhesive compound.

- Ground rods shall be 5/8" x 10'-0" minimum. They shall be connected to the system with a two-bolt copper clamp having a minimum length of 1-1/2" and employing stainless steel cap screws.
- Cable fasteners shall be substantial in construction, galvanically compatible with the conductor and mounting surface.
- Bonding devices, cable splicers and connectors shall be of aluminum with bolt pressure cable connectors.
- Equipment on stacks and chimneys shall be protected from corrosion and sized in accordance with requirements.
- Bolts, nuts and screws shall be stainless steel.

Installation:

- The installation shall be accomplished by an experienced installer. The installer shall work under the direct supervision of a manufacturer as listed above or a qualified distributor of such manufacturer's products.
- All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible.
- Provide complete cable network on the roof including; air terminals, splices, bonding connectors and cable downloads to ground rods. Down conductors shall run in 1" PVC conduit concealed within the building construction to ground.
- The electrical contractor shall furnish and install all necessary PVC conduit and junction boxes.
- A bimetal transition fitting shall be used where aluminum roof conductor and copper down conductor are spliced together.

Public Safety Radio Distribution Antenna System (DAS)

- This specification describes the criteria for deploying an Public Safety Radio Distributed Antenna System (DAS). The DAS components specified in this document include: Bi-Directional Amplifiers (BDA), Donor Antennas, Coverage Antennas, Coax Cable, Coax Connectors, Splitters, Combiners and Couplers. These devices shall be used as part of a system, by the DAS integrator, experienced with designing projects for in-building, public safety, 2-way radio systems.
- The system specified is based upon TX/RX Systems Bird Technologies Group RescueLine Signal Booster and represents the performance standard upon which any equivalent solution shall be based. It shall be the integrator's responsibility to base the design on the frequency ranges used by and the Fire department. The system provided shall meet IFC 2009 and NFPA 1 2009 codes and shall be designed as such. It shall include a true, integrated battery backup unit which is serially connected to the main BDA system. A remote monitor display panel shall also be included and shall be located in the emergency command center to annunciate all 5 potential conditions of the BDA system. The 5 conditions to be monitored include: Normal AC Power, Signal Booster Trouble, Loss of Normal AC Power, Failure of Battery Charger, Low Battery Power.

Electronic Scoreboard and Shot Clocks:

- Furnish and install, as hereinafter specified, Fair-Play Electronic Scoreboard, as Manufactured by Fairtron Corporation and distributed by Hampden Engineering Corporation, East Longmeadow, Massachusetts.

The scoreboard shall include all equipment as hereinafter specified and shall be Model BB-6620, with metric clock. Provide remote shot clocks.

- The Electrical Subcontractor shall be responsible for structural support including all anchor bolts, hangers, etc. support shall be provided as recommended by scoreboard manufacturer.

Stage Lighting and Dimming System

- Provide all labor, material, equipment and services for a full dimming system for the auditorium including theatrical lighting. System shall include dimming racks, control console, connector strips, emergency transfer cabinet, light fixtures, etc.
- Refer to section describing Theatrical Dimming for Theatrical Dimming Requirements.

D5095 - General Construction Items

Portable or Detachable Parts:

- Retain possession of and be responsible for spare parts, portable and detachable parts, and other removable portions of installation including fuses, keys, locks, blocking clips, inserts, lamps, instructions, drawings, and other devices or materials that are relative to and necessary for proper operation and maintenance of the system until final acceptance, at which time such parts shall be installed or turned over to the Owner, as the case may be.

Safety Precautions:

- Provide proper guards, signage, and other necessary construction required for prevention of accidents and to insure safety of life and property. Remove any temporary safety precautions at completion.

Mounting Heights:

- All electrical equipment shall be mounted at the following heights unless noted or detailed otherwise on drawings. Notes on architectural drawings shall supersede those noted below or detailed on the electrical drawings. If mounting height of an electrical component is questionable, obtain clarification from Architect before installation.
 - Duplex convenience outlets, microphone outlets, and telephone outlets - 18 inches.
 - Light switches, pushbutton stations, HOA switches, and all other toggle or control switches for the operation of heating, ventilating, and air conditioning, plumbing, and general service - 48 inches.

- Clock outlets - 84 inches.
 - Fire alarm pullstations - 48 inches.
 - Fire alarm audio visual signals - 80 inches or 6 inches below ceiling, whichever is lower.
 - Panelboards for lighting, power, telephone, and other auxiliary systems - 78" to top.
- Mounting heights given are from finished floor to centerline. In the case of a raised floor, surface of raised floor is the finished floor.

Workmanship and Installation Methods:

- Fastenings:
 - Fasten electric work to building structure in accordance with the best industry practice.
- General Raceway Installation:
 - Install the various types of raceways in permitted locations as previously specified. All raceways shall be run concealed. Consult Architect for instruction for raceways which must be exposed in public spaces.

Branch Circuits:

- Provide all branch circuit wiring and outlets for a complete and operating system. The system shall consist of insulated conductors connected to the panelboards and run in raceways or as cable systems if permitted under products section, as required to the final outlet and shall include outlet boxes, supports, fittings, receptacles, plates, fuses, etc.

Fireproofing and Waterproofing:

- Fireproof and waterproof all openings in slabs and walls to maintain the original rating of same.

Cutting and Patching:

- All cutting of surfaces, including core drilling of walls and slabs, shall be done by Electrical Subcontractor. Openings through new wall surfaces will be provided by General Contractor if Electrical Subcontractor gives suitable notice as erection of surface proceeds. If suitable notice is not given, Electrical Subcontractor shall then be responsible for cost of corrective work required.

Elevator Coordination:

- Elevator Electrical Work:
 - Several items pertaining to elevator electrical system shall be provided by Electrical Subcontractor as follows:

- Power source to elevator machine room including fused disconnect switch and wiring between disconnect switch and controller for each elevator fused disconnect switch (120 volt) for elevator signal system and cab light for each cab light, switch, and GFCI receptacle in each pit and machine room.
- Control modules from fire alarm system for elevator recall to prevent cab opening on a fire floor.
- Junction box in machine room for cab telephone and paging system.

Mechanical System Coordination:

- The Mechanical System Subcontractor will be providing various items of mechanical services equipment and control apparatus. In general, Electrical Subcontractor shall connect up power wiring to this equipment. Equipment provided by Mechanical System Subcontractors will include built-in disconnecting means and overcurrent protection unless shown otherwise on drawings. This does not include terminal boxes.

Distribution Equipment Testing:

- All dry type transformers, individual motor starters, switchboard and main distribution panels, motor controls, motor control centers, feeder conductors, and emergency systems shall be tested in accordance with the following. In general, all tests shall be done in accordance with the 1995 Acceptance Testing Specifications of the International Electrical Testing Association.
- Grounding Grids or Electrodes: Measurement of resistance from ground grids or electrodes to earth to determine adequacy of grounding system in building and compliance with specifications and/or electrical code.
- Settings of Adjustable Devices: Using the result of the fault current and coordination study specified hereinafter, the Testing Contractor shall set all adjustable devices.

END OF DOCUMENT

Fuller Middle School
Framingham, MA
J#680 015 00.00
L#60589/Page 1/September 7, 2018

TECHNOLOGY SYSTEMS

NARRATIVE REPORT

The following is the Technology Systems narrative, which defines the scope of work and capacities of the Communications system infrastructure, as well as, the Basis of Design.

1. CODES

- A. All work installed under Section 270000 shall comply with the Massachusetts Building Code, IBC 2009, and all local, county, and federal codes, laws, statues, and authorities having jurisdiction.

2. DESIGN INTENT

- A. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Technology and Security work and all items incidental thereto, including commissioning and testing.

3. TECHNOLOGY

- A. The data system infrastructure will consist of fiber optic backbone cabling. Horizontal wiring will consist of Category 6A UTP Non-Plenum rated cabling for both data and telephone systems for gigabit connectivity. The telephone infrastructure will accommodate VOIP based voice systems. A new IP telephone system will be used.
- B. Each classroom will have four (4) data outlets for student computers. Two (2) data with video and audio connections to a wall mounted touch screen monitor will be provided at teacher's station. A wall phone will be provided for communications with administration in each classroom. Wireless access points will be provided in all classrooms and other spaces with two (2) CAT6A cables.
- C. A central paging system will be provided and integrated with the telephone system. The speakers shall be IP.
- D. A wireless GPS/LAN based master clock system will be provided with 120V wireless remote clocks that act as transceivers.
- E. The Main Distribution Frame (MDF) will contain all core network switching and IP voice switch. Intermediate Distribution Frames (IDFs) will serve each floor/wing of the school. A fiber optic backbone will be provided from each IDF to MDF. The backbone will be designed for 10 Gbps Ethernet.

Fuller Middle School
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4. TESTING REQUIREMENTS

The Technology Contractor shall provide testing of the following systems with the Owner and Owner's Representative present:

- Telephone and data cabling
- Fiber optic backbone cabling
- Paging system
- Wireless clock system
- A/V wiring for classrooms

Testing reports shall be submitted to the Engineer for review and approval before providing to the Owner.

5. OPERATION MANUALS AND MAINTENANCE MANUALS

When the project is completed, the Technology Contractor shall provide operation and maintenance manuals to the Owner.

6. RECORD DRAWINGS AND CONTROL DOCUMENTS

When the project is completed, an as-built set of drawings, showing all lighting and power requirements from contract and addendum items, will be provided to the Owner.

7. COMMISSIONING

The project shall be commissioned per Commissioning Section of the specifications.



**FINAL FOUNDATION ENGINEERING
REPORT**

**FULLER MIDDLE SCHOOL
FRAMINGHAM, MASSACHUSETTS**

SEPTEMBER 10, 2018

Prepared For:

Jonathan Levi Architects
266 Beacon Street
Boston, MA 02116

2269 Massachusetts Avenue
Cambridge, MA 02140
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(617) 868-1420

PROJECT NO. 6473.2.02



September 10, 2018

Jonathan Levi Architects
266 Beacon Street
Boston, MA 02116

Attention: Mr. Philip Gray

Reference: Fuller Middle School; Framingham, Massachusetts
Final Foundation Engineering Report

Ladies and Gentlemen:

This report documents the results of our subsurface exploration program and final foundation design study for the proposed redevelopment of the Fuller Middle School (FMS) located in Framingham, Massachusetts.

This report was prepared in accordance with our proposal dated May 25, 2018, and the subsequent authorization of Jonathan Levi Architects (JLA). These services are subject to the limitations contained in **Appendix A**.

Purpose and Scope

The purpose of the subsurface exploration programs and final foundation design study are to assess the subsurface soil and groundwater conditions at the site as they relate to foundation design and construction and, based on this information, to provide safe and economic foundation design recommendations for the proposed building.

Foundation design includes foundation support of the proposed building and its lowest level slabs, treatment of the lowest level slabs in consideration of groundwater, lateral earth pressures on foundation walls, and seismic design considerations in accordance with the provisions of the Ninth Edition of the Massachusetts State Building Code (Code). Foundation construction considerations are also presented herein.

Available Information

Information provided to McPhail Associates, LLC (McPhail) by JLA included a 40-scale drawing entitled "Existing Condition Plan" dated November 20, 2017 prepared for JLA and a schematic untitled and undated drawing prepared by (JLA) and provided to McPhail via email on July 18, 2018, which indicates an approximate location of the proposed building. Also, a drawing entitled "Approximate and Potential Stockpile Areas" dated November 20, 2017 was provided to us via email on July 21, 2018.

Further, information previously provided to McPhail by JLA included a set of architectural and structural drawings for the existing FMS prepared by Samuel Glaser Associates (SGA) dated May 25, 1956. McPhail was also provided the logs of thirty-four (34) borings



performed during the original school design in 1956. Two plans were included in the set of plans prepared by SGA: a sheet entitled "Existing Topography Map" dated May 25, 1956 and a sheet entitled "Site Improvement Plan – Boring Location Plan" dated May 25, 1956. Elevations as noted on the boring location plan are in feet and referenced to the Framingham Town Base (FTB). A conversion of 3.3 feet from FTB to the NAVD88 (FTB + 3.3 feet = NAVD88) was utilized for the preparation of this report.

Existing and Proposed Conditions

The subject site fronts onto Flagg Drive to the south and is bounded by the Mass Bay Community College to the east, residential properties to the west and a wooded area to the north. Currently, the existing one-story, brick Fuller Middle School building occupies the central portion of the site, which was built in the late 1950's. The site is occupied by a paved surface parking lot, as well as grassed and landscape areas. Existing ground surface across the site varies from about Elevation +160.5 to Elevation +166.

The proposed development involves the demolition of the existing school and the construction of a new school building to the east of the existing school. Based on the information provided to us, the proposed school consists of a 2 to 3-story structure that will occupy a footprint of approximately 55,900 square feet. The proposed building will generally be located within an existing bituminous concrete parking area to the east of the existing school where the existing grade slopes downward from north to south from about Elevation +164 to Elevation +165.2. The lowest level slab of the proposed building will be located at about Elevation +165.5. Except for the area of the proposed auditorium (floor slab at Elevation +163.5), it is understood that the proposed building will not contain any below grade space. In addition, it is understood that a retaining wall and an access ramp will be constructed south of the proposed school. The construction of the ramp will require the placement of upwards to approximately 11 feet of fill.

Elevations cited herein are in feet and are referenced to the North American Vertical Datum of 1988 (NAVD88).

Subsurface Explorations

Two (2) phases of subsurface explorations consisting of a total of eighteen (18) borings were completed at the site for foundation design purposes under contract to McPhail. Approximate plan locations of the borings are as indicated on the enclosed Subsurface Exploration Plan, **Figure 2**.

A preliminary subsurface exploration program consisting of ten (10) borings was conducted at the site on February 21, 22 and April 19, 2018 by Northern Drill Services, Inc. under contract to McPhail. The borings were performed utilizing track or truck-mounted drilling equipment. Borings B-101 through B-109 were terminated at depths ranging from 8 to 31



feet below existing ground surface. Boring logs prepared by McPhail from the initial exploration program are contained in **Appendix B**.

A supplemental subsurface exploration program was conducted as part of our final foundation engineering services on July 26 and 27, 2018 consisting of eight (8) borings, B-201 through B-208. The borings were performed by Carr-Dee Corp. under contract to McPhail. Boring logs from the final exploration phase are contained in **Appendix C**.

The borings were performed utilizing NW casing. Standard 2-inch O.D. split-spoon samples and standard penetration tests (SPT) were obtained continuously or at 5-foot intervals of depth, in general accordance with the standard procedures described in ASTM D1586.

The most recent borings were performed within the existing parking lot south and east of the existing building. Borings B-201 through B-208 were each terminated at a depth of 17 feet below ground surface.

The borings were observed by representatives of McPhail who performed field layout, prepared field logs, obtained and visually classified soil samples, monitored groundwater conditions in the open boreholes, and determined the required boring depths based upon the actual subsurface conditions encountered.

Field locations of the borings were determined by taping from existing site features indicated on the existing conditions plan provided to us. The existing ground surface elevation at each boring location was determined by a level survey performed by our field staff utilizing vertical control information indicated on the plan.

Laboratory Testing

At the completion of the subsurface exploration program, soil samples were returned to our laboratory for more detailed classification, analysis, and testing. The laboratory testing consisted of sieve analyses to determine the grain size distribution and confirm the visual classifications of the fill material, lacustrine deposit and the glacial outwash deposit. Laboratory test procedures were in general accordance with applicable ASTM Standards. Results of the gradation testing appear on **Figure 4, Figure 5, Figure 6 and Figure 7** following the text of this report.

Previous Subsurface Information

As part of the original construction, thirty-four (34) boring logs were performed within or near the footprint of the existing school building, in the area of the existing parking lot and in the field northeast of the existing building. The boring logs indicate that directly below the former ground surface the explorations encountered either soft peat/organic soil or loamy sand deposits. The peat/organic soil was encountered within thirteen (13) of the previous borings and it was observed to extend to depths from about 1.7 to 6.6 feet below



ground surface. The loamy sand deposit was observed to extend to depths from about 0.5 to 4 feet below ground surface. Below the soft peat/organic soil and loamy sand deposits, the borings encountered a loose to very dense sand and gravel deposit with occasional boulders. Groundwater was encountered in the borings at a depth of 0 to 8 feet below ground surface. The boring logs and location plan are attached as **Appendix D**. Approximate plan locations of the borings are also indicated on the enclosed Subsurface Exploration Plan, **Figure 2**.

Recent Subsurface Conditions

A detailed description of the subsurface conditions encountered within the recent borings are documented on the boring logs contained in **Appendix B** and **Appendix C**. Based on these explorations, the following is a description of the generalized subsurface conditions encountered across the site from ground surface downward.

Fill material of about 2.2- to 7.5-foot in thickness was encountered in the borings at ground surface or below the surface treatments, which consisted of a 3-inch thickness of asphalt or a 6-inch thickness of topsoil. The fill material was observed to generally range from a very loose to dense gray to brown sand and gravel with trace silt to a sand with some gravel and silt. Grain size distributions of selected samples of the fill material are shown on **Figures 4 and 5**.

Due to obstructions within the fill deposit, boring B-106 was terminated at a depth of 4.5 feet below the existing ground surface. Therefore, boring B-106A was drilled adjacent to the abandoned boring B-106 and standard sampling commenced at a depth of 4 feet below the existing ground surface.

Underlying the fill deposit, nine (9) borings B-101, B-102, B-103, B-104, B-107, B-202, B-203, B-205, and B-206 encountered an alluvial/organic silt deposit and/or peat, which ranged in consistency from a very loose to compact, dark brown to fine to medium sand with trace to some organic silt and peat fibers to a peaty sand trace gravel. Generally, the alluvial/organic silt deposit and/or peat, where encountered, ranged from about 2 to 5.5 feet in thickness.

Below the fill and/or alluvial/organic silt deposits, a natural lacustrine deposit was encountered within borings B-102 and B-107 at a depth of 8 feet below ground surface corresponding to Elevation +156.9 and Elevation +154.9, respectively. The lacustrine deposit was observed to vary from a compact, light gray, silt with trace sand to silty sand with trace gravel and clay. A typical grain size distribution of the lacustrine deposit is presented on **Figure 6**.

Below the fill, alluvial/organic silt, peat and lacustrine deposits, a natural glacial outwash deposit was encountered at depths ranging from 4 to 9 feet below ground surface corresponding to Elevation +159.4 to Elevation +155.6. The glacial outwash was observed to vary from a compact to very dense, brown to gray, sand with trace silt to a sand and



gravel with some silt. Grain size distributions of samples of the glacial outwash deposit are presented on **Figure 7**. A contour plan indicating the elevation of the top of natural soil deposits (glacial outwash, and lacustrine deposits) across the site is presented on the enclosed **Figure 3**.

At the time of the 2018 borings, groundwater levels were measured within the completed boreholes performed within the project site. The groundwater levels were observed to vary from about 2.5 to approximately 6.5 feet below the existing ground surface corresponding to about Elevation +159.6 to Elevation +157.8. It is anticipated that future groundwater levels across the site may vary from those reported herein due to factors such as normal seasonal changes, periods of heavy precipitation, and alterations of existing drainage patterns or may become perched on the relatively impervious organic deposit.

Final Foundation Design Recommendations

Based upon the results of subsurface exploration programs described above, the ground surface across the project site is underlain by fill and alluvial/organic deposits which extend to depths ranging from approximately 4 to 9 feet below the existing ground surface and are underlain by successive natural glacial lacustrine and glacial outwash deposits. The existing fill and alluvial/organic deposits as they exist are not considered to be suitable for direct foundation support. Therefore, foundation support for the proposed building is recommended to be provided by spread footing foundations in conjunction with slab-on-grade construction supported on the existing fill soil that has been improved with a ground improvement technique. Ground improvement methods such as Aggregate Piers (APs) deriving their support within the lacustrine or glacial outwash deposits would allow for the utilization of conventional spread footing construction without requiring over excavation and replacement, temporary earth support, extensive construction dewatering and significant soil disposal from the site.

Ground Improvement

In general, an AP cavity is created by either augering open-hole or driving an approximately 12 to 16-inch closed-end diameter casing to the surface of the lacustrine or glacial outwash deposit. Aggregate is then introduced either through a top-feed or bottom-feed system and the subsequent dynamic compaction of aggregate layers introduced into the cavity. The use of a closed-ended temporary casing with bottom-feed capability eliminates spoils as all penetrated soils are displaced laterally. After creating the AP cavity to the design depth, aggregate is placed inside the void. The aggregate is compacted into layers of about 1-foot in thickness and the process is repeated to the top of the cavity, forming the AP. The compaction densifies the aggregate and increases the lateral stress in the soil matrix beneath the proposed buildings.

Additionally, the aggregate may be grouted to increase the stiffness of the AP in very loose granular deposits or in organic materials. Potential for larger settlements is reduced by



improving the unsuitable soils to a stiffer composite soil matrix with the installation of the AP.

Since ground improvement techniques are provided by a design-build consultant, detailed design calculations should be submitted to the Architect for review prior to the beginning of construction. A detailed explanation of the design parameters for capacity and settlement calculations should be included in the design submittal. The design submittal should also include a testing program to demonstrate the design capacity of the aggregate pier elements is being achieved. All calculations and drawings should be prepared and sealed by a Professional Engineer licensed in the Commonwealth of Massachusetts and retained by the Contractor who is to perform the work.

The following general criteria should be utilized in the design of aggregate piers:

1. Aggregate piers should extend at least to the surface of the lacustrine or glacial outwash deposit;
2. The maximum allowable bearing pressure supported on a reinforced ground surface which extends to the lacustrine or glacial outwash deposit should be equal to or less than 2 tons per square-foot (TSF);
3. Estimated long-term settlement for footings should be less than 1-inch;
4. Estimated long-term differential settlement of adjacent footings should be less than 1/2-inch; and
5. A modulus load test should be performed on at least one aggregate pier to 150 percent of the maximum design stress.

Where AP elements are installed through organic materials, it is typical that the AP be grouted to increase the stiffness of the foundation unit. Therefore, it is anticipated that a grouted AP would be required for this project due to the presence of organic deposit.

It is understood that the proposed finished grades will roughly coincide with the existing grades as part of the proposed construction. In the event that existing grades are raised to establish the proposed finished site grades, long-term settlement of the existing organic deposit is anticipated. Therefore, it is recommended that site grades either remain at the existing levels or be raised as little as possible to minimize the amount of future settlement of the organic deposit.

Lowest Level Slab

The proposed floor slab at Elevation +165.5 should be designed as a conventional slab-on-grade underlain by a polyethylene vapor barrier spread over a minimum 9-inch thickness of off-site gravel fill containing less than 8 percent by weight passing the No. 200 sieve. It is recommended that slab-on-grade to be constructed on the AP improved soils.

Based on information provided to us, it is understood that the proposed lowest level slab at Elevation +165.5 of the proposed building will be located at or slightly above the proposed exterior finished grades, therefore, perimeter and underslab drainage are not considered



necessary. It is recommended that the proposed finished grades be sloped away from the proposed buildings to promote drainage away from the structure.

Retaining Wall(s)

As indicated above, a retaining wall will be constructed south of the proposed school building to support soil for a new access ramp. The proposed retaining wall footings and the access ramp are recommended to be constructed on the AP improved soils.

In addition, it is recommended that drainage be provided along the retained soil side of the proposed retaining wall. The drainage should consist of a foundation drain pipe embedded within a minimum 6-inch thickness of $\frac{3}{4}$ -inch crushed stone which is surrounded by filter fabric and backfilled with a free draining gravel to within 18 inches of final grade. Alternatively, a prefabricated drainage product such as Miradrain 6000 should be installed directly along the exterior of the wall that that should be tied directly into the crushed stone envelope surrounding the foundation drain. The upper 18 inches of backfill should be relatively impervious ordinary fill with the finished grade pitched away from the wall to minimize surface water infiltration.

If the proposed final site grades require filling to establish the required access ramp subgrade elevation in consideration with the AP supported access ramp, settlement of the site areas should be monitored by means of settlement platforms installed at several locations across the proposed ramp area. In addition, it is recommended that the APs utilized for support of the ramp and settlement platforms be installed prior to the backfilling to the proposed access ramp grade elevations. Following installation of the APs for support of the ramp, the settlement platforms should be monitored daily during construction of the working pad, and bi-weekly thereafter. The settlement platform monitoring data would be used to determine when the ramp construction can begin which typically occurs when settlement has either stopped or when the rate of settlement is very small. Typically, the settlement monitoring program could take between about 1 to 3 months, depending upon such factors as the thickness of the compressible soils, the distance to free draining soils, the consolidation parameters of the compressible soils and the height of the soil surcharge, etc.

General Foundation Recommendations

Recommended minimum footing widths for continuous and isolated spread footings are 30 and 36 inches, respectively. Perimeter foundations and interior foundations located adjacent to unheated areas should be provided with a minimum 4-foot thickness of soil cover as frost protection. Interior footings below heated areas should be located such that the top of the foundation concrete is at least 6 inches below the underside of the lowest level slab. All foundations should be located such that they bear below a theoretical line drawn upward and outward at 2 to 1 (horizontal to vertical) from the bottom exterior edge of all existing adjacent footings, structures and utilities. All foundations should be designed in accordance with the provisions of the Ninth Edition of the Code.



All localized depressions in the lowest level slab (such as elevator pits, etc.) should be provided with properly tied continuous waterstops in all construction joints and cementitious waterproofing to protect against groundwater intrusion. Furthermore, the perimeter below-grade foundation walls should receive a trowelled-on bitumastic damproofing.

Below-grade foundation walls receiving lateral support at the top and bottom (i.e. restrained walls) should be designed for a lateral earth pressure corresponding to an equivalent fluid density of 60 pounds per cubic-foot. Similarly, drained cantilevered retaining walls, (i.e. receiving no lateral support at the top) should be designed for a lateral earth pressure corresponding to an equivalent fluid density of 40 pounds per cubic-foot. To these values must be added the pressures attributable to earthquake forces per Section 1610.2 of the Code.

Lateral forces can be considered to be transmitted from the structure to the soil by passive pressure against the foundation walls utilizing an equivalent fluid density of 120 pounds per cubic-foot providing that the walls are designed to resist these pressures. Lateral force can also be considered to be transmitted from the structure to the soil by friction on the base of footings using a coefficient of 0.35, to which a safety factor of 1.5 should be applied.

Seismic Design Considerations

For the purposes of determining parameters for structural seismic design, this site is considered to be a Site Class D as defined in Chapter 20 of American Society of Civil Engineers (ASCE) Standard 7-10 "Minimum Design Loads for Buildings and Other Structures". Further, the bearing stratum on the proposed site is not considered to be subject to liquefaction during an earthquake based on the criterion of Section 1806.4 of the Code.

Foundation Construction Considerations

The primary foundation construction considerations that are anticipated to have an impact on the design of the structure include removal of potential obstructions to AP installation, impact AP installation on surrounding structures, the preparation of the foundation bearing surfaces, construction dewatering, and off-site disposal of excess excavated material.

Removal of obstructions to AP installation should be performed on an as-needed basis. Excavations to remove the obstructions should be backfilled with ordinary fill after all oversized material has been removed. The fill should be replaced in maximum 2-foot lifts and tamped with the backhoe bucket to facilitate future AP installation. The below-grade obstructions should be removed in their entirety wherever they interfere with the new construction, however, they may remain in-place under the proposed building provided that they are in excess of 18 inches below the lowest level slab and do not interfere with the foundation or utility installation.



The installation of the aggregate piers will likely result in some ground vibrations and noise which may be disruptive to the Mass Bay Community College building occupants and could potentially cause cosmetic damage to existing structures. Therefore, it is recommended that ground vibration monitoring be performed with the use of seismographs during the installation of the aggregate piers.

To minimize disturbance of the AP-improved soil bearing surfaces, it is recommended that the final excavation to expose the surface of the bearing stratum at footing locations be performed utilizing an excavator that has a smooth-edged "toothless" bucket. Further, it is recommended that bearing surfaces be immediately covered with a minimum of 3-inch thickness of 3/4-inch crushed stone to minimize disturbance of the subgrade during subsequent forming operations.

It is anticipated that portions the excavated fill material may be re-used on-site as ordinary fill provided it is primarily granular excavated during non-freezing conditions in a relatively dry condition, is maintained in a dry condition, and can be properly compacted. Protection of all materials from increases in moisture content is considered to be the responsibility of the Contractor. Prior to reusing the fill material on-site as ordinary fill, it will be necessary to cull out all material in excess of 4 inches in largest dimension.

It is recommended that the placement and compaction of the on-site materials be completed during relatively dry and non-freezing conditions. Stockpiled excavated material designated for reuse on-site should be covered at all times with 6-mil polyethylene for protection from precipitation and also as a dust mitigation measure. If, due to any of the above conditions, the excavated material becomes unsuitable for reuse, it should be removed from the site and an off-site gravel fill used.

It is anticipated that dewatering, if required, by means of strategically located sumps and trenches should suffice during foundation construction operations. In addition, trapped surface water may accumulate within localized depressions in the ground surface across the site after periods of heavy precipitation and will most likely necessitate localized sumping. It is recommended that all pumped groundwater be discharged on-site. If pumped groundwater cannot be discharged on-site, it would be necessary to dispose of pumped groundwater into a nearby storm drain or combined sewer which may require the need for a temporary groundwater discharge permit.

Should excess excavated soil generated from the proposed construction require off-site disposal, current Department of Environmental Protection (DEP) policies and regulations for off-site reuse of excess excavated soil require environmental characterization of the excavated soil prior to its off-site reuse.

Final Comments

Under the terms of our contract, McPhail will provide design assistance to the design team during the final design phase of this project. The purpose of this involvement would be to



JLA
September 10, 2018
Page 10

review the structural foundation drawings and foundation notes for conformance with the recommendations presented herein and to prepare the earthwork and specialty foundation specification sections for inclusion into the Contract Documents for construction.

It is recommended that McPhail Associates, LLC be retained during the construction period to review ground-improvement and earthwork-related submittals; observe installation of aggregate piers; observe pre-excavation, observe final preparation of the foundation bearing surfaces; and to monitor placement and compaction of fill materials in accordance with the provisions of the Code and the provisions of the Contract Documents. Our involvement during the construction phase of the work should minimize costly delays due to unanticipated field problems since our field engineer would be under the direct supervision of our project manager who was responsible for the subsurface exploration program and foundation and site design recommendations documented herein.

We trust that the above is sufficient for your present requirements. Should you have any questions concerning the recommendations presented herein, please do not hesitate to call us.

Very truly yours,

McPHAIL ASSOCIATES, LLC

A handwritten signature in blue ink that reads "Fatima Babic-Konjic". The signature is written in a cursive, flowing style.

Fatima Babic-Konjic, P.E.

A handwritten signature in blue ink that reads "Chris M. Erikson". The signature is written in a cursive, flowing style.

Chris M. Erikson, P.E.

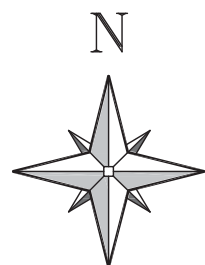
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FBK/cme

FIGURE I



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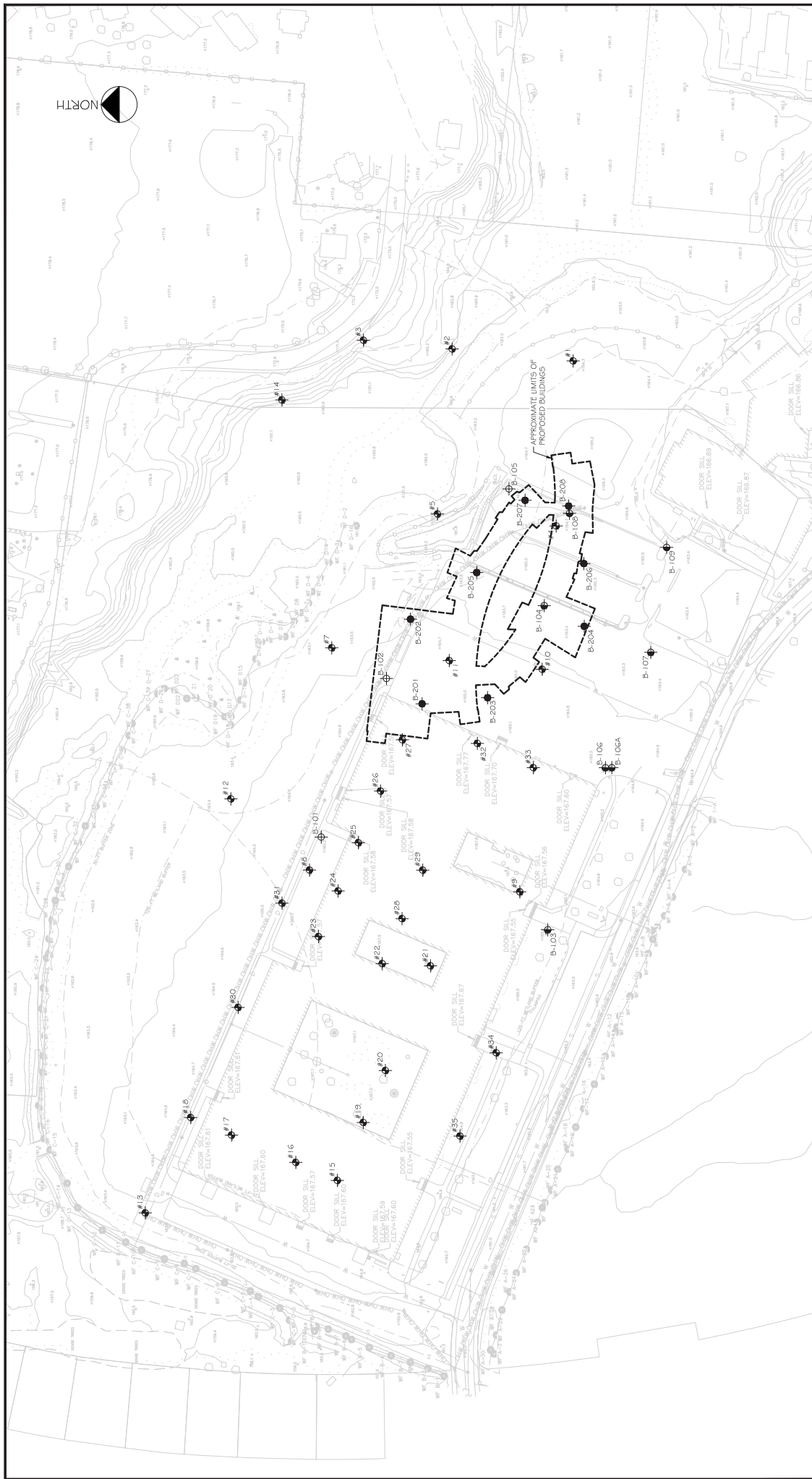
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PROJECT LOCATION PLAN

FULLER MIDDLE SCHOOL

FRAMINGHAM

MASSACHUSETTS



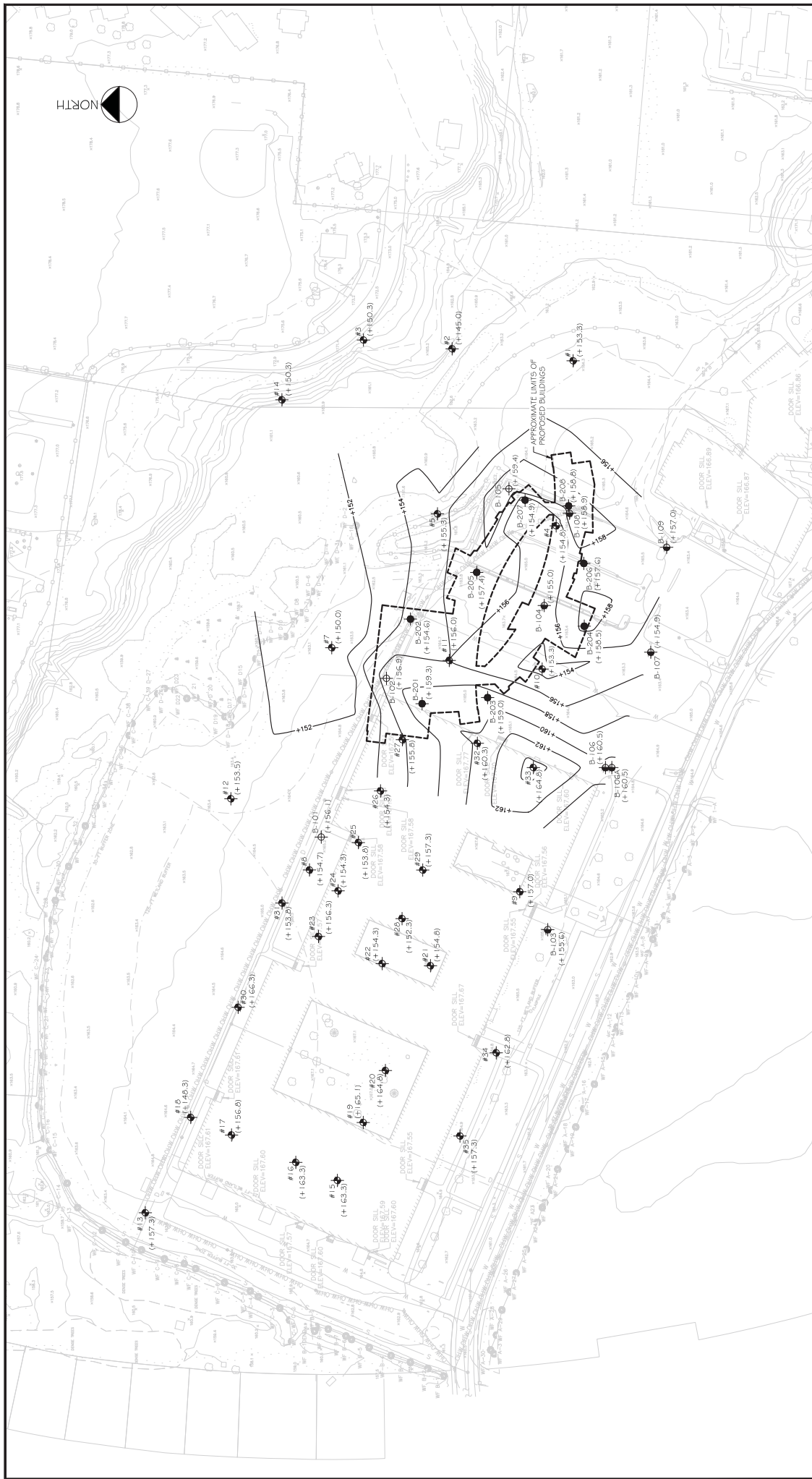
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FRAMINGHAM MASSACHUSETTS
 SUBSURFACE EXPLORATION PLAN
 FOR
JONATHAN LEVI ARCHITECTS
 BY
McPHAIL ASSOCIATES, LLC

Date: AUGUST 2016 Dwn: M.E.S. Chkd: P.B.K. Scale: 1" = 60'
 Project No. 6475 **FIGURE 2**

REFERENCE THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED NOVEMBER 20, 2017 PROVIDED BY JONATHAN LEVI ARCHITECTS

- LEGEND**
- APPROXIMATE LOCATION OF BORING PERFORMED BY CARR-DICE CORP. ON JULY 26 & 27, 2016 FOR McPHAIL ASSOCIATES, LLC
 - APPROXIMATE LOCATION OF BORING PERFORMED BY NORTHERN DRILL SERVICES, INC. ON APRIL 19, 2016 FOR McPHAIL ASSOCIATES, LLC
 - APPROXIMATE LOCATION OF BORING PERFORMED BY NORTHERN DRILL SERVICES, INC. ON FEBRUARY 21 & 22, 2016 FOR McPHAIL ASSOCIATES, LLC
 - APPROXIMATE LOCATION OF PREVIOUS BORING CONDUCTED IN 1955 BY OTHERS



FRAMINGHAM MASSACHUSETTS

FOR
FULLER MIDDLE SCHOOL
 TOP OF NATURAL SOIL CONTOUR PLAN

BY
JONATHAN LEVI ARCHITECTS
 McPHAL ASSOCIATES, LLC

Date: SEPTEMBER 2018
 Project No. 6475

Scale: 1" = 60'
 Figure 3

McPHAL ASSOCIATES, LLC
 Geotechnical and Engineers
 2269 Massachusetts
 Cambridge, MA 02140
 617/868-1420
 www.mcphal.com

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED 'EXISTING CONDITIONS PLAN' DATED NOVEMBER 20, 2017 PROVIDED BY JONATHAN LEVI ARCHITECTS

NOTES:
 1. CONDITIONS PRESENTED ARE BASED ON LINEAS INTERPOLATION BETWEEN EXPLORATIONS. THE ACTUAL FIELD CONDITIONS MAY VARY FROM THE INDICATED CONTOURS.
 2. NATURAL SOIL FOR THE PURPOSE OF THIS FIGURE INCLUDES GACAL DOWWASH AND ILLUSTRIATE DEPOSIT.

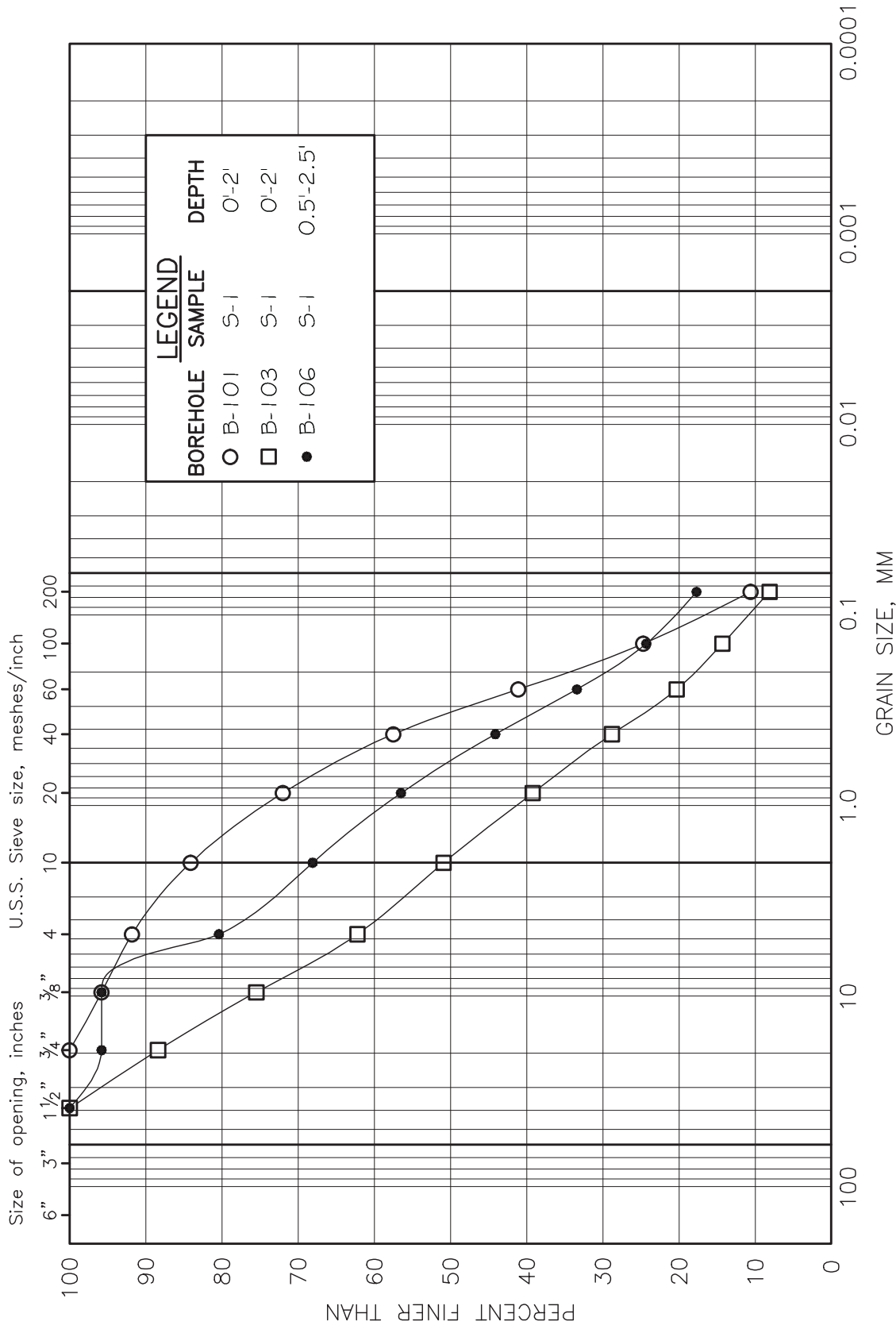
GRAPHIC SCALE
 0 10 20 30 40 50 60 70 80 90 100

- LEGEND**
- APPROXIMATE LOCATION OF BORING PERFORMED BY GARD-DEE CORP. ON JULY 26 & 27, 2016 FOR McPHAL ASSOCIATES, LLC
 - APPROXIMATE LOCATION OF PREVIOUS BORING CONDUCTED IN 1955 BY OTHERS
 - ⊕ APPROXIMATE LOCATION OF BORING PERFORMED BY NORTHERN DRILL SERVICES, INC. ON APRIL 19, 2016 FOR McPHAL ASSOCIATES, LLC
 - ⊖ APPROXIMATE LOCATION OF BORING PERFORMED BY NORTHERN DRILL SERVICES, INC. ON FEBRUARY 21 & 22, 2016 FOR McPHAL ASSOCIATES, LLC
 - +153.0— CONTOUR ELEVATION OF TOP OF NATURAL SOIL (REFER TO NOTES 1 AND 2)
 - +153.0— ELEVATION OF TOP OF NATURAL SOIL ENCOUNTERED AT EXPLORATION LOCATION

GRAIN SIZE DISTRIBUTION
FILL

FIGURE 4

M.I.T. GRAIN SIZE SCALE

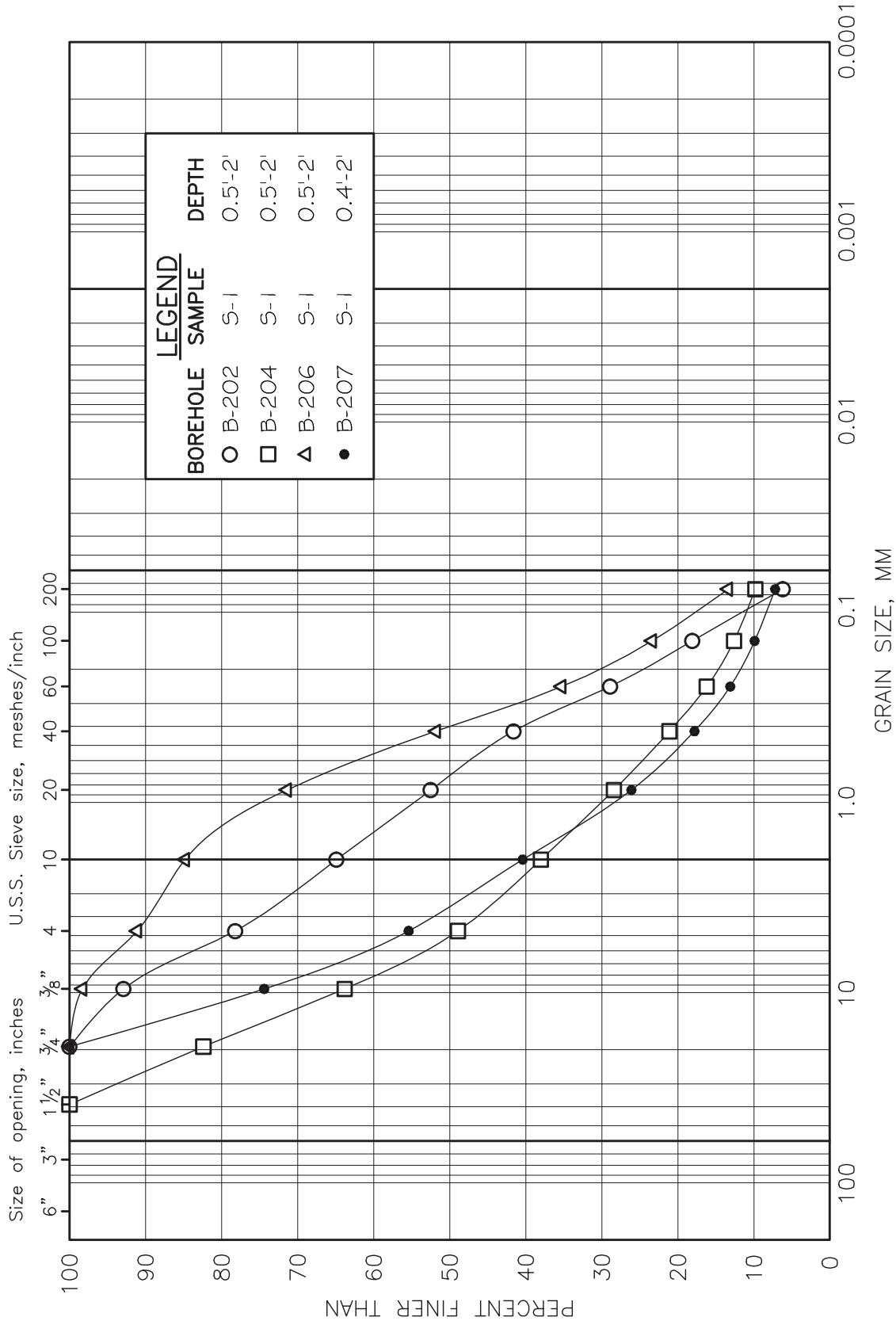


COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED	

GRAIN SIZE DISTRIBUTION
FILL

FIGURE 5

M.I.T. GRAIN SIZE SCALE

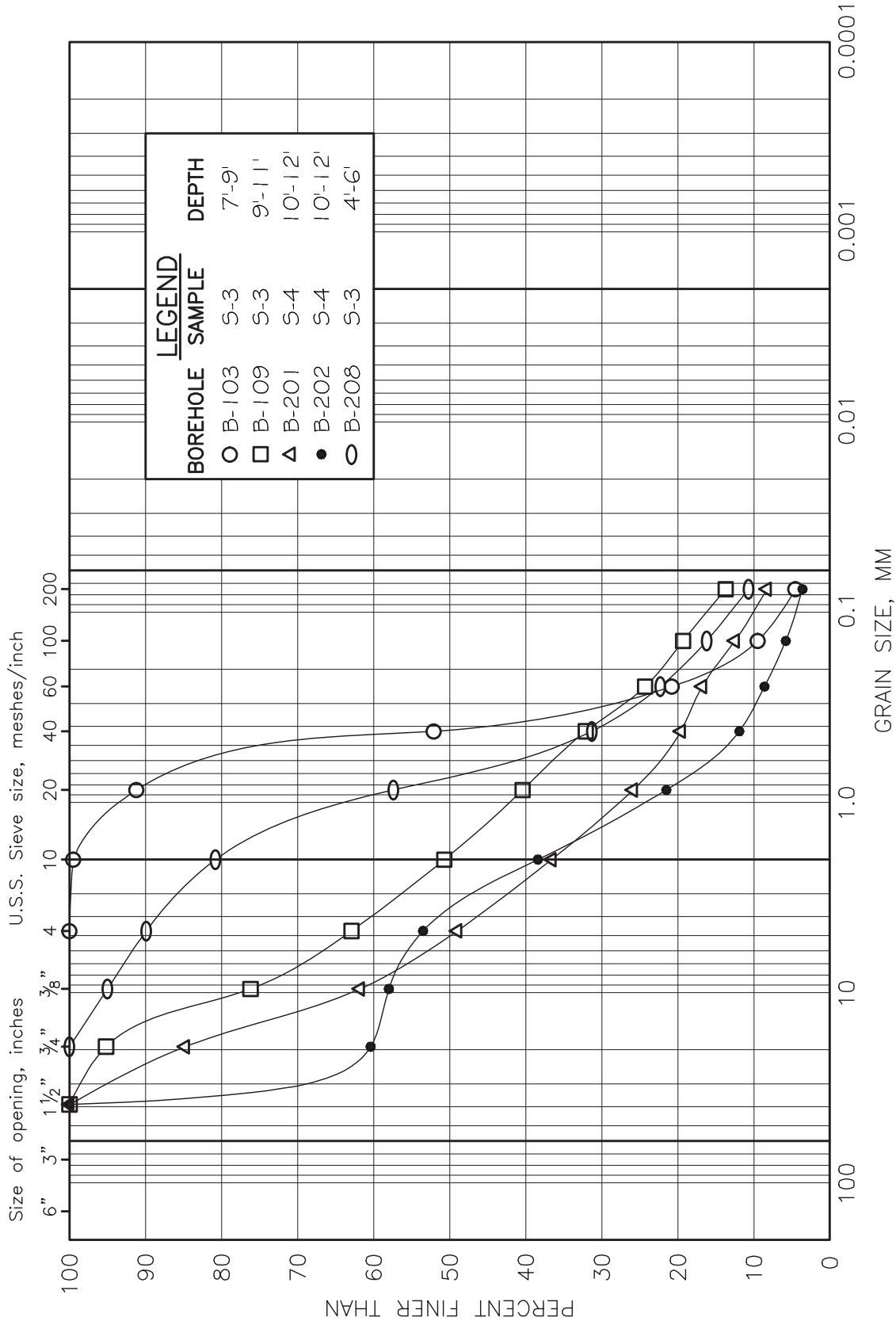


COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED	

GRAIN SIZE DISTRIBUTION
GLACIAL OUTWASH

FIGURE 7

M.I.T. GRAIN SIZE SCALE



COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED	



**APPENDIX A:
LIMITATIONS**



LIMITATIONS

This report has been prepared on behalf of and for the exclusive use of Jonathan Levi Architects for specific application to the proposed new construction to be located on the campus of the Fuller Middle School in Framingham, Massachusetts in accordance with generally accepted soil and geotechnical engineering practices. No other warranty, expressed or implied, is made.

In the event that any changes in nature or design of the proposed construction are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by McPhail Associates, LLC.

The analyses and recommendations presented in this report are based upon the data obtained from the subsurface explorations performed at the approximate locations indicated on the enclosed plan. If variations in the nature and extent of subsurface conditions between the widely spaced explorations become evident during the course of construction, it will be necessary for a re-evaluation of the recommendations of this report to be made after performing on-site observations during the construction period and noting the characteristics of any variations.



APPENDIX B:

**BORING LOGS B-101 THROUGH B-109
PREPARED BY MCPHAIL**

CARR-DEE CORP.

37 LINDEN STREET

MEDFORD, MA 02155-0001

Telephone (781) 391-4500

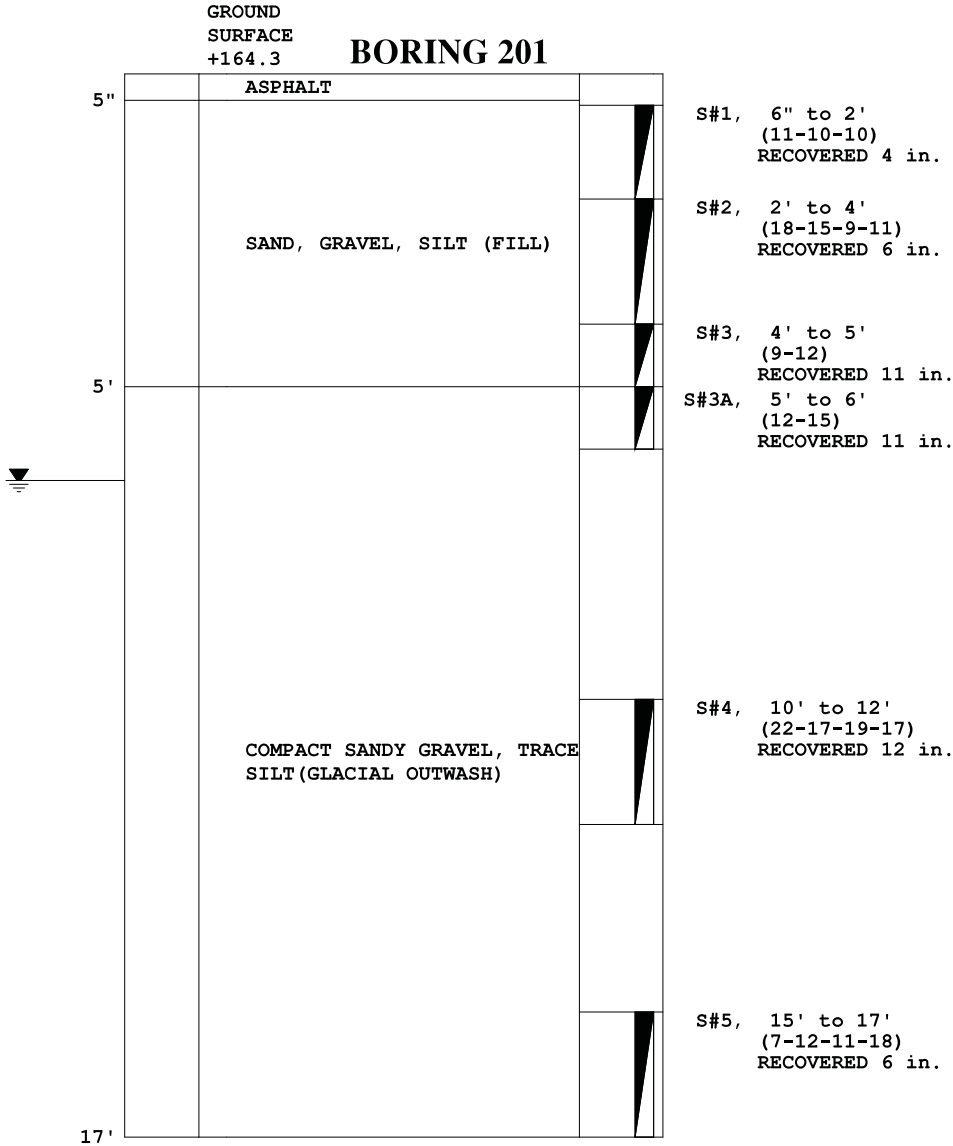
To: MCPHAIL ASSOC., LLC, 2269 MASS. AVE., CAMBRIDGE, MA

Date: 7-30-2018

Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.



All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).

CARR-DEE CORP.

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Date: 7-30-2018

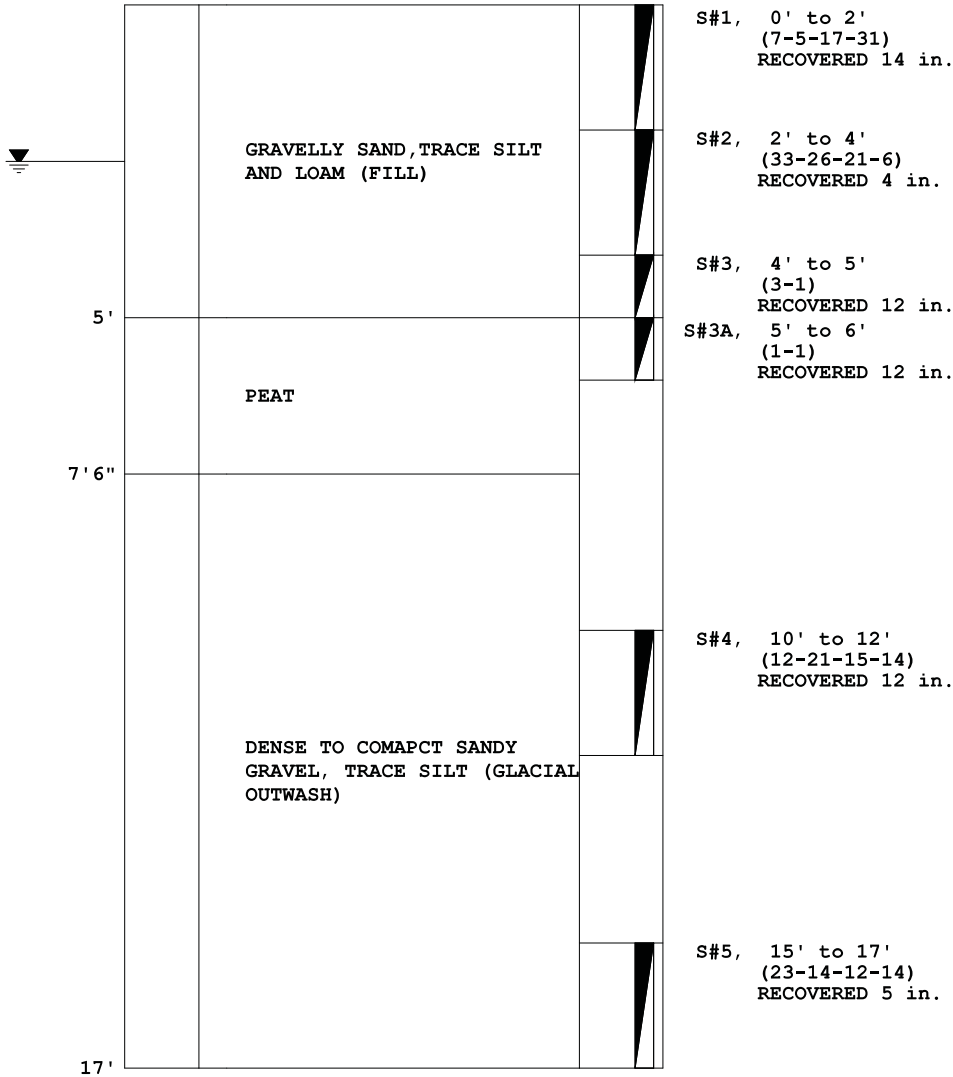
Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.

GROUND
SURFACE
+162.1

BORING 202



WATER LEVEL 2'6"
 SIZE OF CASING: NW, LENGTH: 15'0"
 DRILLER: G. SMITH, INSPECTOR: J. CRONIN
 DATE STARTED & COMPLETED: 7-27-2018

All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).

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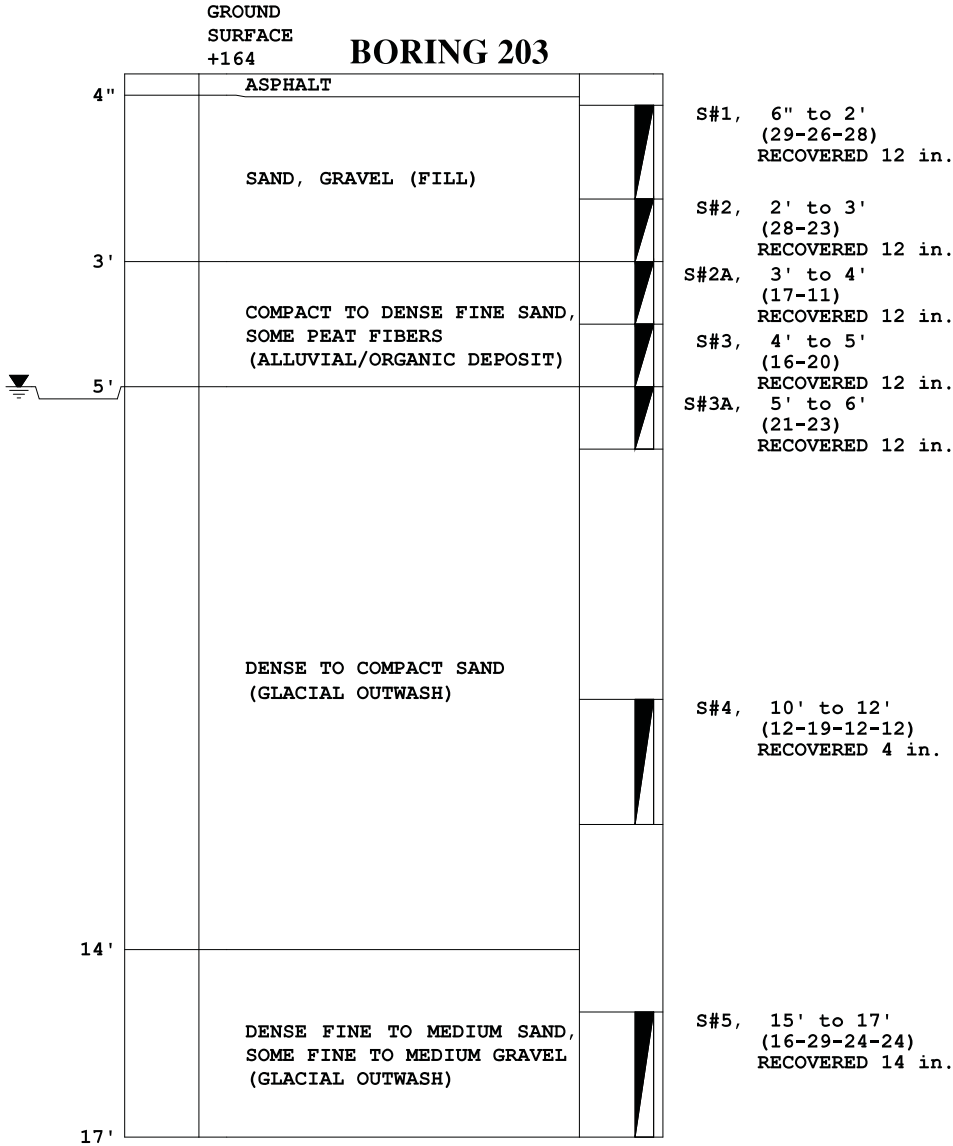
To: MCPHAIL ASSOC., LLC, 2269 MASS. AVE., CAMBRIDGE, MA

Date: 7-30-2018

Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.



SIZE OF CASING: NW, LENGTH: 15'0"
 DRILLER: G. SMITH, INSPECTOR: J. CRONIN
 DATE STARTED & COMPLETED: 7-26-2018

All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).

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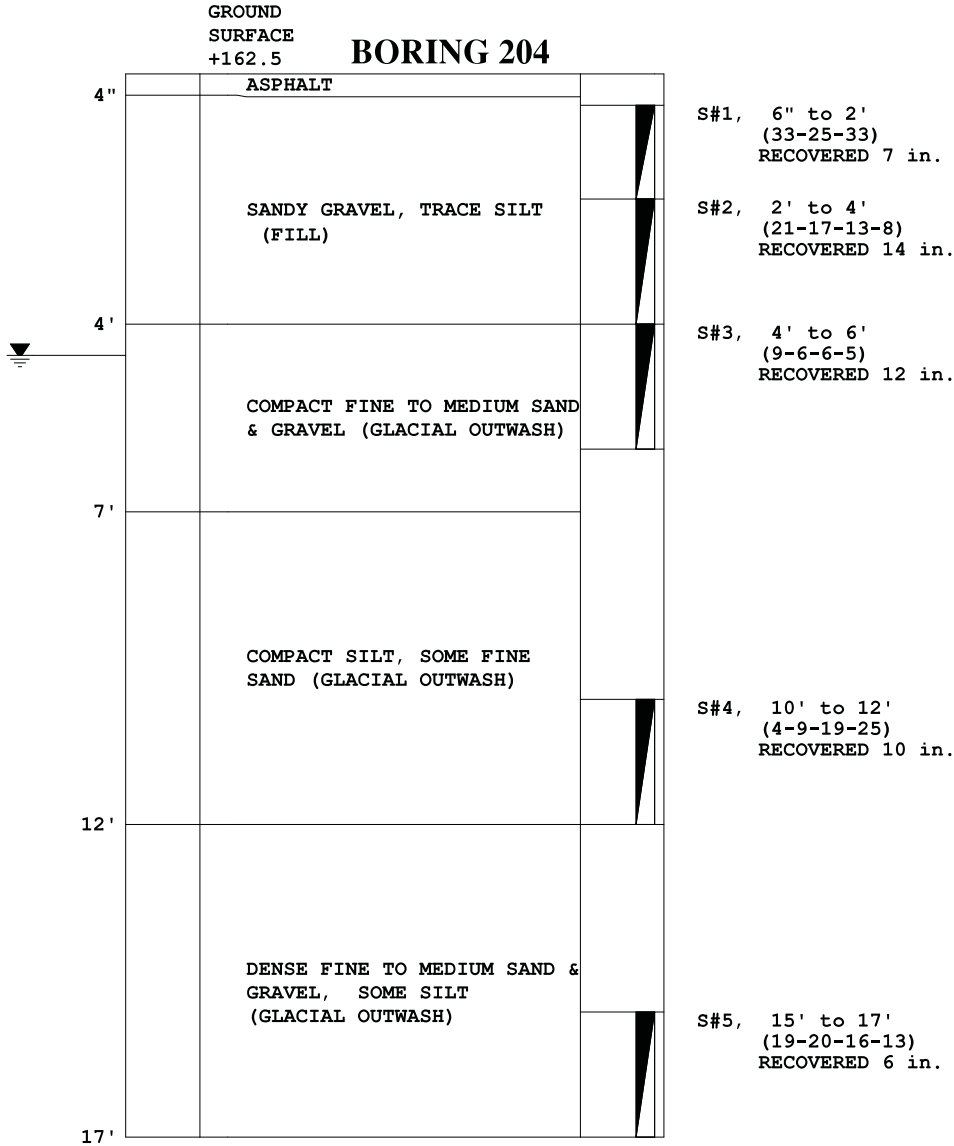
To: MCPHAIL ASSOC., LLC, 2269 MASS. AVE., CAMBRIDGE, MA

Date: 7-30-2018

Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.



All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).

CARR-DEE CORP.

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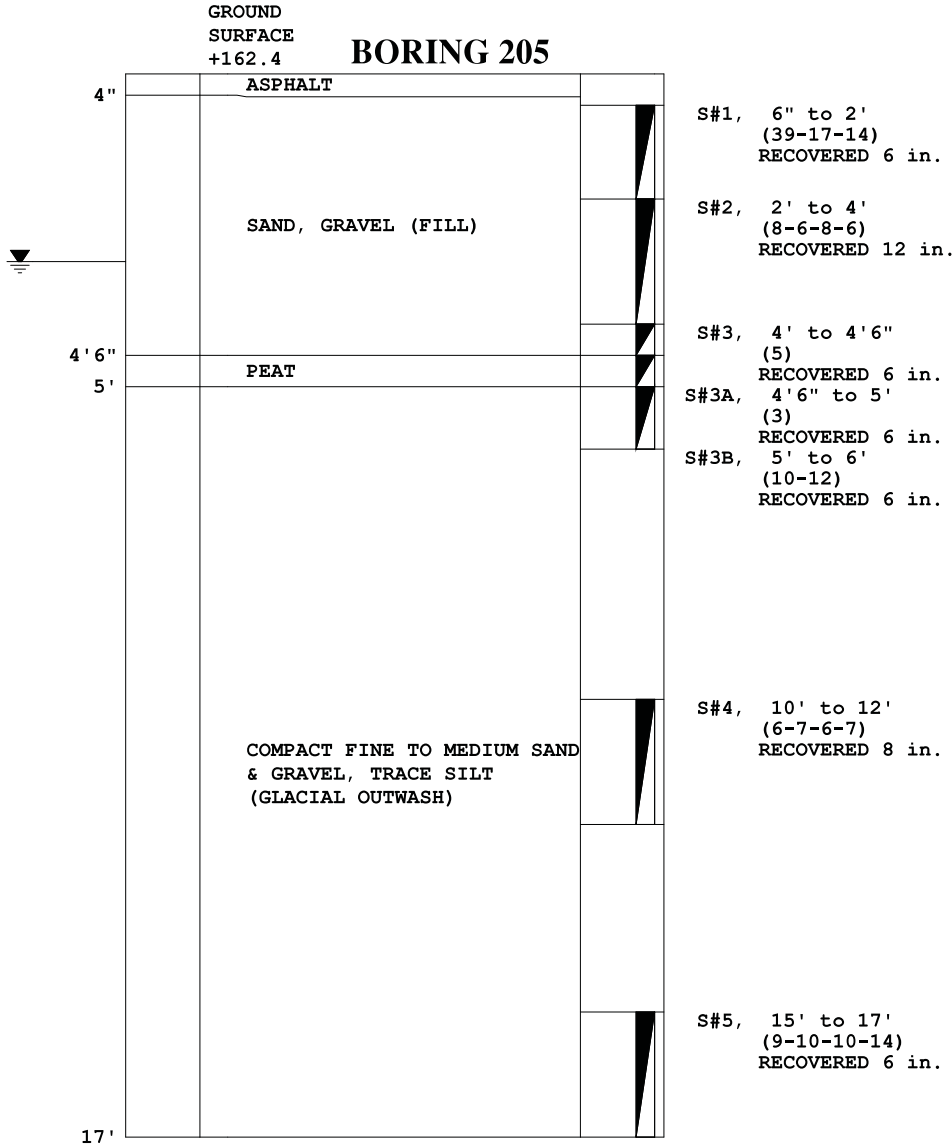
To: MCPHAIL ASSOC., LLC, 2269 MASS. AVE., CAMBRIDGE, MA

Date: 7-30-2018

Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.



WATER LEVEL 3'
 SIZE OF CASING: NW, LENGTH: 15'0"
 DRILLER: G. SMITH, INSPECTOR: J. CRONIN
 DATE STARTED & COMPLETED: 7-26-2018

All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).

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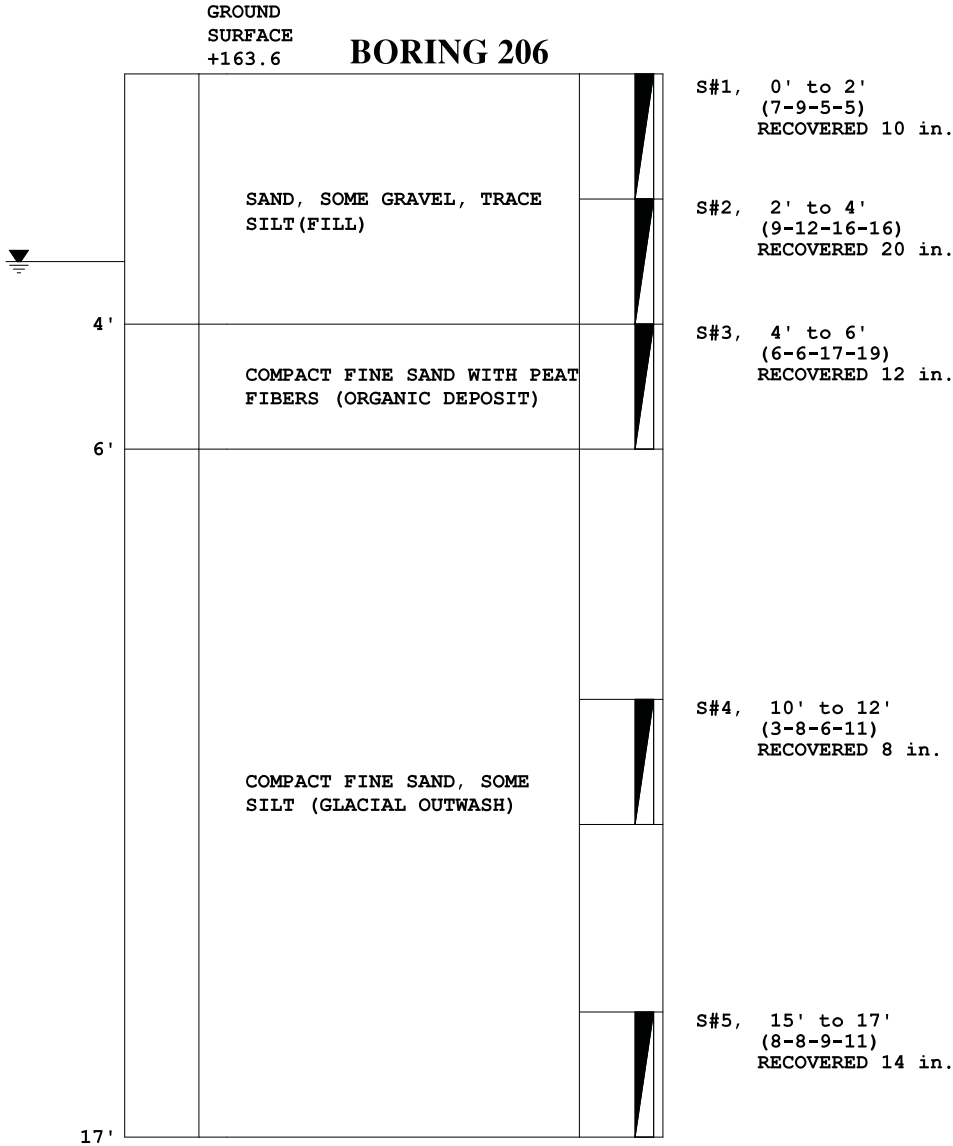
To: MCPHAIL ASSOC., LLC, 2269 MASS. AVE., CAMBRIDGE, MA

Date: 7-30-2018

Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.



WATER LEVEL 3'
 SIZE OF CASING: NW, LENGTH: 15'0"
 DRILLER: G. SMITH, INSPECTOR: J. CRONIN
 DATE STARTED & COMPLETED: 7-27-2018

All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).

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Telephone (781) 391-4500

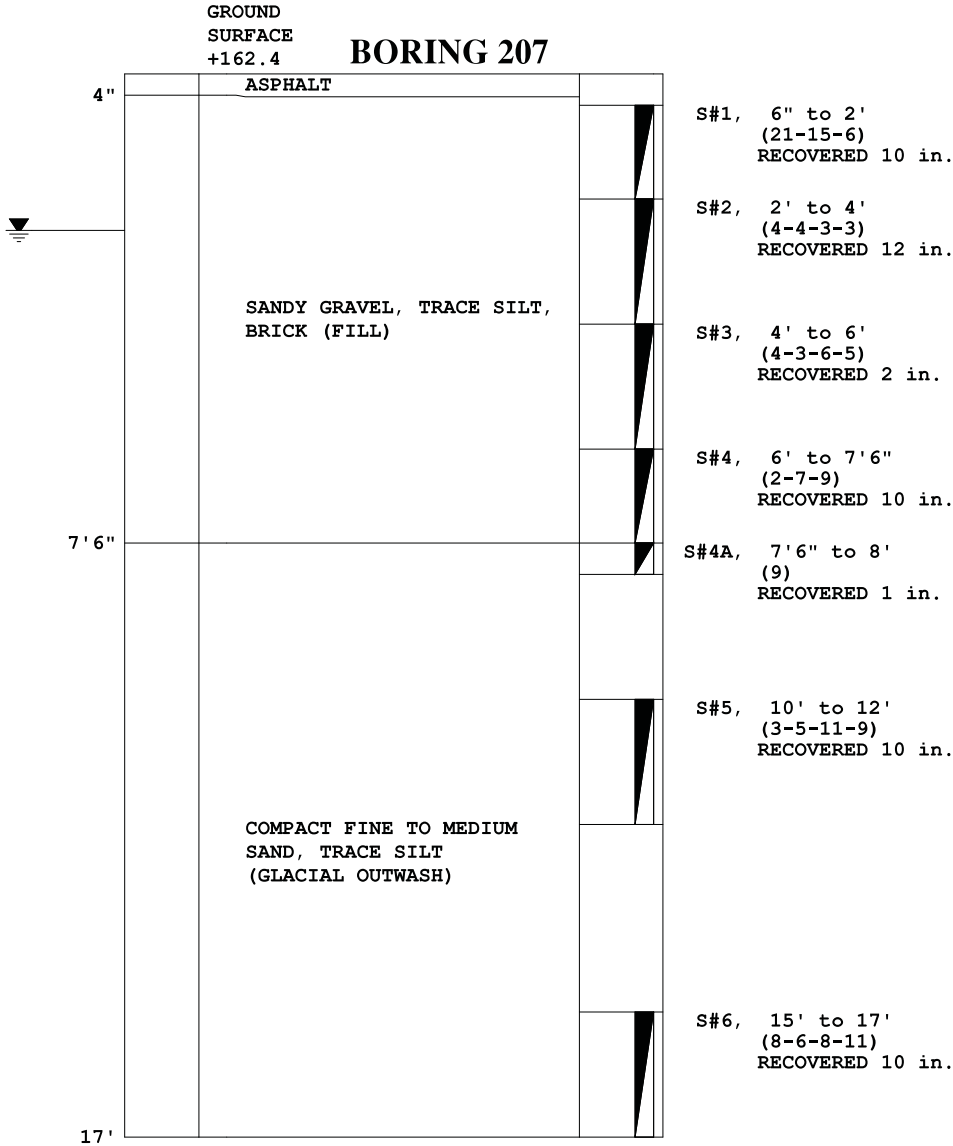
To: MCPHAIL ASSOC., LLC, 2269 MASS. AVE., CAMBRIDGE, MA

Date: 7-30-2018

Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.



WATER LEVEL 2'6"
 SIZE OF CASING: NW, LENGTH: 15'0"
 DRILLER: G. SMITH, INSPECTOR: J. CRONIN
 DATE STARTED & COMPLETED: 7-27-2018

All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).

CARR-DEE CORP.

37 LINDEN STREET

MEDFORD, MA 02155-0001

Telephone (781) 391-4500

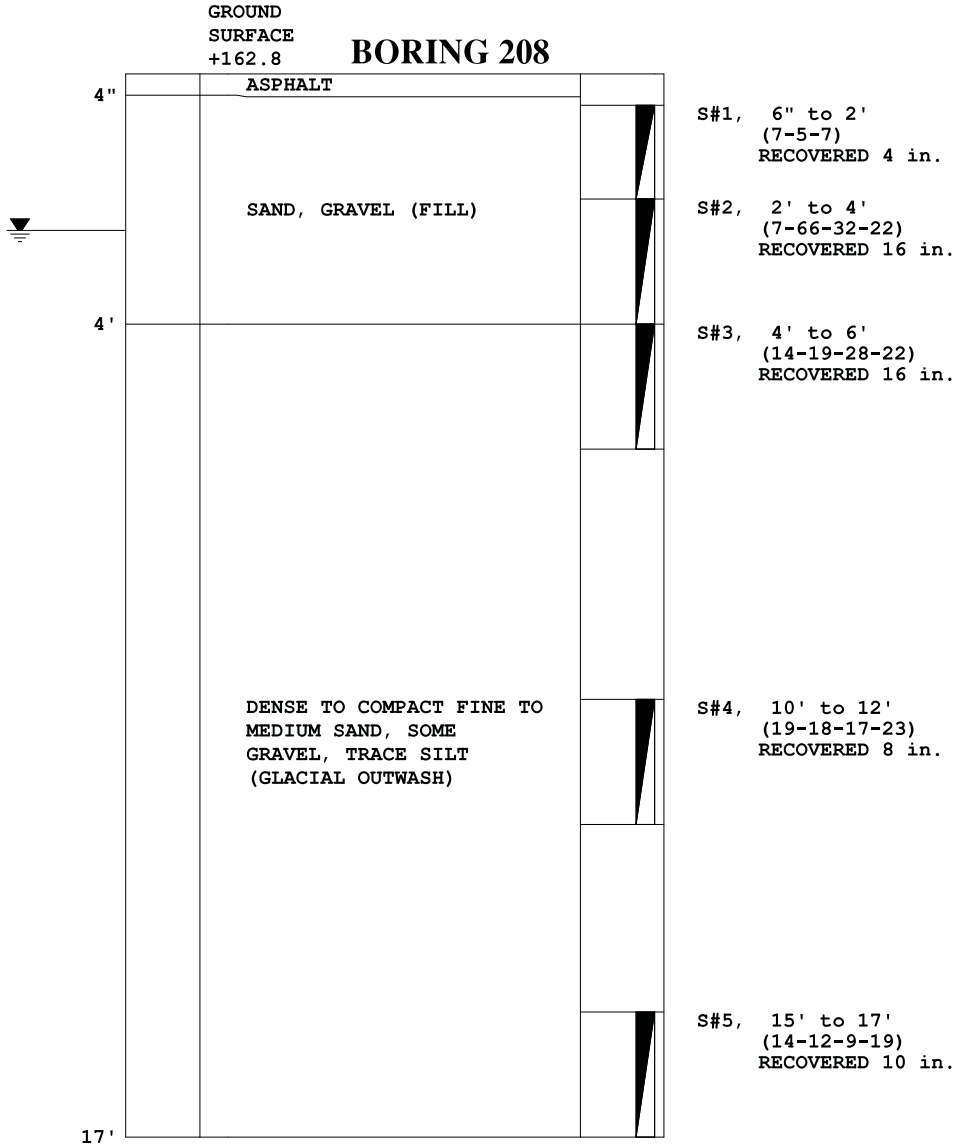
To: MCPHAIL ASSOC., LLC, 2269 MASS. AVE., CAMBRIDGE, MA

Date: 7-30-2018

Job No.: 2018-146

Location: FULLER MIDDLE SCHOOL, 31 FLAGG DRIVE, FRAMINGHAM, MA

Scale: 1 in. = 3 ft.



WATER LEVEL 2'6"

SIZE OF CASING: NW, LENGTH: 15'0"

DRILLER: G. SMITH, INSPECTOR: J. CRONIN

DATE STARTED & COMPLETED: 7-27-2018

All samples have been visually classified by . Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in parenthesis indicate the number of blows required to drive Two-inch Split Sampler 6 inches using 140 lb. weight falling 30 inches(±). Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches (±).



APPENDIX C:

**BORING LOGS B-201 THROUGH B-208
PREPARED BY CARR-DEE**

Project: Fuller Middle School	Job #: 6473	Boring No. B-101
Location: 31 Flagg Drive	Date Started: 4-19-18	
City/State: Framingham, MA	Date Finished: 4-19-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"		Date Depth Elev. Notes
Logged By/Reviewed By: C. Connors	Sampler Size/Type: 24" Split Spoon		
Surface Elevation (ft): 165.1	Sampler Hammer (lbs)/Drop (in): 140lb/30"		

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
1	164	[Cross-hatch symbol]	0.5 / 164.6	TOPSOIL	0.0	9	S1	24/14	0.0-2.0	2 4 5 6	Loose, light brown to brown, SILTY SAND, some gravel. (Fill)	
2	163		[Diagonal lines symbol]	5.0 / 160.1	FILL	0.0	2	S2	24/16	2.0-4.0	2 1 1	Very loose, brown to yellow/brown, SILTY SAND, trace gravel. (Fill)
3	162				ALLUVIAL ORGANIC SILT DEPOSIT	0.0	4	S3	12/6	4.0-5.0	2 2	Very loose to loose, yellow/brown, SAND, some silt, trace gravel. (Fill)
4	161	0.1				4	S3A	12/6	5.0-6.0	2 6	Very loose to loose, dark brown, fine to medium grain, SAND, trace to some organic silt and peat fibers. (Alluvial Organic Silt Deposit)	
5	160	[Downward arrows symbol]	9.0 / 156.1	GLACIAL OUTWASH	0.0	8	S4	24/8	9.0-11.0	3 4 4 5	Loose, light brown to gray, medium to coarse grain, SAND, trace silt and gravel. (Glacial Outwash)	
6	159				GLACIAL OUTWASH	0.0	6	S5	24/6	14.0-16.0	2 3 3 4	Loose, light brown to brown, medium to coarse grain, SAND, trace silt and gravel. (Glacial Outwash)
7	158					20	S6	24/4	19.0-21.0	9 11 9 7	Compact, light brown to gray, SANDY GRAVEL, trace silt. (Glacial Outwash)	
8	157	[Dotted symbol]										
9	156											
10	155											
11	154	[Dotted symbol]										
12	153											
13	152											
14	151	[Dotted symbol]										
15	150											
16	149											
17	148	[Dotted symbol]										
18	147											
19	146											
20	145	[Dotted symbol]										
21	144											
22	143											

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

COHESIVE SOILS		Notes:
BLOWS/FT.	CONSISTENCY	
<2	V.SOFT	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:
2-4	SOFT	
4-8	FIRM	
8-15	STIFF	
15-30	V.STIFF	
>30	HARD	



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Page 1 of 2

Project: Fuller Middle School	Job #: 6473	Boring No.:
Location: 31 Flagg Drive	Date Started: 4-19-18	B-101
City/State: Framingham, MA	Date Finished: 4-19-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4">Groundwater Observations</th> </tr> <tr> <th>Date</th> <th>Depth</th> <th>Elev.</th> <th>Notes</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		Groundwater Observations				Date	Depth	Elev.	Notes																
Groundwater Observations																											
Date	Depth			Elev.	Notes																						
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"																										
Logged By/Reviewed By: C. Connors	Sampler Size/Type: 24" Split Spoon																										
Surface Elevation (ft): 165.1	Sampler Hammer (lbs)/Drop (in): 140lb/30"																										

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
24	141		26.0 / 139.1	GLACIAL OUTWASH							Compact, gray, well graded mixture of SILT, SAND and GRAVEL, trace clay. (Glacial Outwash)	
25	140				28	S7	24/8	24.0-26.0	14			
26	139								16			
27	138			Bottom of borehole 26 feet below ground surface.								
28	137											
29	136											
30	135											
31	134											
32	133											
33	132											
34	131											
35	130											
36	129											
37	128											
38	127											
39	126											
40	125											
41	124											
42	123											
43	122											
44	121											
45	120											

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		
COHESIVE SOILS		Notes:	
BLOWS/FT.	CONSISTENCY	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:	
<2	V.SOFT		
2-4	SOFT		
4-8	FIRM		
8-15	STIFF		
15-30	V.STIFF		
>30	HARD		

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 FAX: 617-868-1423

Page 2 of 2

Project: Fuller Middle School	Job #: 6473	Boring No.
Location: 31 Flagg Drive	Date Started: 4-19-18	B-102
City/State: Framingham, MA	Date Finished: 4-19-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: C. Connors	Sampler Size/Type: 24" Split Spoon	Elev.	Notes
Surface Elevation (ft): 164.9	Sampler Hammer (lbs)/Drop (in): 140lb/30"		

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
1	164	[Symbol: Diagonal Lines]	0.5 / 164.4	TOPSOIL	0.1	13	S1	24/20	0.0-2.0	2 6 7 10	Compact, brown to yellow/brown, SILTY SAND, trace gravel. (Fill)	
2	163		[Symbol: Diagonal Lines]	6.0 / 158.9	FILL	0.1	15	S2	24/18	2.0-4.0	8 8 7 5	Compact, yellow/brown to orange/brown, SILTY SAND, trace gravel. (Fill)
3	162											
4	161											
5	160											
6	159											
7	158	[Symbol: Dotted]										
8	157		[Symbol: Dotted]	8.0 / 156.9	LACUSTRINE	0.0	17	S5	24/12	8.0-10.0	4 9 8 8	Compact, light gray to gray, medium to coarse grain, SILTY SAND. (Lacustrine)
9	156											
10	155											
11	154											
12	153											
13	152											
14	151	[Symbol: Dotted]	8.0 / 156.9	LACUSTRINE	0.1	13	S6	24/14	14.0-16.0	6 8 5 9	Compact, light brown, fine grain, SILTY SAND, trace clay and gravel. (Lacustrine)	
15	150											
16	149											
17	148											
18	147											
19	146											
20	145	[Symbol: Dotted]	8.0 / 156.9	LACUSTRINE	0.0	13	S7	24/18	19.0-21.0	5 7 6 10	Compact, light brown, fine grain, SILTY SAND, trace clay and gravel. (Lacustrine)	
21	144											
22	143											

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

SOIL COMPONENT		
DESCRIPTIVE TERM	PROPORTION OF TOTAL	SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"
"TRACE"	0-10%	
"SOME"	10-20%	
"ADJECTIVE" (eg SANDY, SILTY)	20-35%	
"AND"	35-50%	

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
 TVOC Background: ppm
 Weather:
 Temperature:




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Page 1 of 2

Project: Fuller Middle School	Job #: 6473	Boring No.:
Location: 31 Flagg Drive	Date Started: 4-19-18	B-102
City/State: Framingham, MA	Date Finished: 4-19-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: C. Connors	Sampler Size/Type: 24" Split Spoon	Elev.	Notes
Surface Elevation (ft): 164.9	Sampler Hammer (lbs)/Drop (in): 140lb/30"		

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev. to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft	
24	141		26.0 / 138.9	LACUSTRINE							Compact, light brown, fine grain, SILTY SAND, trace gravel. (Lacustrine)
25	140				0.0	28	S8	24/10	24.0-26.0	8	
26	139				20					13	
27	138			Bottom of borehole 26 feet below ground surface.							
28	137										
29	136										
30	135										
31	134										
32	133										
33	132										
34	131										
35	130										
36	129										
37	128										
38	127										
39	126										
40	125										
41	124										
42	123										
43	122										
44	121										
45	120										

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		
COHESIVE SOILS		Notes:	
BLOWS/FT.	CONSISTENCY	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:	
<2	V.SOFT		
2-4	SOFT		
4-8	FIRM		
8-15	STIFF		
15-30	V.STIFF		
>30	HARD		



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Project: Fuller Middle School	Job #: 6473	Boring No.:
Location: 31 Flagg Drive	Date Started: 2-22-18	B-103
City/State: Framingham, MA	Date Finished: 2-22-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-22-18	6
Surface Elevation (ft): 164.6	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev. to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
1	164	[Symbol: Diagonal Lines]	0.5 / 164.1	TOPSOIL		11	S1	24/16	0.0-2.0	3 3 8 10	Compact, brown to yellow/brown, SAND and GRAVEL, some silt. (Fill)	
2	163		FILL									
3	162											
4	161											
5	160		5.0 / 159.6									
6	159	[Symbol: Dotted]		ALLUVIAL ORGANIC SILT DEPOSIT		20	S2	24/14	5.0-7.0	5 10 10 9	Compact, dark brown, PEATY SAND, trace gravel. (Alluvial Organic Silt Deposit)	
7	158											
8	157						11	S3	24/18	7.0-9.0	8 5 6 5	Compact, dark brown, fine to medium grain, SAND, trace to some organic silt, to gray, fine to medium grain, SAND, trace silt. (Alluvial Organic Silt Deposit)
9	156		9.0 / 155.6									
10	155	[Symbol: Dotted]		GLACIAL OUTWASH		6	S4	24/14	9.0-11.0	2 3 3 6	Loose, gray, fine to medium grain, SAND, trace silt and gravel. (Glacial Outwash)	
11	154											
12	153											
13	152											
14	151											
15	150						9	S5	24/12	14.0-16.0	14 6 3 4	Loose, gray, SAND and GRAVEL, trace silt. (Glacial Outwash)
16	149											
17	148											
18	147											
19	146											
20	145					16	S6	24/8	19.0-21.0	10 10 6 6	Compact, orange/brown, SAND and GRAVEL, trace silt, to light brown, SILTY SAND. (Glacial Outwash)	
21	144											
22	143											
	142											

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

COHESIVE SOILS		Notes:
BLOWS/FT.	CONSISTENCY	
<2	V.SOFT	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:
2-4	SOFT	
4-8	FIRM	
8-15	STIFF	
15-30	V.STIFF	
>30	HARD	



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Project: Fuller Middle School	Job #: 6473	Boring No.:
Location: 31 Flagg Drive	Date Started: 2-22-18	B-103
City/State: Framingham, MA	Date Finished: 2-22-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-22-18	6
Surface Elevation (ft): 164.6	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes
		158.6	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft	
24	141	●●●●●	26.0 / 138.6	GLACIAL OUTWASH		25	S7	6/5	24.0-24.5	4	Loose to compact, yellow/brown, fine to medium grain, SAND, trace silt and gravel. (Glacial Outwash) Compact, gray/brown, stratified, fine grain, SANDY SILT, to fine grain, SAND, trace silt. (Glacial Outwash)
25	140					25	S7A	18/16	24.5-26.0	10	
26	139										
27	138			Bottom of borehole 26 feet below ground surface.							
28	137										
29	136										
30	135										
31	134										
32	133										
33	132										
34	131										
35	130										
36	129										
37	128										
38	127										
39	126										
40	125										
41	124										
42	123										
43	122										
44	121										
45	120										
	119										

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

COHESIVE SOILS		Notes:
BLOWS/FT.	CONSISTENCY	
<2	V.SOFT	Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
2-4	SOFT	TVOC Background: ppm
4-8	FIRM	Weather:
8-15	STIFF	Temperature:
15-30	V.STIFF	
>30	HARD	



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Project: Fuller Middle School	Job #: 6473	Boring No.
Location: 31 Flagg Drive	Date Started: 2-21-18	B-104
City/State: Framingham, MA	Date Finished: 2-21-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-21-18	4.5
Surface Elevation (ft): 163.0	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
		[Cross-hatch symbol]	0.3 / 162.7	ASPHALT								
1	162	[Cross-hatch symbol]		FILL		22	S1	18/10	0.5-2.0	8 11 11	Compact, brown, GRAVELLY SAND, trace silt. (Fill)	
2	161	[Cross-hatch symbol]	2.5 / 160.5			9	S2	6/6	2.0-2.5	11	Compact, brown SAND, some gravel, trace silt. (Fill)	
3	160	[Downward arrows symbol]		ALLUVIAL ORGANIC SILT DEPOSIT		9	S2A	18/8	2.5-4.0	5 4 5	Loose, light gray, stratified, SAND, w/ seams of dark brown organic silt. (Alluvial Organic Silt Deposit)	
4	159	[Downward arrows symbol]								3 2 2 4	Very loose to loose, gray, fine to medium grain, SAND, trace silt, w/ pockets of organic silt. (Alluvial Organic Silt Deposit)	
5	158	[Downward arrows symbol]										
6	157	[Downward arrows symbol]										
7	156	[Downward arrows symbol]										
8	155	[Downward arrows symbol]	8.0 / 155.0	GLACIAL OUTWASH								
9	154	[Dotted symbol]								3 4 6 6	Loose to compact, stratified, light gray to brown, fine to medium grain, SAND, trace silt. (Glacial Outwash)	
10	153	[Dotted symbol]				10	S4	24/16	9.0-11.0			
11	152	[Dotted symbol]										
12	151	[Dotted symbol]										
13	150	[Dotted symbol]										
14	149	[Dotted symbol]								2 2 3 4	Loose, brown, fine to medium grain, SAND, trace silt. (Glacial Outwash)	
15	148	[Dotted symbol]				5	S5	24/16	14.0-16.0			
16	147	[Dotted symbol]										
17	146	[Dotted symbol]										
18	145	[Dotted symbol]										
19	144	[Dotted symbol]										
20	143	[Dotted symbol]				9	S6	24/12	19.0-21.0	2 4 5 5	Loose, brown, fine to medium grain, SAND, trace silt, to SAND and GRAVEL. (Glacial Outwash)	
21	142	[Dotted symbol]										
22	141	[Dotted symbol]										

GRANULAR SOILS		SOIL COMPONENT		
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL	SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"
0-4	V.LOOSE	"TRACE"	0-10%	
4-10	LOOSE	"SOME"	10-20%	
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%	
30-50	DENSE	"AND"	35-50%	
>50	V.DENSE			
COHESIVE SOILS		Notes:		
BLOWS/FT.	CONSISTENCY	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:		
<2	V.SOFT			
2-4	SOFT			
4-8	FIRM			
8-15	STIFF			
15-30	V.STIFF			
>30	HARD			




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Project: Fuller Middle School	Job #: 6473	Boring No.:
Location: 31 Flagg Drive	Date Started: 2-21-18	B-104
City/State: Framingham, MA	Date Finished: 2-21-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-21-18	4.5
Surface Elevation (ft): 163.0	Sampler Hammer (lbs)/Drop (in): 140lb/30"		

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes		
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft			
24	139		31.0 / 132.0	GLACIAL OUTWASH							Compact, gray/brown to orange/brown, SAND and GRAVEL, some silt. (Glacial Outwash)		
25	138					29	S7	24/12	24.0-26.0	12			
26	137									12			
27	136												
28	135												
29	134												
30	133					34	S8	24/8	29.0-31.0	8	Dense, gray/brown, SAND and GRAVEL, to light gray/brown, SILTY SAND and GRAVEL. (Glacial Outwash)		
31	132								19				
32	131								15				
33	130												
34	129												
35	128												
36	127												
37	126												
38	125												
39	124												
40	123												
41	122												
42	121												
43	120												
44	119												
45	118												

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		
COHESIVE SOILS		Notes:	
BLOWS/FT.	CONSISTENCY	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:	
<2	V.SOFT		
2-4	SOFT		
4-8	FIRM		
8-15	STIFF		
15-30	V.STIFF		
>30	HARD		



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Project: Fuller Middle School	Job #: 6473	Boring No.
Location: 31 Flagg Drive	Date Started: 4-19-18	B-105
City/State: Framingham, MA	Date Finished: 4-19-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: C. Connors	Sampler Size/Type: 24" Split Spoon	Elev.	Notes
Surface Elevation (ft): 163.4	Sampler Hammer (lbs)/Drop (in): 140lb/30"		

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev. to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes		
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft			
1	163		0.5 / 162.9	ASPHALT									
	162				FILL	0.1	8	S1	18/6	0.5-2.0	3 4 4	Loose, dark gray to dark brown, well graded mixture of SILT, SAND and GRAVEL, w/ asphalt. (Fill)	
2	161										3	Loose, dark gray, SAND and GRAVEL, trace silt. (Fill)	
3	160					0.2	8	S2	24/12	2.0-4.0	6 2 9		
4	159		4.0 / 159.4	GLACIAL OUTWASH									
5	158						0.1	13	S3	24/12	4.0-6.0	4 6 7 6	Compact, gray to brown, coarse grain, SAND, trace silt and gravel. (Glacial Outwash)
6	157											6	Loose, gray, coarse grain, SAND, trace silt and gravel. (Glacial Outwash)
7	156						0.1	8	S4	24/16	6.0-8.0	4 4 7	
8	155											3	Loose, light brown to orange/brown, coarse grain, SAND, trace silt and gravel. (Glacial Outwash)
9	154						0.1	8	S5	24/6	8.0-10.0	4 4 5	
10	153												
11	152												
12	151												
13	150												
14	149											2	Loose, light brown to orange/brown, coarse grain, SAND, trace silt and gravel. (Glacial Outwash)
15	148						0.1	5	S6	24/3	14.0-16.0	2 2 3 6	
16	147												
17	146												
18	145												
19	144											3	Compact, light brown, coarse grain, GRAVELY SAND, trace silt. (Glacial Outwash)
20	143						0.0	11	S7	24/10	19.0-21.0	4 7 10	
21	142												
22	141												

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

COHESIVE SOILS		Notes:
BLOWS/FT.	CONSISTENCY	
<2	V.SOFT	Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
2-4	SOFT	TVOC Background: ppm
4-8	FIRM	Weather:
8-15	STIFF	Temperature:
15-30	V.STIFF	
>30	HARD	



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Project: Fuller Middle School	Job #: 6473	Boring No.:
Location: 31 Flagg Drive	Date Started: 4-19-18	B-105
City/State: Framingham, MA	Date Finished: 4-19-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: C. Connors	Sampler Size/Type: 24" Split Spoon	Elev.	Notes
Surface Elevation (ft): 163.4	Sampler Hammer (lbs)/Drop (in): 140lb/30"		

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes		
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft			
24	140	[Symbol: Dotted pattern]	31.0 / 132.4	GLACIAL OUTWASH									
25	139				0.0	8	S8	24/6	24.0-26.0	8 4 4 5	Loose, light brown, fine to medium grain, SILTY SAND. (Glacial Outwash)		
26	138												
27	137												
28	136												
29	135												
30	134												
31	133							10	S9	24/6	29.0-31.0	7 6 4 8	Loose to compact, brown to dark brown, coarse grain, SAND and GRAVEL, trace silt. (Glacial Outwash)
32	132						Bottom of borehole 31 feet below ground surface.						
33	131												
34	130												
35	129												
36	128												
37	127												
38	126												
39	125												
40	124												
41	123												
42	122												
43	121												
44	120												
45	119												
	118												

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		
COHESIVE SOILS		Notes:	
BLOWS/FT.	CONSISTENCY	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:	
<2	V.SOFT		
2-4	SOFT		
4-8	FIRM		
8-15	STIFF		
15-30	V.STIFF		
>30	HARD		



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Project: Fuller Middle School	Job #: 6473	Boring No. B-106
Location: 31 Flagg Drive	Date Started: 2-21-18	
City/State: Framingham, MA	Date Finished: 2-21-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-21-18	6
Surface Elevation (ft): 165.0	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes
		159.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
		0.3 / 164.7		ASPHALT								
1	164	4.5 / 160.5		FILL		34	S1	24/16	0.5-2.5	31 16 18 38	Dense, gray/brown, SAND and GRAVEL, some silt. (Fill) Drilled through cobbles from 5 to 8 feet below ground surface and casing refusal at 8 feet below ground surface. Moved borehole 4 feet to the south.	
2	163											
3	162	8.0 / 157.0		GLACIAL OUTWASH								
4	161											
5	160			Bottom of borehole 8 feet below ground surface.								
6	159											
7	158											
8	157											
9	156											
10	155											
11	154											
12	153											
13	152											
14	151											
15	150											
16	149											
17	148											
18	147											
19	146											
20	145											
21	144											
22	143											

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		
COHESIVE SOILS		Notes:	
BLOWS/FT.	CONSISTENCY	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:	
<2	V.SOFT		
2-4	SOFT		
4-8	FIRM		
8-15	STIFF		
15-30	V.STIFF		
>30	HARD		



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Project: Fuller Middle School	Job #: 6473	Boring No. B-106A
Location: 31 Flagg Drive	Date Started: 2-21-18	
City/State: Framingham, MA	Date Finished: 2-22-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-22-18	6
Surface Elevation (ft): 165.0	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes
		159.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft	
1	164		0.3 / 164.7	ASPHALT							
2	163			FILL							
3	162										
4	161		4.5 / 160.5		49	S2	6/4	4.0-4.5	6	Loose to compact, gray/brown, SAND and GRAVEL, some silt. (Fill)	
5	160			GLACIAL OUTWASH	49	S2A	18/6	4.5-6.0	15 34 28	Dense, yellow/brown to orange/brown, SAND and GRAVEL, trace silt. (Glacial Outwash)	
6	159										
7	158										
8	157										
9	156										
10	155				47	S3	24/12	9.0-11.0	22 25 22 12	Dense, light gray, SILTY SAND and GRAVEL, to brown, SAND and GRAVEL, trace to some silt. (Glacial Outwash)	
11	154										
12	153										
13	152										
14	151				29	s4	24/16	14.0-16.0	12 19 10 8	Compact, brown, SAND and GRAVEL, trace to some silt. (Glacial Outwash)	
15	150		16.0 / 149.0								
16	149			Bottom of borehole 16 feet below ground surface.							
17	148										
18	147										
19	146										
20	145										
21	144										
22	143										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

SOIL COMPONENT		
DESCRIPTIVE TERM	PROPORTION OF TOTAL	SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"
"TRACE"	0-10%	
"SOME"	10-20%	
"ADJECTIVE" (eg SANDY, SILTY)	20-35%	
"AND"	35-50%	

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
 TVOC Background: ppm
 Weather:
 Temperature:



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Page 1 of 1

Project: Fuller Middle School	Job #: 6473	Boring No.
Location: 31 Flagg Drive	Date Started: 2-21-18	B-107
City/State: Framingham, MA	Date Finished: 2-21-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-21-18	4
Surface Elevation (ft): 162.9	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
1	162		0.3 / 162.6	ASPHALT								
2	161			FILL		20	S1	24/12	0.5-2.5	26 11 9 12		Compact, brown, GRAVELLY SAND, trace silt. (Fill)
3	160											
4	159		4.0 / 158.9									
5	158			ALLUVIAL ORGANIC SILT DEPOSIT		5	S2	24/14	4.0-6.0	2 2 3 5		Loose, interbedded, gray, SAND and brown to dark brown, ORGANIC SILT, some peat. (Alluvial Organic Silt Deposit)
6	157											
7	156											
8	155		8.0 / 154.9									
9	154			LACUSTRINE DEPOSIT								
10	153					11	S3	24/16	9.0-11.0	5 6 5 6		Compact, light gray, fine grain, SANDY SILT, to fine grain SILTY SAND. (Lacustrine Deposit)
11	152											
12	151											
13	150											
14	149											
15	148		14.5 / 148.4			34	S4	6/6	14.0-14.5	8		Loose to compact, light gray, fine grain, SAND, trace silt, to brown, fine to medium grain, SAND, trace silt. (Lacustrine Deposit)
16	147					34	S4A	18/14	14.5-16.0	18 16 7		Dense, gray/brown to orange/brown, SAND and GRAVEL, trace silt. (Glacial Outwash)
17	146			GLACIAL OUTWASH								
18	145											
19	144											
20	143											
21	142		21.0 / 141.9			35	S5	24/12	19.0-21.0	11 19 16 15		Dense, gray/brown, SAND and GRAVEL, trace silt. (Glacial Outwash)
22	141			Bottom of borehole 21 feet below ground surface.								

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

SOIL COMPONENT		
DESCRIPTIVE TERM	PROPORTION OF TOTAL	SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"
"TRACE"	0-10%	
"SOME"	10-20%	
"ADJECTIVE" (eg SANDY, SILTY)	20-35%	
"AND"	35-50%	

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
 TVOC Background: ppm
 Weather:
 Temperature:



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Project: Fuller Middle School	Job #: 6473	Boring No. B-108
Location: 31 Flagg Drive	Date Started: 2-22-18	
City/State: Framingham, MA	Date Finished: 2-22-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-22-18	3
Surface Elevation (ft): 163.9	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes
		160.9	

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
			0.3 / 163.6	ASPHALT								
1	163			FILL		32	S1	24/15	0.5-2.5	14 11 21 19	Dense, dark gray/black, SILTY SAND and GRAVEL. (Fill)	
2	162											
3	161											
4	160											
5	159		5.0 / 158.9	GLACIAL OUTWASH		37	S2	12/8	4.0-5.0	13 19	Dense, dark gray/brown, SILTY SAND and GRAVEL. (Fill) Dense, light gray, fine to medium grain, SAND, trace silt. (Glacial Outwash)	
6	158					37	S2A	12/8	5.0-6.0	18 16		
7	157											
8	156											
9	155											
10	154			GLACIAL OUTWASH		32	S3	24/13	9.0-11.0	15 17 15 18	Dense, brown, SAND and GRAVEL, trace silt. (Glacial Outwash)	
11	153		11.0 / 152.9									
12	152				Bottom of borehole 11 feet below ground surface.							
13	151											
14	150											
15	149											
16	148											
17	147											
18	146											
19	145											
20	144											
21	143											
22	142											

GRANULAR SOILS		SOIL COMPONENT	
BLOWS/FT.	DENSITY	DESCRIPTIVE TERM	PROPORTION OF TOTAL
0-4	V.LOOSE	"TRACE"	0-10%
4-10	LOOSE	"SOME"	10-20%
10-30	COMPACT	"ADJECTIVE" (eg SANDY, SILTY)	20-35%
30-50	DENSE	"AND"	35-50%
>50	V.DENSE		

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

COHESIVE SOILS		Notes:
BLOWS/FT.	CONSISTENCY	
<2	V.SOFT	Total Volatile Organic Compounds (TVOC) measured w/ PID Model: TVOC Background: ppm Weather: Temperature:
2-4	SOFT	
4-8	FIRM	
8-15	STIFF	
15-30	V.STIFF	
>30	HARD	



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Project: Fuller Middle School	Job #: 6473	Boring No. B-109
Location: 31 Flagg Drive	Date Started: 2-22-18	
City/State: Framingham, MA	Date Finished: 2-22-18	

Contractor: Northern Drill Service, Inc.	Casing Type/Depth (ft): 4"	Groundwater Observations	
Driller/Helper: Z. Nada/J. Stevens	Casing Hammer (lbs)/Drop (in): 140lb/30"	Date	Depth
Logged By/Reviewed By: T. Cormican	Sampler Size/Type: 24" Split Spoon	2-22-18	4.5
Surface Elevation (ft): 163.5	Sampler Hammer (lbs)/Drop (in): 140lb/30"	Elev.	Notes
		159.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/Elev to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes	
					TVOC (ppm)	N-Value RQD	No.	Pen./Rec. (in)	Depth (ft)	Blows/6" Min/ft		
1	163	[Cross-hatch symbol]	0.1 / 163.4	ASPHALT		61	S1	24/13	0.0-2.0	10 18 43 29	Very dense, dark brown, SILTY SAND and CRUSHED CONCRETE. (Fill)	
2	162											
3	161				FILL							
4	160											
5	159									13	Dense, gray/brown, SAND and GRAVEL, trace silt. (Fill)	
6	158						32	S2	24/8	4.0-6.0	15 17 14	
7	157	[Dotted symbol]	6.5 / 157.0									
8	156											
9	155											
10	154									8	Compact, brown to gray/brown, SAND and GRAVEL, trace silt. (Glacial Outwash)	
11	153						19	S3	24/14	9.0-11.0	9 10 19	
12	152				GLACIAL OUTWASH							
13	151											
14	150											
15	149									12	Dense, gray/brown, SAND and GRAVEL, trace to some silt. (Glacial Outwash)	
16	148			16.0 / 147.5			49	S4	24/10	14.0-16.0	17 32 27	
17	147			Bottom of borehole 16 feet below ground surface.								
18	146											
19	145											
20	144											
21	143											
22	142											
	141											

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

SOIL COMPONENT		
DESCRIPTIVE TERM	PROPORTION OF TOTAL	SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"
"TRACE"	0-10%	
"SOME"	10-20%	
"ADJECTIVE" (eg SANDY, SILTY)	20-35%	
"AND"	35-50%	

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
 TVOC Background: ppm
 Weather:
 Temperature:



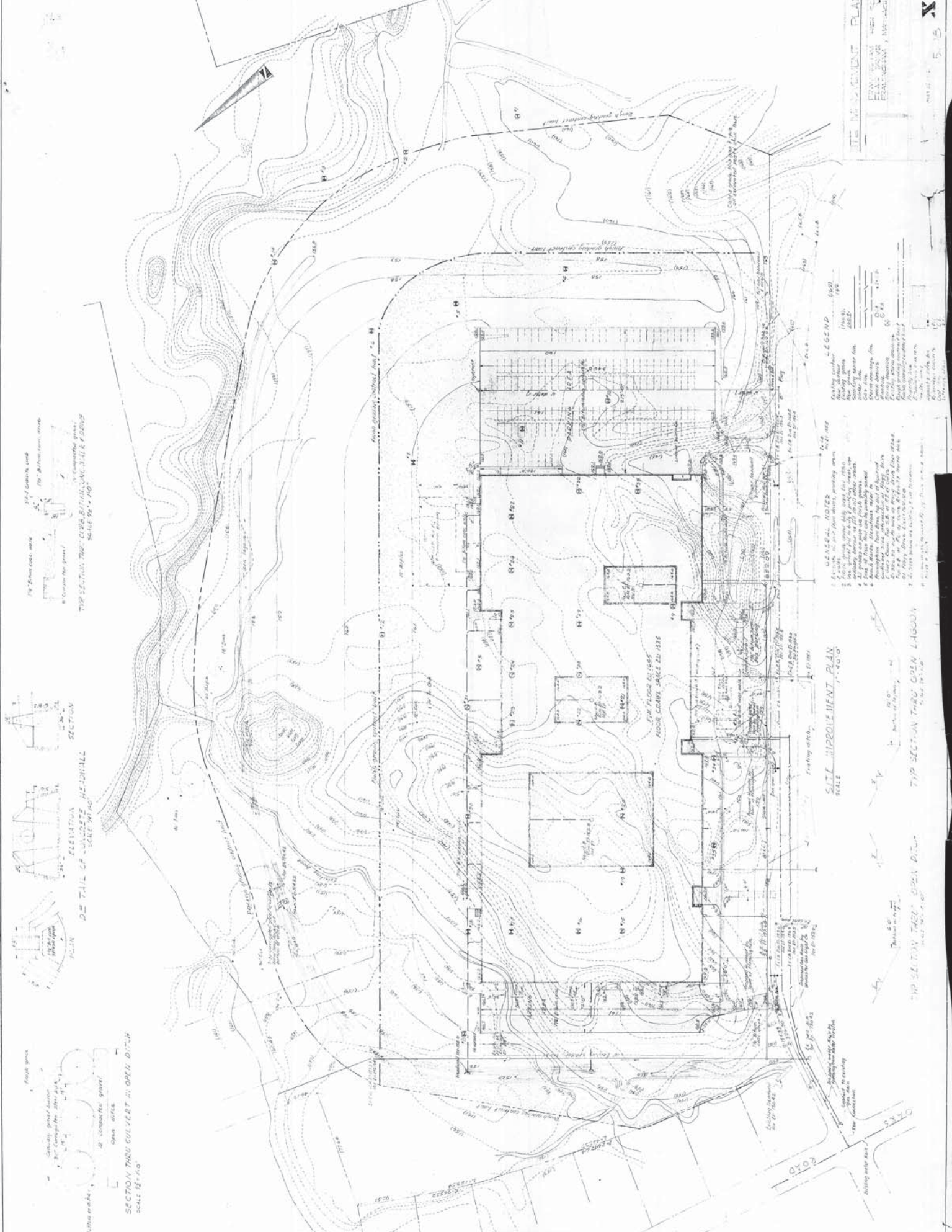
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APPENDIX D:

1956 BORING LOCATION PLANS AND LOGS



1/2" = 100' (Vertical scale)
 1" = 100' (Horizontal scale)
 1" = 100' (Plan scale)
 1" = 100' (Profile scale)

SECTION THROUGH DAM
 SCALE 1" = 100'
 SECTION THROUGH DAM
 SCALE 1" = 100'
 SECTION THROUGH DAM
 SCALE 1" = 100'

SECTION THROUGH CULVERT IN OPEN DITCH
 SCALE 1" = 100'

LEGEND

Existing contour	(Solid line)
Proposed contour	(Dashed line)
Proposed structure	(Thick solid line)
Proposed road	(Thin solid line)
Proposed drainage	(Dotted line)
Proposed fence	(Thin dashed line)
Proposed utility	(Thin solid line with cross-ticks)
Proposed spot height	(Circle with number)
Proposed spot height	(Circle with number and 'A')
Proposed spot height	(Circle with number and 'B')
Proposed spot height	(Circle with number and 'C')
Proposed spot height	(Circle with number and 'D')
Proposed spot height	(Circle with number and 'E')
Proposed spot height	(Circle with number and 'F')
Proposed spot height	(Circle with number and 'G')
Proposed spot height	(Circle with number and 'H')
Proposed spot height	(Circle with number and 'I')
Proposed spot height	(Circle with number and 'J')
Proposed spot height	(Circle with number and 'K')
Proposed spot height	(Circle with number and 'L')
Proposed spot height	(Circle with number and 'M')
Proposed spot height	(Circle with number and 'N')
Proposed spot height	(Circle with number and 'O')
Proposed spot height	(Circle with number and 'P')
Proposed spot height	(Circle with number and 'Q')
Proposed spot height	(Circle with number and 'R')
Proposed spot height	(Circle with number and 'S')
Proposed spot height	(Circle with number and 'T')
Proposed spot height	(Circle with number and 'U')
Proposed spot height	(Circle with number and 'V')
Proposed spot height	(Circle with number and 'W')
Proposed spot height	(Circle with number and 'X')
Proposed spot height	(Circle with number and 'Y')
Proposed spot height	(Circle with number and 'Z')

GENERAL NOTES
 1. All work shall be in accordance with the approved plans and specifications.
 2. The contractor shall be responsible for obtaining all necessary permits.
 3. The contractor shall maintain access to all existing roads and utilities.
 4. The contractor shall be responsible for the safety of all workers and the public.
 5. The contractor shall be responsible for the protection of all existing structures and utilities.
 6. The contractor shall be responsible for the removal of all debris and waste.
 7. The contractor shall be responsible for the maintenance of all construction equipment.
 8. The contractor shall be responsible for the payment of all taxes and fees.
 9. The contractor shall be responsible for the completion of all work within the specified time.
 10. The contractor shall be responsible for the provision of all necessary labor and materials.

SITE IMPROVEMENT PLAN
 SCALE 1" = 100'
 SECTION THROUGH OPEN DITCH
 SCALE 1" = 100'

SECTION THROUGH OPEN DITCH
 SCALE 1" = 100'

SECTION THROUGH OPEN DITCH
 SCALE 1" = 100'

B O R I N G

TEST BORING REPORT JAN. 21, 1955

BORING NO.	DATE	DEPTH (FEET)	SOIL DESCRIPTION	WATER TABLE (FEET)	REMARKS
1	1/21/55	10.0	GRAVELLY SAND	10.0	
2	1/21/55	10.0	GRAVELLY SAND	10.0	
3	1/21/55	10.0	GRAVELLY SAND	10.0	
4	1/21/55	10.0	GRAVELLY SAND	10.0	
5	1/21/55	10.0	GRAVELLY SAND	10.0	
6	1/21/55	10.0	GRAVELLY SAND	10.0	
7	1/21/55	10.0	GRAVELLY SAND	10.0	
8	1/21/55	10.0	GRAVELLY SAND	10.0	
9	1/21/55	10.0	GRAVELLY SAND	10.0	
10	1/21/55	10.0	GRAVELLY SAND	10.0	
11	1/21/55	10.0	GRAVELLY SAND	10.0	
12	1/21/55	10.0	GRAVELLY SAND	10.0	
13	1/21/55	10.0	GRAVELLY SAND	10.0	
14	1/21/55	10.0	GRAVELLY SAND	10.0	
15	1/21/55	10.0	GRAVELLY SAND	10.0	
16	1/21/55	10.0	GRAVELLY SAND	10.0	
17	1/21/55	10.0	GRAVELLY SAND	10.0	
18	1/21/55	10.0	GRAVELLY SAND	10.0	
19	1/21/55	10.0	GRAVELLY SAND	10.0	
20	1/21/55	10.0	GRAVELLY SAND	10.0	
21	1/21/55	10.0	GRAVELLY SAND	10.0	
22	1/21/55	10.0	GRAVELLY SAND	10.0	
23	1/21/55	10.0	GRAVELLY SAND	10.0	
24	1/21/55	10.0	GRAVELLY SAND	10.0	
25	1/21/55	10.0	GRAVELLY SAND	10.0	
26	1/21/55	10.0	GRAVELLY SAND	10.0	
27	1/21/55	10.0	GRAVELLY SAND	10.0	
28	1/21/55	10.0	GRAVELLY SAND	10.0	
29	1/21/55	10.0	GRAVELLY SAND	10.0	
30	1/21/55	10.0	GRAVELLY SAND	10.0	
31	1/21/55	10.0	GRAVELLY SAND	10.0	
32	1/21/55	10.0	GRAVELLY SAND	10.0	
33	1/21/55	10.0	GRAVELLY SAND	10.0	
34	1/21/55	10.0	GRAVELLY SAND	10.0	
35	1/21/55	10.0	GRAVELLY SAND	10.0	
36	1/21/55	10.0	GRAVELLY SAND	10.0	
37	1/21/55	10.0	GRAVELLY SAND	10.0	
38	1/21/55	10.0	GRAVELLY SAND	10.0	
39	1/21/55	10.0	GRAVELLY SAND	10.0	
40	1/21/55	10.0	GRAVELLY SAND	10.0	
41	1/21/55	10.0	GRAVELLY SAND	10.0	
42	1/21/55	10.0	GRAVELLY SAND	10.0	

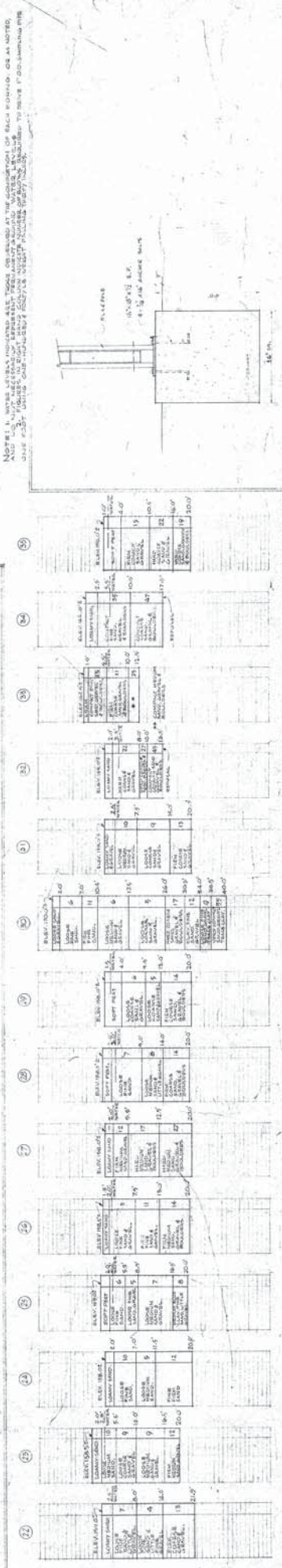
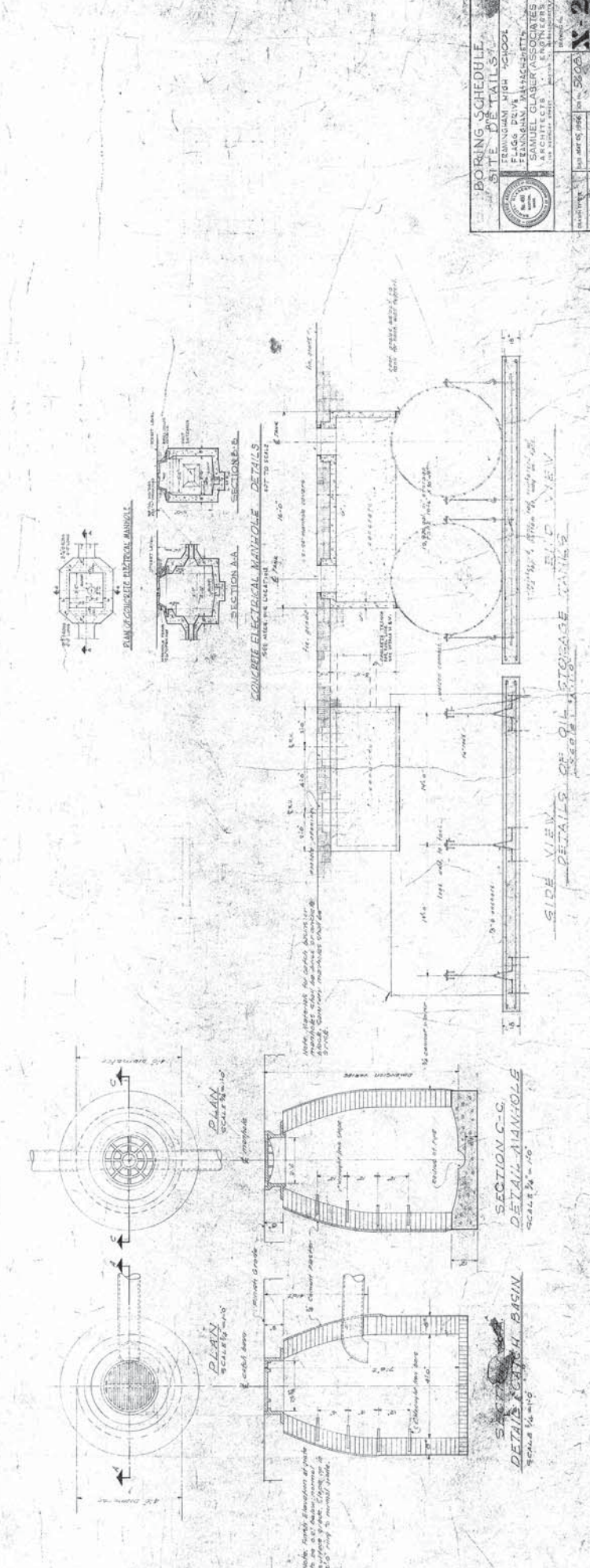


FIGURE BASE DETAIL



BORING SCHEDULE
SITE: DE TAIL 57

PLANNING: []
 DRAWING: []
 CHECKED: []
 DATE: []

5000 X 2

Notes: 1. Water table shown on this plan is based on the elevation of each boring. 2. All borings were 10.0 feet deep. 3. All borings were 4.0 inches diameter. 4. All borings were 10.0 feet apart. 5. All borings were 10.0 feet from the edge of the site.

Notes: 1. The manhole is to be constructed of concrete. 2. The manhole is to be 10.0 feet deep. 3. The manhole is to be 4.0 inches diameter. 4. The manhole is to be 10.0 feet apart. 5. The manhole is to be 10.0 feet from the edge of the site.

Notes: 1. The manhole is to be constructed of concrete. 2. The manhole is to be 10.0 feet deep. 3. The manhole is to be 4.0 inches diameter. 4. The manhole is to be 10.0 feet apart. 5. The manhole is to be 10.0 feet from the edge of the site.

311000

CLEARING AND GRUBBING

- A. Description: Perform all site preparation as indicated herein. Unless otherwise indicated, the areas to be cleared, grubbed and stripped shall consist of the entire worksite, with the exception of those areas specifically designated to remain in an undisturbed, natural condition.
- B. Functional Requirements:
1. Design Requirements:
 - a. Cut and remove all roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground in the area of construction, as indicated on the Contract Drawings as the limit of work.
 - b. Grub and remove all stumps, roots in excess of 1-1/2-inches in diameter, matted roots, brush, timber, logs, concrete rubble and other debris encountered to a depth of 30 inches below original grade or 18 inches beneath the bottom of excavations, whichever is deeper.
 - c. Strip topsoil and subsoil from all areas to be excavated as detailed on the contract drawings. Topsoil shall be free from brush, trash, stones larger than 2 inches in diameter and other extraneous material. Avoid mixing topsoil with subsoil. Stockpile and protect topsoil in area.
 - d. Contractor shall dispose of rubbish and debris from site preparation operations by hauling such materials and debris to an approved offsite disposal area. No rubbish or debris of any kind shall be buried on the site.
 - e. Trees and other vegetation not indicated to be removed in the contract drawings shall remain and shall be protected from damage by all construction operations. Provide protection to prevent damage to surrounding trees, not within the limit of work or specified to be removed, from the felling operations. Clearing operations shall be conducted in a manner so as to provide for the safety of employees and others.

END OF 311000

**FULLER MIDDLE SCHOOL
FRAMINGHAM, MASSACHUSETTS**

A. Description: Perform all required excavation, fill and grading to complete the Work as indicated on the contract drawings and as specified herein. The work shall include excavation for drain manholes, drain pipes, and paving; all backfilling, compaction and fill; embankment and grading; disposal of waste and surplus materials; temporary support of excavation, excavation dewatering and surface water control during excavation. All materials not re-used on-site shall be disposed of by the Contractor. Materials required in the Work which are not available from on-site excavated materials shall be imported from approved off-site sources. Unless otherwise indicated, the areas to be cleared, grubbed and stripped shall consist of the entire worksite, with the exception of those areas specifically designated to remain in an undisturbed, natural condition.

B. Functional Requirements:

1. Design Requirements:

a. Structural Fill: Structural fill shall be gravel, sandy gravel, or gravelly sand free of organic material, wood, trash, snow, ice, frozen soil and other materials which may be compressible or which cannot be compacted as specified herein and shall be graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
4 in	100
No. 4	30 to 90
No. 40	10 to 50
No. 200	0 to 8

b. Controlled Density Fill: Controlled Density Fill shall conform to the Commonwealth of Massachusetts Department of Highways Standard Specifications for Highways and Bridges, as amended, specification M4.08.0.

c. Common Fill: Common Fill shall consist of mineral soil free from organic materials, topsoil, wood, trash and other objectionable materials which may be compressible or which cannot be properly compacted. Common Fill shall not contain stones that are greater than 2/3 the lift thickness of common fill being placed. Common fill shall not contain granite blocks, broken concrete, masonry rubble or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice and frozen soil will not be permitted. Soil excavated as part of the Work which meets the above requirements in this paragraph, as shown by a certified sieve analysis may be used in the Work.

d. Select Common Fill: Select Common Fill shall be as specified above for Common Fill, except that the material shall contain no stones larger than 2-in in diameter. Soil excavated as part of the Work which meets the requirements of this paragraph, as shown by a properly executed and certified sieve analysis may be used in the Work.

**FULLER MIDDLE SCHOOL
FRAMINGHAM, MASSACHUSETTS**

e. Riprap: Riprap shall be sound, durable rock which is angular in shape. Rounded stones, boulders, sandstone or similar soft stone will not be acceptable. Material shall be free from overburden, spoil, shale and organic material, and meet the following Commonwealth of Massachusetts Department of Highways Standard Specifications for Highways and Bridges, as amended:

- 1) Type 1: M2.02.2 (Dumped Riprap)
- 2) Type 2: M2.02.4 (Modified Rockfill)
- 3) Type 3: M2.06.0 (Slope Paving)

f. Crushed Stone:

- 1) Crushed stone for temporary access ways, construction entrances, walkways, setting bed for riprap, and sediment filtration devices shall conform to the Commonwealth of Massachusetts Department of Highways Standard Specifications for Highways and Bridges, as amended, specification M2.01.3.
- 2) Dense-graded crushed stone for subbase material in project pavement sections shall conform to the Commonwealth of Massachusetts Department of Highways Standard Specifications for Highways and Bridges, as amended, specification M2.01.7.

g. Screened Gravel:

- 1) Screened gravel shall be used for drainage pipe and drainage structures bedding as indicated or if standing water is observed in the pipe trench prior to installation and at other locations as specified on the Contract Drawings.
- 2) Screened gravel shall consist of hard, durable, rounded or subangular particles of proper size and gradation and shall be free from sand, loam, clay, excess fines and deleterious materials. The gravel shall be graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
3-in	100
No. 4	40 to 75
No. 50	8 to 28
No. 200	0 to 10

h. Sand: Sand shall conform to ASTM C33 for fine aggregate.

i. Manufactured Topsoils:

- 1) Manufactured topsoils shall be friable and capable of promoting and supporting healthy plant growth, as determined by soil testing described in this section, when mixed with fertilizer and soil conditioners as specified. Manufactured topsoils shall be free of slag, stones greater than 2 inches in diameter, plants or their roots, sticks, clay clods, toxic substances or any material harmful to plant growth. Manufactured topsoils shall have a pH between 5.5 and 7.5.

**FULLER MIDDLE SCHOOL
FRAMINGHAM, MASSACHUSETTS**

- 2) Manufactured topsoil - Type I shall contain between 4 and 6 percent organic matter, and shall be used in reinforced steep slope facing and all other grassed areas as indicated.
 - 3) Manufactured topsoils shall be classified as a sandy loam, loam, or sandy clay loam, using the following USDA textural classification system based on the percentage of clay (<0.002mm), silt (0.05 to 0.002mm) and sand (2mm-0.05mm) in the fine earth fraction (<2mm). In addition, the gravel (2mm-2-in) content shall be less than 10 percent.
 - 4) The organic matter content for manufactured topsoils shall be by weight as determined by loss on ignition of moisture free test samples oven dried to a constant weight at a temperature of 100°C. To adjust organic matter content, the manufactured topsoils may be amended with organic amendments.
 - 5) Soluble salts shall not be greater than 160 ppm.
- j. Organic Amendments for use in Producing Manufactured Topsoil:
- 1) On-site topsoil shall be screened and used as organic amendment to create manufactured topsoils.
 - 2) Compost material may also be used as an organic amendment. The compost shall be a stable, humus-like material produced from the aerobic decomposition of organic residues. The residues may include biosolids as well as yard wastes, and agricultural wastes. The compost shall be of a dark brown to black color and be capable of supporting plant growth in conjunction with the addition of fertilizers and other amendments. The composted material shall have been stabilized so as not to have an unpleasant odor. An organic amendment not stabilized and having an objectionable odor may be rejected at the discretion of the Owner.

END OF 312000

312500

EROSION AND SEDIMENTATION CONTROLS

- A. Description: Erosion and sedimentation control shall be provided as shown on the Contract Drawings and Order of Conditions by the Framingham Conservation Commission with materials and procedures as specified herein. The plan shall implement erosion and sedimentation control prevention and treatment procedures such that stormwater runoff discharged from the site shall meet the following general requirements:
1. All work shall be performed in accordance with the erosion control measures shown on The Plan.
 2. Best management practices (BMPs) shall be used to address storm water pollution prevention in accordance with MADEP Stormwater Management Guidelines & EPA NPDES Regulations.
 3. The Plan shall be implemented and installed prior to commencement of earthwork activities.
 4. The EPA NPDES Stormwater Pollution Prevention Plan Shall be kept on-site at all times and review / project inspections shall take place as specified therein.
- B. Functional Requirements:
1. Design Requirements:
 - a. In order to minimize erosion, the natural vegetation of the area shall be preserved at locations adjacent to and outside the limits of work as indicated on the Contract Drawings. All earthwork, grading, moving of equipment and other operations likely to cause disturbed soil conditions and erosion and siltation and tracking of sediments, shall be planned and performed in a sequence as to avoid sedimentation and erosion of disturbed soil.
 - b. Furnish all labor, materials, equipment and incidentals required to perform installation, maintenance, temporary pumping, removal and area cleanup related to erosion and sedimentation control work as indicated and as specified herein.
 - c. Crushed Stone: For temporary access ways, staging areas, stone filter boxes, stone filter berms, setting bed for riprap, and sediment filtration devices, crushed stone shall conform to the Commonwealth of Massachusetts Department of Highways Standard Specifications for Highways and Bridges, as amended, SSHB M2.01.3.
 - d. Geosynthetic Materials:
 - 1) Drainage Fabric, Silt Fence, Filter Fabric and Filter Cloth shall be Mirafi Envirofence; American Excelsior "Siltstop" fence or DGIP series siltfence, or approved equal.
 - 2) Stabilization Fabric: Erosion control blanket shall be constructed of a porous, biodegradable geotextile matting specifically manufactured to retain soil moisture, to hold soil temperatures and to generally stabilize soils where stormwater flows in channels, swales or on recently planted slopes such as Mirafi 100X; Curlex Excelsior, North American Green

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Bionet 575BN, or approved equal. Erosion control blanket shall be installed to protect soil and seedlings where specified.

The erosion control fabric shall be 'stapled' to the surface which it is installed in accordance with the recommendation of the selected manufacturer. All materials used in the construction of and installation of the fabric must be biodegradable and require no maintenance by the Owner.

e. Sediment Fence:

- 1) Wooden stakes shall be 4-ft in length, 2-in by 2-in oak.
- 2) Sediment fence fabric shall be a woven, polypropylene, ultraviolet resistant, selected to provide a barrier to prevent the transport of sediment laden water with fines and debris, yet provide the passage of water.
- 3) Prefabricated commercial sediment fence may be substituted for built-in-field fence.
- 4) 1/4-in woven wire mesh shall be galvanized steel or hardware cloth.
- 5) Temporary mulch
Wood chip mulch or bark chip mulch: Chipped material shall have a uniform consistency and be free of rock and soil. Material shall be stockpiled on the site in approved areas at the direction of the Owner. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain a minimum of 50 percent by weight of material to be 10-in or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.
- 6) Hay bales shall be bales made of straw of oats, wheat, barley, rye or natural hay and shall be utilized to control sediment runoff during construction activities. Each bale shall be either wire-bound or string tied. Bales shall be placed with bindings oriented around the bale rather than over and under. Furnish oak wood stakes 2-in x 2-in x 4-ft long or 1/2-in x 4-ft long rebar as indicated.
- 7) Tackifier for use on straw mulch areas shall be a latex acrylic copolymer emulsion specifically manufactured for use as a tackifier. Asphalt tackifier shall not be used.
- 8) Temporary seeding for erosion control
- 9) Dust Control
- 10) Cloth Filters: Cloth filters at catch basins shall be The Dandy Bag as manufactured by Dandy Products, Inc. or equal; Siltsack as manufactured by Jennian Enterprises; Drainpac as manufactured by Drainworks.

END OF 312500

- A. Description: Furnish labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Hot-mix asphalt pavement at all excavations made in any existing pavement.
 2. Pavement-marking paint.
- B. Functional Requirements:
1. Design Requirements:
 - a. Hot –mix asphalt pavement bituminous concrete paving shall be Class 1, as specified in Mass DOT Standard Specifications for Highways and Bridges Section M3.11.0
 - b. Asphalt tack coat shall consist of either emulsified asphalt, Grade RS-1 conforming to Mass DOT Section M3.03.0, or cutback asphalt, Grade RC-70 or RC-250 conforming to Mass DOT Section M3.02.0.
 - c. Pavement-marking paint shall be acrylic/latex type, low VOC, traffic marking paint.

END OF 321216

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SECTION 321316 – DECORATIVE CONCRETE PAVING

1. Description of Work: Provide decorative concrete paving and related items, as indicated on the Drawings and as specified herein. Work of this Section includes, but is not limited to:
 - a. Stamped concrete paving.
2. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - a. Use flexible or uniformly curved forms for curves of a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.
 - b. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
3. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
4. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
5. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars. Cut bars true to length with ends square and free of burrs.
6. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - a. Portland Cement: ASTM C 150, white portland cement Type I.
7. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
 - a. Maximum Aggregate Size: 3/4 inch (19 mm).
 - b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
8. Water: Potable and complying with ASTM C 94/C 94M.
9. Air-Entraining Admixture: ASTM C 260.
10. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - a. Water-Reducing Admixture: ASTM C 494/C 494M, Type A[, **colored**].
 - b. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - c. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

11. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1) ChemMasters.
 - 2) Davis Colors.
 - 3) Scofield, L. M. Company.
 - 4) Solomon Colors, Inc.
Specialty Concrete Products, Inc.
12. Stamp Mats: Semirigid polyurethane mats with projecting textured and ridged underside capable of imprinting texture and joint patterns on plastic concrete.
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1) Bomanite Corporation.
 - 2) Matcrete Precision Stamped Concrete Tools.
 - 3) Scofield, L. M. Company.
 - 4) Stampcrete International Ltd.
13. Stamp Tools: Open-grid, aluminum or rigid-plastic stamp tool capable of imprinting joint patterns on plastic concrete.
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:
- 1) Matcrete Precision Stamped Concrete Tools.
 - 2) Scofield, L. M. Company.
 - 3) SuperStone, Inc.

END OF SECTION

321220

PEDESTRIAN PAVEMENT

- A. Description: Furnish and install concrete walkways.

- B. Functional Requirements:
 - 1. Design Requirements:
 - a. Concrete shall be no less than 4,000 psi at 28 days with 5% to 7% air entrainment.
 - b. Welded wire fabric shall conform to ASTM A185 and shall be of size and gauge shown.
 - c. Expansion joint filler shall be bituminous type, ½-inch thick meeting AASHTO M-213-65.
 - d. Concrete sidewalks shall have a broom finish.

END OF 321220

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SECTION 32 33 00

SITE FURNISHINGS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.
- B. All references to products by manufacturer, trade name or performance Specifications bearing the connotation "or Approved Equal" shall be as determined by the Landscape Architect and the City, per MGL c. 30 s. 39M, part b, criteria 1.

1.2 WORK INCLUDED

- A. Provide all labor, equipment, implements and materials required to furnish, install, construct and perform all site improvements complete as shown on the Drawings and specified herein.
- B. To be included, but not limited to the following:
 - 1. Bollards;
 - 2. Bike Racks;
 - 3. Benches;
 - 4. Trash and Recycling Receptacles.

1.3 REFERENCES

- A. Examine all other Sections of the Specifications and all Drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all trades and all departments of the City and coordinate all work under this Section therewith.
- B. The following related items are included under the Sections listed below:
 - 1. Section 02 41 00 - Site Preparation and Demolition
 - 2. Section 03 30 00 - Cast In Place Concrete
 - 3. Section 32 10 00 - Bases, Ballasts, Paving, and Edging

1.4 SUBMITTALS AND SHOP DRAWINGS

- A. Submit digital files or three (3) hard copies of shop drawings, product literature, catalog cuts and / or samples for all items indicating material characteristics, fabrications, details of construction, connections and relationship with adjacent construction, called for on the Drawings and as specified and in accordance with applicable requirements under Division 1.
- B. Take field measurements prior to preparation or shop drawings and fabrication. Allow sufficient time for shop drawing review and approval, before fabricating or ordering.
- C. Submit digital file or three (3) copies of the following cut sheets and / or detailed shop drawings for each item to be fabricated and installed under this Section:
 - 1. Bollards;
 - 2. Bicycle Racks;

3. Benches;
 4. Trash and Recycling Receptacles.
- D. Do not order materials or begin installation of Work of this Section until Owner's / Landscape Architect's approval of submittals has been obtained. Delivered materials shall closely match approved samples.

1.5 SAMPLES

- A. Initial Selection Samples: Submit samples showing complete range of colors, textures and finishes available for each material used.
- B. Verification Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variation expected.

1.6 PRODUCT LITERATURE

- A. For each product or material used, submit manufacturer's product data, including installation instructions, use, limitations and recommendations.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original unopened and undamaged packages and containers with labels legible and intact.
- B. Store and handle materials in accordance with manufacturer's instructions. Prevent damage and deterioration of products from the environment and construction operations.
- C. Handle in accordance with manufacturer's instructions.

1.8 JOB CONDITIONS

- A. Examine all surfaces to receive site improvements to see that they are in proper condition to receive the Work specified. Report to the Engineer in writing all unacceptable areas. All defects resulting from use of accepted surfaces shall be corrected by the appropriate Contractor at no additional expense to the Owner.
- B. Start of Work under this Section 02 80 00 shall constitute acceptance of the site conditions to which this Work is to be applied. Site preparation shall be of proper approved quality. Any defects in Work resulting from such conditions shall be corrected under this Section, at no extra cost to the Owner.
- C. Environmental Requirements: Contractor shall not Work on or with soils when they are dry, wet, or frozen. Field Test: Form soil in palm of hand; if soil retains shape and crumbles upon touching, then it may be worked (if it will not retain its shape, it is too dry; if it does not crumble, it is too wet). Landscape Architect shall be final authority on condition of soil.

1.9 DEFINITIONS

- A. The following items are included herein and shall mean:
 1. A.A.S.H.T.O. - American Association of State Highway and Transportation Officials.

2. S.S.H.B. - Standard Specifications for Highway and Bridges, the Commonwealth of Massachusetts, Department of Public Works, latest edition.
3. A.S.T.M. - American Society for Testing and Materials. The following standard specifications are applicable to the associated items as listed.
 - a. A 36: Specifications for Structural Steel.
 - b. A 48-83: Specifications for Gray Iron Castings.
 - c. A 153...Zinc Coating (hot-dip) on hardware
 - d. A 307: Specifications for Unfinished Bolts and Nuts.
 - e. A 446, GRADE A: Specifications for Steel Sheet.
 - f. A 500-501: Specifications for Structural Tubing.
4. CPSC - Consumer Product Safety Council.
5. ADA - Americans with Disabilities Act and its current regulations.
6. AWS: American Welding Society
7. SSPS: Steel Structures Painting Council

1.10 WARRANTIES

- A. Attention is directed to provisions of the CONDITIONS OF THE CONTRACT and applicable parts of Division 1 regarding guaranties and warranties.
- B. Manufacturers shall provide their standard guaranties for Work specified in the Section. However, such guaranties shall be in addition to and not in lieu of all other liabilities which manufacturers and Contractor may have by law or by other provisions of the Contract Documents.

1.11 QUALITY ASSURANCE

- A. Comply with applicable codes, ordinances and regulations. Provide products of acceptable manufacturer's which have been in satisfactory in similar service for three years. Use experienced installers.

PART 2 - PRODUCTS

2.1 BOLLARDS

- A. Bollards shall be xxxx by xxxx or Approved Equal.
- B. Color and finish is to be selected by Landscape Architect from Manufacturer's full range of colors.
- C. Submit Manufacturer's Shop Drawings for approval.

2.2 BICYCLE RACKS

- A. Bicycle Racks shall be the xxxx by xxxx, or Approved Equal.
- B. Submit Manufacturer's Shop Drawings.
- C. The entire rack shall be coated with a polyester powder coat; color to be selected from Manufacturer's standard colors.

2.3 BENCHES

- A. Bollards shall be xxxx by xxxx or Approved Equal.
- B. Color and finish is to be selected by Landscape Architect from Manufacturer's full range of colors.
- C. Submit Manufacturer's Shop Drawings for approval.

2.4 TRASH AND RECYCLING RECEPTACLES

- A. Trash and recycling receptacles shall be xxxx by xxxx or Approved Equal. Provide shop drawings and/or manufacturer's cut sheets for approval before ordering.
- B. All hardware is to be supplied by manufacturer and shall be tamper-resistant.
- C. Use rustproof anchor bolts to attach trash and recycling receptacle to concrete pad (see Manufacturer's instructions)
- D. Colors and finishes to be selected by Landscape Architect and Owner, from full range of manufacturer's standard colors.

PART 3 - EXECUTION

3.1 BOLLARDS

- A. Install as shown in Drawings and per Manufacturer's instructions. Contractor to touch up any scratches and all mars to surfaces or finishes.

3.2 BIKE RACKS

- A. Install as shown in Drawings and per Manufacturer's instructions. Contractor to touch up any scratches and all mars to surfaces or finishes.

3.3 BENCHES

- A. Install as shown in Drawings and per Manufacturer's instructions. Contractor to touch up any scratches and all mars to surfaces or finishes.

3.4 TRASH AND RECYCLING RECEPTACLES

- A. To be installed per Drawings and manufacturer's instructions. Shim as needed so receptacle is plumb and level.
- B. Contractor to touch up any scratches and all mars to surfaces and finishes.

END OF SECTION

SECTION 32 90 00 PLANTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.
- B. All references to products by manufacturer, trade name or performance Specifications bearing the connotation "or Approved Equal" shall be as determined by the Landscape Architect and the City, per MGL c. 30 s. 39M, part b, criteria 1.
- C. Contractor shall comply with all laws, regulations, and quarantines for agricultural and horticultural products.

1.2 WORK INCLUDED

- A. The work of this Section consists of the provision of all materials, labor, equipment and the like for the complete execution of all lawn establishment by sodding and related items as indicated on the Drawings and/or as specified herein.
- B. Work includes but is not limited to the following:
 - 1. Topsoil (loam borrow), fine grading and loaming;
 - 2. Plant Materials;
 - 3. Soil additives;
 - 4. Mulch;
 - 5. Hydro-seeded Lawns;
 - 6. Sod;
 - 7. Meadow Grass Seed Mix;
 - 8. Erosion Control Fabric;
 - 9. Maintenance, watering, and protection of plantings until final acceptance.

1.3 SPECIAL CONDITIONS

- A. No burning will be permitted on the project site.
- B. Prior to commencing work, the Contractor shall submit a plan for legal disposal of removed materials, acceptable to the Owner.

1.4 REFERENCES

- A. Examine all other Sections of the Specifications and all Drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all other trades and all departments of the City and coordinate all work under this Section therewith.
- B. Related items include but are not limited to work under the Sections listed below:
 - 1. Section 02 41 00 – Demolition and Site Preparation
 - 2. Section 31 00 00 – Earthwork

1.5 SUBMITTALS

- A. Prior to ordering the below listed materials, submit representative samples to Landscape Architect for selection and approval, in accordance with requirements of General Condition and special provisions as follows. Do not order material until Landscape Architect's approval has been obtained. Delivered materials shall closely match the approved samples.
1. Topsoil: The Contractor shall provide a one (1) cubic foot representative sample from each proposed source for testing and approval as directed by the Landscape Architect. The Contractor shall deliver samples to testing laboratory prior to any loaming and shall have the testing report sent directly to the Landscape Architect, and pay all costs.
 - a. Mechanical and chemical (pH soluble salts) analysis shall be by public extension service agency or a certified private testing laboratory in accordance with the current standards of the Association of Official Agricultural Chemists.
 - b. Report shall be submitted at least one (1) month before any loaming is to be done. Soil tests shall be for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and Lead, and show acidity and USDA classification of the soil.
 2. Submit a written guarantee of conformance to specifications for sod.
 3. Submit material specifications and installation instructions where applicable attesting that soil additives meet the requirements specified.

1.6 DEFINITIONS

- A. The following related items are included herein and shall mean:
1. S.S.H.B.: The Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges, latest edition
 2. A.O.A.C.: Association of Official Agricultural Chemists
 3. A.A.N.: American Association of Nurserymen

1.7 PRODUCT DELIVERY AND HANDLING

- A. All topsoil, whether from stockpiles on site or loam borrow, shall be stored in piles not to exceed six feet in height, and shall not be handled when frozen or not in a friable condition.

1.8 CERTIFICATION OF ACCEPTANCE AND GUARANTEE

- A. The Contractor shall be responsible for maintenance until the LATER of: the acceptance of the project as substantially complete, or 90 days after installation. After the minimum ninety (90) day maintenance period and substantial completion of the project, the Contractor shall request of the Landscape Architect, in writing, an inspection to determine whether the lawns and plantings are acceptable. If the plant material and workmanship are acceptable, written notice will be given by the Landscape Architect to the Contractor stating that the guarantee period begins from the date of the Certificate of Acceptance. Acceptance shall be given only for the entire lawn area covered by the Contract, and for all plantings.
- B. Lawns shall exhibit a uniform, thick, well-developed stand of grass, which has received a minimum of three cuttings. Lawn areas shall have no bare spots in

excess of four inches in diameter, and bare spots shall comprise no more than two percent of the total area of the lawn. No lawn areas shall exhibit signs of damage from erosion, washouts, gullies, or other causes.

- C. Lawns, shrubs, and perennials shall be guaranteed for a period of one calendar year after inspection and acceptance and shall be alive and in satisfactory growth at the end of the guarantee period. Trees 3" caliper or greater shall be guaranteed for a period of two calendar years after inspection and acceptance.
- D. At the end of the guarantee period, inspection will be made again. Any lawn area or planting covered under this contract that is dead or unsatisfactory shall be replaced according to the planting seasons called for herein, until the lawn or planting lives through one guarantee period. A final inspection for acceptance will be made after the replacement plantings have lived through one guarantee period. Contractor shall test soil and add fertilizer and lime as needed in the fall after installation.
- E. All replacements shall be the same turf mix (sod), seed mix (meadow mix and seeded lawns) or species and cultivar (plantings) as originally installed and accepted. The cost shall be borne by the Contractor.

1.9 SITE CONDITIONS

- A. All areas to be planted shall be inspected by the Contractor before starting work and any defects such as incorrect grading, etc., shall be reported to the Landscape Architect prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be planted and he shall assume full responsibility.
- B. Environmental Requirements: Contractor shall not work on or with soils when they are dry, wet, or frozen. Field Test: Form soil in palm of hand; if soil retains shape and crumbles upon touching, then it may be worked (if it will not retain its shape, it is too dry; if it does not crumble, it is too wet). Landscape Architect shall be final authority on condition of soil.

1.10 PROTECTION

- A. The Contractor shall be liable for any damage to property caused by the work, and all areas disturbed shall be returned to their original condition to the satisfaction of the Landscape Architect. During all work of this section, the Contractor shall protect all site improvements from contact with agricultural chemicals, soil amendments, and fertilizers.
- B. The Contractor shall provide all erosion, sedimentation, and environmental controls necessitated by site and governing codes.
- C. Damage no plant to remain by burning, by pumping of water, by cutting of live roots or branches, or by any other means. No plant to be saved shall be used for crane stays, guys, or their fastenings. Vehicles shall not be parked within the dripline of trees to remain, or wherever damage may result to trees to be saved. Construction material shall not be stored beneath trees to be saved. See Drawings for Tree Protection.

PART 2 - PRODUCTS

2.1 TOPSOIL/LOAM

- A. Loam shall be a "fine sandy loam" or a "sandy loam" determined by mechanical analysis and based on the USDA classification system. It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one inch, lumps, plants and their roots, debris and other extraneous matter over one inch in diameter or excess of smaller pieces of the same materials as determined by the Landscape Architect. It shall not contain toxic substances harmful to plant growth. Loam shall contain not less than 4% nor more than 10% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 F, plus or minus 9.
- B. Loam shall have an acidity range of pH 5.6 to pH 6.5.
- C. The amount of either sulfur or limestone required to adjust the planting loam to the proper pH range (above) shall be determined by the Landscape Architect on the basis of soil tests as specified herein.
- D. Soil tests for this area shall be through the University of Massachusetts Amherst Cooperative Extension Soil Testing Laboratory, with recommendations for both Grasses/Lawns and Trees/Shrubs, or Approved Equal testing service (submit proposed alternative before testing).

2.2 PLANT MATERIALS

- A. The Contractor shall furnish and plant all plants shown on the Drawings, as specified, and in quantities listed on the Plant List. No substitutions will be permitted. All plants shall be nursery-grown unless specifically authorized to be collected.
- B. Plants shall be in accordance with the USA Standard for Nursery Stock of the American Association of Nurserymen, latest edition.
- C. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Only plant stock grown within the hardiness Zones 1 through 6, as established by the United States Department of Agriculture, will be accepted. The Contractor's suppliers must certify in writing that the stock has actually been grown under Zone 6 or hardier conditions for a minimum of 2 years. Plants not so certified will not be accepted.
- D. The root system of each shall be well provided with fibrous roots. All parts shall be moist and show active green cambium when cut. They shall be sound, healthy, and vigorous, well-branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae.
- E. All plants must be moved with the root systems as solid units with balls of earth firmly wrapped with untreated eight (8) ounce burlap, firmly held in place by a stout cord or wire. The diameter and depth of the balls of earth must be sufficient to encompass the fibrous and root feeding system necessary for the healthy development of the plant. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during the process of planting or after the burlap, staves, ropes or platform required in connection with its transplanting have been removed. The plants and balls shall remain intact during all operations. All plants that cannot be planted at once must be heeled in by setting in the ground and covering the balls with soil and then watering them.
- F. The caliper of the trees shall be not less than the minimum size designated. Take caliper measurement six inches (6") above ground level up to and including four (4") caliper size and twelve inches (12") above ground for larger sizes. The trunk of each tree shall be a single trunk growing from a single unmutated crown of roots. No part

of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire or other causes. No pruning wounds shall be present having a diameter exceeding two inches (2") and such wounds must show vigorous bark on all edges. Plants shall not be pruned prior to delivery.

- G. Plants delivered by truck and plants requiring storage on site shall be properly wrapped and covered to prevent wind-drying and desiccation of branches, leaves or buds; plant balls should be firmly bound, unbroken, reasonably moist to indicate watering prior to delivery and during storage and tree trunks should be free from fresh scars and damage in handling. No trees with double-leaders or twin-heads shall be acceptable without the written approval of the Landscape Architect. The Contractor shall reject such plants at time of delivery by the nursery/supplier unless such plants were selected by the Landscape Architect as indicated by tags and seals. No plant material from cold storage will be accepted.

2.3 SOIL ADDITIVES

- A. Commercial fertilizer, manufactured compost, peat, humus or other additives shall be used to counteract soil deficiencies as recommended by the soil analysis and as directed by the Landscape Architect.

- 1. Commercial fertilizer shall be a product complying with the State and United States Fertilizer Laws. Deliver to the site in the original unopened containers that shall bear the manufacturer's Certificate of Compliance covering analysis which shall be furnished to the Landscape Architect. At least 50% by weight of the Nitrogen content shall be derived from organic materials. Fertilizer shall contain not less than the percentages of weight of ingredients as follows or as recommended by the soil analysis:

	Nitrogen	Phosphorus	Potash
For All Plants	10%	10%	10%

- 2. Fertilizer plan, including schedule and specific mix, must be submitted and approved by the Landscape Architect and the Owner's Representative.
- B. Ground dolomite limestone shall be an approved agricultural limestone containing not less than 85% of total calcium or magnesium carbonates. Limestone shall be ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.
- C. Humus shall be natural humus, reed peat or sedge peat. It shall be free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. According to the methods of testing of A.O.A.C., latest edition, the acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 85% as determined by loss on ignition. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.
- D. Peat moss shall be composed of the partly decomposed stems and leaves of any or several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign matter. It shall have an acidity range of 3.5 pH to 5.5 pH as determined in accordance with the methods of testing of A.O.A.C., latest edition. Its water absorbing ability shall be a minimum of 1,100% by weight on an oven-dry basis. Manufactured Compost of comparable qualities will be accepted in lieu of peat moss.

- E. Superphosphate: Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.
- F. Water retention gel shall be used where appropriate. Mix with soil per manufacturer's directions.

2.4 BARK MULCH

- A. Mulch shall be pine bark aged a minimum of six (6) months. The mulch shall be dark brown in color, free of chunks and pieces of wood thicker than one-quarter inch (1/4"). Mulch must be free of stringy material over three inches (3") in length and shall not contain, in the judgment of the Landscape Architect, an excess of fine particles. Mulch shall be 98% organic matter with the pH range of 3.5 to 4.5. Moisture content of packaged material shall not exceed 35%. Submit sample for the Landscape Architect's approval.

2.5 LAWN SEED MIX

- A. Seed Mix shall be "Black Beauty Ultra" by Jonathan Green Co. of Reading, PA or Approved Equal low-fertilizer-requirement mix designed to minimize need for irrigation.
- B. Grass seed for lawn areas shall be fresh, clean, dry, new crop seed, which meets the standard of the Federal Seed Act. Seed shall be mixed in proportion by weight and testing the minimum percentages of purity and germination. Seed shall be nursery grown seed composed of grasses grown from the following seed mixtures.
Lawn Areas:

Approx % by Wt.	Common Name of Grass	% Germination
70	Tall Fescues	92
20	Perennial Ryegrass	92
10	Kentucky Bluegrass	85

- C. Weed seed shall not exceed 0.1% by weight. Tall Fescue shall be a mix of "Tonto," "Montana," "Dorado," or similar cultivar tall fescues. Bluegrass shall be "Madison," "Deepblue," "Prosperity," or similar cultivar Kentucky bluegrass. Perennial Rye shall be "Frontier," "Singular," or similar cultivar Perennial Ryegrass.

2.6 SOD MIX

- A. Sod shall be nursery grown sod composed of grasses grown from the following seed mixtures.

% by Weight	Common Name of Grass
70	Tall Fescue
20	Kentucky Bluegrass
10	Perennial Ryegrass

- B. The sod shall be "Black Beauty Turf Type Fescue" grown by Sodco, Inc. of Slocum, Rhode Island, or other approved New England source; submit proposed sod specifications and source for approval.
- C. Weed seed shall not exceed 0.1% by weight. Tall fescue shall be a mix of "Golconda", "Montana", "Dorado", or similar cultivar tall fescues. Bluegrass shall be a mix of "Deepblue," "Prosperity," or similar cultivar Kentucky bluegrass. Perennial Rye shall be a mix of "Frontier," "Singular," or similar cultivar Perennial Ryegrass.

- D. Sod shall be machine cut at a uniform soil thickness of $\frac{3}{4}$ inch, plus or minus $\frac{1}{4}$ inch, 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 length shall be 5%. 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.
- E. Sod shall be furnished and installed in either of the following dimensions, to be selected by the Contractor:
- F. In rectangular sod strips measuring 12 inches or 16 inches in width and from 4 feet to 6 feet in length, stored in rolls with the grass top side inverted so that the topsoil is to the exterior.
- G. Sod shall be harvested, delivered and installed within a period of 36 hours. Sod not transplanted within this period shall be inspected and approved by the Landscape Architect prior to its installation. Soil on sod pads shall be kept moist at all times.
- H. If delivered in multiple shipments, the sods shall match one another in texture and consistency, in the judgment of the Landscape Architect.

2.7 MEADOW GRASS SEED MIX

- A. Seed for wildflower areas shall be fresh, clean, dry, new crop seed, which meets the standard of the Federal Seed Act. Seed shall be mixed in proportion by weight and testing the minimum percentages of purity and germination. Seed shall be nursery grown seed composed of grasses grown from the following species:

<u>Botanical Name</u>	<u>Common Name</u>
Schizachyrium scoparium	Little Bluestem
Festuca rubra	Red Fescue
Sorghastrum nutans	Indian Grass
Chamaecrista fasciculata	Partridge Pea
Elymus canadensis	Canada Wild Rye
Elymus virginicus	Virginia Wild Rye
Verbena hastata	Blue Vervain
Asclepias tuberosa	Butterfly Milkweed
Sisyrinchium angustifolium	Narrowleafed Blue Eyed Grass
Rudbeckia hirta	Black Eyed Susan
Aster lateriflorus	Starved/Calico Aster
Aster novae-angliae	New England Aster
Eupatorium fistulosum	Hollow Stem Joe Pye Weed
Liatris spicata	Spiked Gayfeather
Solidago juncea	Early Goldenrod

- B. Weed seed shall not exceed 0.5% by weight.
- C. Seed mix shall be: New England Wildflower Seed Mix by New England Wetland Plants Inc. Amherst, MA (ph: 1.413.548.8000), or approved equal.

2.8 EROSION CONTROL MAT

- A. Erosion Control Mat to be ECS-1B Single Net Straw Biodegradable Rolled Erosion Control Product by East Coast Erosion Control, 443 Bricker Road, Bernville, PA 19506 (ph1-800-582-4005) or approved equal to match specifications.

- B. Erosion control mat to be made of uniformly distributed 100% agricultural straw and one organic jute net securely sewn together with biodegradable. Net opening to be . 5"x.1".
- C. The erosion control fabric to have a functional longevity of approximately 12 months. The erosion control fabric to meet Type 2.C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17
- D. Erosion control fabric to come in 2 sizes. Standard to be 8' wide by 112.5' long, Mega to be 16' wide by 112.5' long.

2.9 INSECTICIDE

- A. No insecticide shall be used except as specifically approved in writing by the Landscape Architect and the Owner's Representative.

2.10 WATER

- A. The Contractor shall be responsible to furnish his/her own supply of water to the site at no extra cost.
- B. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.
- C. All new trees shall be furnished with a Portable Drip Irrigation System (PDIS) water bag, "Gator Bags" or Approved Equal. PDIS water bags shall be UV-treated, reinforced polyethylene bags with a nylon toothed zipper extending from top to bottom of bag, capable of holding a minimum of 20 gallons of water, constructed so that they can be attached to the trees, which provide water from a minimum of three drip points.

PART 3 - EXECUTION

3.1 FINE GRADING AND LOAM

- A. After the areas to be loamed have been brought to subgrade, and immediately prior to dumping and spreading the loam, the subgrade shall be loosened by disking or rototilling to a depth of at least three inches (3") to permit bonding of the loam to the subsoil. Remove all stones greater than two inches (2") and all debris or rubbish. Such material shall be removed from the site.
- B. Loam shall be placed and spread over approved areas to a depth sufficiently greater than six inches (6") so that after natural settlement and light rolling, the completed work will conform to the lines, grading and elevations indicated. Supply additional loam, after testing and approval, as may be needed to give the specified depths and finished grades under the contract without additional cost to the Owner.
- C. No subsoil or loam shall be handled in any way if it is in a wet, dry, or frozen condition.
- D. Sufficient grade stakes shall be set for checking the finished grades. Grades shall be established which are accurate to one-tenth (1/10th) of a foot either way. Connect contours and spot elevations with an even slope.
- E. After lime, fertilizer, and humus if required have been spread and incorporated into the bed, it shall be carefully prepared by scarifying or harrowing and hand raking. All

large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter, and stones over one inch (1") in diameter shall be removed from the loam. Loam shall also be free of smaller stones in excessive quantities as determined by the Landscape Architect.

- F. The whole surface shall then be rolled with a hand roller weighing not more than 100 lbs. per foot of width. During the rolling, all depressions caused by settlement or rolling shall be filled with additional loam and the surface shall be regraded and rolled until presenting a smooth and even finish to the required grade. The finish grades shall be inspected by the Landscape Architect for approval before final acceptance.

3.2 PLANTING

- A. Furnishing and planting of any plant material includes the digging of the holes, provision of soil additives and loam, furnishing the plants of specified size with roots in the specified manner, the labor of planting and mulching and guying and staking where called for.
- B. Season for Planting
 - 1. Spring:
 - a. Deciduous materials March 21 through May 15
 - b. Evergreen materials April 15 through June 1
 - 2. Fall:
 - a. Deciduous materials October 1 through December 1
 - b. Evergreen materials August 15 through October 15
- C. Planting
 - 1. Location for all plants and outlines for planting areas shall be staked on the ground by the Contractor for approval by the Landscape Architect before any plant pits or plant beds are dug.
 - 2. At least fifteen (15) days prior to the expected planting date, the Contractor shall request that the Landscape Architect provide a representative to select and tag stock to be planted under this Section. The Contractor shall provide for the transportation and overnight accommodations, if necessary, for the Landscape Architect's representative during the period of time required to select and tag the plant material, at no extra cost to the Owner.
 - 3. Plants shall be selected by the Landscape Architect at the place of growth for conformity to specification requirements as to quality, size, and variety. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work. Cost of replacement shall be borne by the Contractor.
 - 4. Plant pits shall be circular pits with sloping sides, except for plants specifically indicated to be planted in beds. Holes for trees and shrubs shall be at least two feet (2') greater in diameter than the ball, and shall be at least three (3) times the diameter of the ball for trees where space allows, and shall be of a depth that maintains the plant's prior relation to finish grade. Bottom of pit shall be flat or deepest at the perimeter. If pit is dug deeper than required to maintain plant's relation to finish grade, then soil replaced under root ball shall be compacted to prevent subsequent settling of tree or shrub. If soil at

- bottom of pit is impermeable or poorly drained, pit shall be dug one extra foot, backfilled with planting soil mix, and compacted before installing plant.
5. After excavation, fill pit twice successively with water. If water does not drain out of pit at a minimum of two inches per hour, provisions for drainage must be made. Contractor shall document drainage test results for review by Landscape Architect.
 6. Topsoil, organic material and fertilizer mix for planting soil mix shall be thoroughly premixed in the proportions of one (1) part of organic material with four (4) parts of topsoil together with fertilizer at the rate determined by soil test. The organic material to be added shall be as directed by the Landscape Architect. One part of existing soil shall be mixed with two parts of planting soil mix for use in back filling around root ball. Maintain at all times during the planting operations one or more stockpiles of approved planting soil mix.
 7. Install slow release fertilizer packets per manufacturers' directions with each newly planted tree.
 8. All plant roots and earth balls must be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation and on the ground until the final planting. The plants shall be planted in the center of the holes and at the same depth as they previously grew (see a. below). Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structures. Remove burlap, rope, wires, etc., from the sides and tops of root balls. Do not pull burlap out from under root balls. Any girdling roots or badly damaged roots must be cleanly pruned off. Planting soil mix shall be backfilled in layers of not more than six inches (6") and each layer watered sufficiently to settle before the next layer is put in place. Enough planting soil mix shall be used to bring the surface to finish grade when settled. A saucer shall be formed around each plant at a depth of six inches (6") for trees.
 - a. The Root Flare of each plant shall be located at the finish grade and visible. All planting depths shall be inspected by the Landscape Architect and the Owner's Representative, and if not at the proper depth shall be corrected at the Contractor's expense.
- D. All plants shall be flooded with water twice within the first 24 hours of the time of planting and all plants during the maintenance period shall be watered at least twice each week. At each watering the soil around each plant shall be thoroughly saturated. If sufficient moisture is retained in the soil, as determined by the Landscape Architect, the required watering may be reduced. Trees will require a minimum of ten (10) gallons of water each.
- E. Mulch material shall be placed over entire saucer areas of individual trees and over the entire area of planting beds to a depth of three inches (3") after settlement, not later than one (1) week after planting. No mulch shall be applied prior to the first watering of plant materials. Mulch shall be pulled back two inches (2") from tree trunks.
- F. Portable Drip Irrigation System watering bags shall be installed as directed by the bag manufacturer, and shall be kept filled as necessary to maintain optimum health.
- G. Antidesiccant shall be applied to all plants before digging at the nursery and/or as directed by the Landscape Architect once the plants have been delivered to the site.
- H. Antidesiccant shall be applied to all evergreen plants in the late fall as directed by the Landscape Architect.

- I. If planting is done after lawn preparation or installation proper protection of lawn areas shall be provided and any damage resulting from planting operations shall be repaired immediately at no cost to the Owner.
- J. In the event that rock or underground construction work or obstructions are encountered in any plant pit or bed excavation work to be done under this Contract, alternate locations may be selected by the Landscape Architect.
- K. Absolutely no debris may be left on the site. Excavated material shall be removed as directed by the Landscape Architect. 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.

3.3 SOIL ADDITIVES

- A. Follow all recommendations for soil additives as determined by an approved Soil Testing Laboratory, and all manufacturers' instructions pertaining to additives.

3.4 BARK MULCH

- A. Contractor shall install approved bark mulch material to the limits and depths shown on the Drawings and specified herein.

3.5 HYDROSEEDING

- A. Limit of seeding shall be shown on the Drawings. All areas on the plan shall be loamed and seeded only after written approval of the finished grading or as directed by the Landscape Architect. All seeded areas are to be hydroseeded.

The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and be accepted practice in this locality. At his/her option and on his/her responsibility the Contractor may plant seed under unseasonable conditions without additional compensation, but subject to the Architect's approval as to time and methods.

- B. Planting may be done between August 15 and October 15, or between April 15 and June 15.
- C. Soil additives shall be spread and thoroughly incorporated into the later of loam and the upper 1 inch of the underlying subsoil by harrowing or other methods approved by the Architect. The following soil additives shall be incorporated:
 - 1. Ground limestone as required by soil analysis to achieve a pH of 6.0 to 6.5.
 - 2. Fertilizer as required by soil analysis.
 - 3. Superphosphate at the rate of 20 lbs. Per 1,000 square feet.
 - 4. Humus as required by soil analysis.
 - 5. Compost at a rate of 1 part compost per 4 parts planting loam.
- D. Seeding of lawns shall be done only by experienced workmen under the supervision of qualified foreman. Seeding shall consist of soil preparation, rolling, hydroseeding, weeding, fertilizing, watering and otherwise providing all labor and materials necessary to secure the establishment of acceptable turf.

- E. The soil on which the seed is spread shall be reasonably moist and shall be watered, if directed by the Architect. The seeded areas shall be watered evenly and at a rate of 5 gallons per square yard, unless otherwise directed by the Architect.
- F. Contractor shall place and maintain barriers (in a neat condition) around hydroseeded areas to keep people off during the first sixty (60) days.
- G. The actual seeding of lawns shall be done only during periods within the season which are normal for such work as determined by weather conditions and by accepted practice in this locality, except as approved by the Architect.
- H. The application of grass seed, fertilizer, limestone, and a suitable wood fiber or other mulch shall be accomplished in one operation for hydroseeding.
- I. Hydroseeding shall be done by use of an approved spraying machine, which shall be operated only by personnel thoroughly familiar with this type of seeding operation.
- J. Prior to starting work, Contractor shall furnish the Architect with a certified statement as to the number of pounds of materials to be used per 100 gallons of water and the number of square feet to be covered with the quantity of solution in the hydroseeder.
 - 1. Materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water.
 - 2. Solution shall be sprayed evenly over the area so that resulting deposits of all materials shall equal the required rates.
 - 3. Spraying equipment shall be thoroughly cleaned and flushed prior to start of work and after every ten acres.
 - 4. When inoculum is required, if the inoculum is left in the solution with fertilizer for longer than thirty minutes, a fresh charge of inoculum shall be added to the mixture.

3.6 MEADOW GRASS SEED MIX

- A. Always apply on clean bare soil. Preparation of a clean weed free soil surface is necessary for optimal results. The mix may be applied by hydro-seeding, by mechanical spreader, or on small sites it can be spread by hand. Lightly rake, or roll to ensure proper seed to soil contact. Late Spring and early Summer seeding will benefit with a light mulching of weed-free straw to conserve moisture. If conditions are drier than usual, watering may be required. Fertilization is not required unless the soils are particularly infertile.
- B. Best results are obtained with a Spring seeding. Late Fall and Winter dormant seeding require an increase in the seeding rate.

3.7 SODDING

- A. Limit of sodding shall be shown on the Drawings. All areas on the plan shall be loamed and sodded only after written approval of the finished grading or as directed by the Landscape Architect.
- B. Planting season for sod shall be from April 15 to June 1. The actual planting of sod shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and be accepted practice in this

locality. At this option and on his responsibility the Contractor may plant sod under unseasonable conditions without additional compensation, but subject to the Landscape Architect's approval as to time and methods.

- C. Soil additives shall be spread and thoroughly incorporated into the later of loam and the upper 1 inch of the underlying subsoil by harrowing or other methods approved by the Landscape Architect. The following soil additives shall be incorporated:
 - 1. Ground limestone as required by soil analysis to achieve a pH of 6.0 to 6.5.
 - 2. Fertilizer as required by soil analysis.
 - 3. Superphosphate at the rate of 20 lbs. Per 1,000 square feet.
 - 4. Humus as required by soil analysis.
- D. Sodding of lawns shall be done only by experienced workmen under the supervision of qualified foreman. Sodding shall consist of soil preparation, sodding, rolling, pegging, weeding, fertilizing, watering and otherwise providing all labor and materials necessary to secure the establishment of acceptable turf.
- E. The soil on which the sod is laid shall be reasonably moist and shall be watered, if directed by the Landscape Architect. The sod shall be laid smoothly, edge to edge, and where continuous or solid sodding is called for on the plans sod shall be laid with the longest dimension parallel to the contours. Sodding shall start at the base of slopes and progress upward in continuous parallel rows. Vertical joints between sods shall be staggered. Immediately after laying, so shall be pressed firmly into contact with the sod bed by tamping, rolling, or by other approved method – press firmly as to eliminate all air pockets, provide tree and even surfaces, ensure knitting and protect all exposed sod edges, but without displacement of the sod or deformation of the sod surfaces. The sodded areas shall be watered evenly and at a rate of 5 gallons per square yard, unless otherwise directed by the Landscape Architect.

3.8 EROSION CONTROL FABRIC

- A. Install as shown in Drawings and per Manufacturer's instructions.
- B. Erosion control mat should be secured by 11 gauge staples at a minimum size of 6" long and 1" crown. Staple pattern should reflect the layouts for the corresponding slope given by the manufacture.

3.9 MAINTENANCE AND PROTECTION OF PLANTS AND LAWN AREAS

- A. Maintenance shall begin immediately after an area is planted or sodded and shall continue until final acceptance. The minimum maintenance period shall be ninety (90) calendar days after completion of all plant installations including lawn. Watering and mowing shall be done by the Contractor for the full 90 days. Final acceptance of the plant material cannot be made until the full 90 maintenance period has elapsed.
- B. Maintenance shall include replacement of shrubs, mowing, watering, weeding, and fertilizing.
- C. Watering of Lawn Areas:
 - 1. First week: The Contractor shall provide all labor and arrange for all watering necessary for rooting of the plant materials. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantity to maintain moist soil to a depth of at least 4 inches. Watering shall not be done during the heat of the day to help prevent wilting.

2. Second and Subsequent weeks: The Contractor shall water the lawn and plantings as required to maintain adequate moisture, until final acceptance, in the upper 4 inches of soil.
 3. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one (1) complete coverage to the lawn areas and plantings in an eight (8) hour period.
- D. Watering of Tree Plantings:
1. Portable Drip Irrigation System watering bags shall be kept filled as needed to maintain optimal plant health. Bags shall be filled a minimum of once each week regardless of rain conditions. The contractor shall be responsible for ensuring that watering bags are kept full for one full growing season after installation.
- E. Mowing:
1. The first mowing of lawn areas shall not be attempted until the lawn is firmly rooted and secure in place. Not more than 40% of the grass leaf shall be removed by initial or subsequent mowings. Grass height shall be maintained between 2 inches and 2-1/2 inches unless otherwise specified. Thereafter grass shall be maintained at 2 inches until acceptance.
- F. Fertilizing:
1. A second application of fertilizer, as specified herein and as outlined in the fertilizing schedule to be submitted by the Contractor, shall be applied approximately 6 weeks after the sod has been installed as directed by the Landscape Architect. Fertilizer shall be applied at the rate of 10 pounds per 1,000 square feet or as otherwise approved as part of the fertilizing schedule.

END OF SECTION

331000

SITE DOMESTIC WATER DISTRIBUTION

- A. Description: Furnish and install buried ductile iron pipe, valves, fittings, polyethylene services and appurtenances as shown on the drawings and as specified herein.
- B. Functional Requirements:
1. Design Requirements:
 - a. Ductile Iron Pipe:
 - 1) All ductile iron pipe shall conform to AWWA C151, Class 52.
 - 2) All ductile iron pipe shall have a bituminous outside coating in accordance with AWWA C151.
 - 3) All ductile iron pipe shall be cement mortar lined and seal coated in accordance with AWWA C104. Cement mortar lining shall be double thickness.
 - b. Ductile Iron Fittings:
 - 1) Ductile iron fittings shall conform to AWWA C110 or C153, Class 350.
 - 2) All ductile iron fittings shall have a bituminous outside coating in accordance with AWWA C110.
 - 3) All ductile iron fittings shall be cement mortar lined and seal coated in accordance with AWWA C104. Cement mortar lining shall be double thickness.
 - c. Joints:
 - 1) Joints for pipe and fittings shall be restrained push-on or restrained mechanical joints conforming to AWWA C111. Gaskets shall be of SBR. Un-restrained joints may not be used.
 - 2) Joints shall be suitable for 250 psi working pressure and be fabricated of heavy section ductile iron casting.
 - 3) Bolts and nuts shall be low carbon and conforming to ASTM A307, Grade
 - d. Solid Sleeves:
 - 1) Solid sleeves shall be long body type, ductile iron with mechanical joints and retainer glands shall be of the solid type, long laying length.
 - 2) Solid sleeves shall be cement mortar lined and seal coated in accordance with AWWA C104. Cement mortar lining shall be double thickness.
 - e. Flexible Couplings: Flexible Couplings shall be cast iron with rubber gaskets.
 - f. Retainer Glands: Retainer glands shall be Ebba Iron Sales Inc. – Mega Lug or Ford Co. – 1400 Series.

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- g. Valves: Valves shall be resilient seated gate valves for buried service, and be manufactured in accordance with AWWA C509. Valves shall be provided with a minimum of two O-ring stem seals. Valves shall be epoxy coated, 8mm thick, interior and exterior.
- h. Valve Boxes and Covers: Valve Boxes and covers shall be cast iron, tar coated, two piece adjustable sliding type which include cast iron covers.
- i. Water Services:
 - 1) Corporation Cocks shall be ball valves, open left, with compression fittings.
 - 2) Curb Stops shall be ball valves, open left, with compression fittings.
 - 3) Curb stops shall have service boxes which shall be tar coated, cast iron, sliding type with inlaid covers. Shaft shall be 2 ½ inches diameter with extension rods.
 - 4) Service pipe shall be high density polyethylene copper tube size for use with compression fittings. The pipe shall be polyethylene #4508, SDR-9 rates for 200 psi.
 - 5) Compression fittings shall be used for joining polyethylene tubing.
 - 6) Coupling shall be straight coupling, 3 part, both ends pack joints for polyethylene pipe with a split locking clamp with stainless steel screw.
 - 7) Cut and remove all roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground in the area of construction, as indicated on the Contract Drawings as the limit of work.

END OF 331000

333000

SANITARY SEWERAGE PIPING

- A. Description: Installation and testing of polyvinyl chloride (PVC) sewer pipe, fittings and appurtenances
- B. Functional Requirements:
1. Design Requirements:
 - a. PVC solid wall gravity pipe and fittings shall be Type PSM, PVC SDR 35 and conform to ASTM 3034.
 - b. Pipe shall be furnished in standard laying lengths in accordance with ASTM 3034 and fittings shall be furnished in lengths of not more than 3 feet.
 - c. PVC pipe and fittings shall have bell and spigot push-on ends. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly.
 2. Testing:
 - a. All PVC pipe shall be field tested. Supply all labor, equipment, material, gauges, pumps, meter and incidentals for testing.
 - b. Gravity pipe shall be visibly inspected for leakage.
 3. Cleaning:
 - a. Prior to final completion of the Work, thoroughly clean al new pipelines and remove all dirt, stones, pieces of wood or other materials.

END OF 33 000

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334000

STORM DRAINAGE PIPING

- A. Description: Installation of high density polyethylene (HDPE) pipe, fittings and appurtenances.
- B. Functional Requirements:
1. Design Requirements:
 - a. HDPE pipe resins shall be high molecular weight, high density polyethylene with a cell classification number of 345434C per ASTM D3350.
 - b. HDPE pipe shall meet requirements of ASTM F714.
 - c. Pipe shall be furnished in standard laying lengths not exceeding 25 feet.
 - d. All high density polyethylene pipe and fittings shall be made from the same resin.
 2. Pipe Identification: The following shall be continuously indent printed on the pipe and spaced at intervals not exceeding 5 feet:
 - a. Name and/or trademark of the pipe manufacturer.
 - b. Nominal pipe size.
 - c. Dimension ratio.
 - d. The letters PE followed by the polyethylene grade in accordance with ASTM D1248, followed by the hydrostatic design basis in 100's of psi, e.g. PE 3408.
 - e. Manufacturing standard reference, e.g., ASTM F714.
 - f. A production code from which the date and place of manufacture can be determined.
 3. Testing:
 - a. All HDPE pipe shall be field tested. Supply all labor, equipment, material, gauges, pumps, meter and incidentals required for testing. Pressure test each pipe upon completion of the pipe laying and backfilling operations.
 4. Cleaning:
 - a. Prior to final completion of the Work, thoroughly clean all new pipelines and remove all dirt, stones, pieces of wood or other materials.

END OF 334000

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334200

SITE STORM WATER DRAINS

- A. Description: Furnish, install and test precast concrete manholes, catch basins, stormwater pretreatment separator, frames and covers, frames and grates and appurtenances as shown on the drawings and as specified herein.
- B. Functional Requirements:
1. Design Requirements:
 - a. General:
 - 1) Cement shall conform to ASTM C150, Type II cement or equal.
 - 2) Provide lifting lugs or holes in each precast section for proper handling.
 - 3) Like items of material/equipment shall be end products of one manufacturer.
 - 4) Precast sections shall be properly cured prior to shipping.
 - b. Precast Concrete Manhole Sections and Catch Basins: Precast concrete base sections, riser sections, transition top sections, flat slab tops and grade rings shall conform to ASTM C478 and meet the following requirements:
 - 1) Design precast concrete base and flat slab for their own weight, weight of soil, and a live load equal to AASHTO H-20 truck loading applied at finish grade.
 - 2) Bottom slab thickness shall equal the riser wall thickness or flat slab thickness, whichever is greater.
 - 3) Construct precast concrete base as shown on the drawings.
 - 4) Base, riser, and transition top sections shall have tongue and groove joints.
 - 5) Top section shall be eccentric cone where cover over pipe exceeds 4-feet and as shown on the Drawings. Top section shall be flat slab where cover over pipe is 4-feet or less.
 - 6) Provide integrally cast knock out panels in precast concrete manhole sections at locations, and with sizes shown on the drawings. Knock out panels shall have no steel reinforcing.
 - c. Stormwater Pretreatment Separator:
 - 1) The stormwater pretreatment separator shall be approved by the Massachusetts Stormwater Technology Evaluation project (MASTEP).
 - 2) Design Criteria: Performance objective of 80% TSS to recharge system at design flow.
 - 3) The stormwater pretreatment separator shall be capable of containing spills of floatable substances such as oil and gasoline.
 - 4) The manhole risers and frames and covers for the stormwater pretreatment separator shall be provided by the manufacturer.
 - 5) Design precast concrete base and flat slab for their own weight, weight of soil, and a live load equal to AASHTO H-20 truck loading applied at finish grade.

- 6) The particle separator shall be easy to maintain.
- d. Brick Masonry:
- 1) Bricks for channels and shelves shall conform to ASTM C32, grade SS.
 - 2) Brick for raising frames to finished grade shall conform to ASTM C62.
 - 3) Mortar shall be composed of 1 part Portland cement, 2 parts sand, and hydrated lime not to exceed ten-pounds to each bag of cements. Portland cement shall be ASTM C150, Type II; hydrated lime shall conform to ASTM C207.
 - 4) Sand shall be washed, cleaned, screened, well graded with all particles passing a No. 4 sieve and conform to ASTM C33.
- e. Frames and Covers and Frames and Grates:
- 1) Frames and covers and frames and grates shall be cast iron. Cast iron shall conform to ASTM A48, Class 30.
 - 2) Frames and covers shall have a 24-inch diameter clear opening unless otherwise indicated on the drawings.
 - 3) Frames and grate shall have a 24-inch square clear opening unless otherwise indicated on the drawings.
- f. Jointing Precast Concrete Sections:
- 1) Seal tongue and groove joints of precast sections with either rubber O-ring gasket or preformed flexible joint sealant.
 - 2) Completed joint shall withstand 15 psi internal water pressure without leakage or displacement of gasket or sealant.
- g. Pipe Connections: Connect pipe to precast concrete structures as follows:
- 1) Flexible sleeve- integrally cast sleeve in precast section or install sleeve in a formed or cored opening.
 - 2) Compression gasket – integrally cast compression gasket in precast concrete section.
 - 3) At the discretion of the Engineer, grout in place using non-shrink and waterproof mortar.
- h. Manhole Rungs: Manhole rungs shall be steel reinforced, copolymer polypropylene, 14-inch wide, M.A. Industries Inc. Type PS2-PF-SL, or equal.
- i. Damp proofing: Sanitary precast structures shall have two coats of bituminous waterproofing applied to the exterior surfaces by brush or spray and in accordance with the manufacturer's recommendations. Damp proofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by A. C. Horn Inc., RIW Marine Liquid by Toch Brothers or equal.

END OF 334200

