
D SERVICES

D10 CONVEYING

D1010 Elevators and Lifts

D1010.01 Elevators

Manufacturer: Kone, Otis, Schindler, Thyssen

Elevator, Hydraulic passenger elevator.

- Capacity: 5000 pounds.
- Travel: 3 landings; approximately 42'-0" rise.
- Car Inside Dimensions: To meet requirements of the Massachusetts Elevator Code, 17.40 and the Massachusetts Architectural Access Board (MAAB); nominal 6'-8" wide by 5'-5" deep.
- Speed: 100 fpm.
- Car and Hoistway Doors: Center opening.

D1010.02 Lifts

None

D20 PLUMBING

D2000 Overview

D2000.01 Scope of Work

Scope of work will include the installations of new systems to accommodate the new space configurations:

- Plumbing fixtures and trim.
- Domestic cold water and hot water distribution systems.
- Sanitary waste and vent systems.
- Kitchen waste and vent systems.
- Storm water drainage system.
- Natural gas system.
- Lab waste and vent piping system, including treatment for science classrooms.
- Protected cold water and hot water distribution systems for science classrooms.
- Tempered water system for emergency fixtures.

D2000.02 Codes and Standards

Massachusetts Plumbing and Fuel Gas Code, 248 CMR

D2010 Plumbing Fixtures

Plumbing fixtures will be mounted in accordance with the plumbing code and industry standards. Fixtures designated as "accessible" will be mounted in accordance with the regulations of the Massachusetts Architectural Access Board (MAAB) and the Americans with Disabilities Act Architectural Guidelines (ADA). As required by MAAB and ADA, a percentage of water closets, urinals, lavatories, sinks, drinking fountains and showers will be made accessible.

D2010.01 Water Closets

Institutional grade white vitreous china, wall hung, 1.28 gpf and open front white plastic seat with self-sustaining check hinge. Toilet rooms for student boys and the public will be provided with battery-operated, electronic, automatic flush valves.

All fixtures to be mounted on commercial grade, floor supported chair carrier.

- Basis of Design: Toto Model #CT708E water closet with Model TET1LN32#CP, 1.28 gpf battery operated automatic flush valve. Toilet seat to be Toto Model #SC534.

Institutional grade white vitreous china, wall hung, dual flush and open front white plastic seat with self-sustaining check hinge. Toilet rooms for student girls, staff and kitchen staff to be provided with battery-operated, electronic, automatic flush valves.

- Basis of Design: Toto Model #CT708E water closet with Sloan Dual Flush flush valve Model #8111-1.6/1.1 gpf battery operated automatic flush valve. Toilet seat to be Toto Model #SC534.

D2010.02 Urinals

Institutional grade, white vitreous china, wall hung, waterless or 0.1 GPF. Toilet rooms will be provided with battery-operated, electronic, automatic flush valves. Fixture to be mounted on commercial grade, floor supported chair carrier.

- Basis of Design:
 - 1) Waterless: Sloan Model #WES-1000.
 - 2) 0.1 GPF: Zurn Model #Ecovantage Z5798urinal with Zurn Model #ZEG6003EV, 0.1 gpf battery operated automatic flush valve.

D2010.03 Lavatories

Institutional grade, white vitreous china, wall-hung type, with front overflow for individual staff and kitchen staff toilet rooms. Those fixtures designated as accessible will have the exposed water and waste piping below the fixture insulated with pre-molded type insulation.

- Basis of Design: Toto Model #LT307.4 lavatory with 4" faucet centers and Toto Model #TEL5GSC-10 faucet (10 second run time) with vandal resistant aerator and concealed thermostatic mixing valve with locked access panel.

Gang toilet rooms will be provided with multi-person, wall mounted, and solid surface modular counter system with integral lavatories. Fixture to be provided with chrome plated, temperature selecting and metering faucet, open grid drain, supplies with stops, and "P" trap.

- Basis of Design: SloanStone 2 or 3 station solid surface lavatory, Model #ELS-42000 series with combination Sloan Faucet and Electronic Soap Dispenser Model #ESD-28085.

D2010.04 Sinks

Ceramics: Commercial grade, 18 gauge, Type 302 stainless steel, counter-mounted, with gooseneck faucet and wrist blades.

- Basis of Design: Elkay Model LRAD 2521, 3 hole, 6"deep with Chicago Faucet Model 201-GN2A-E3-317. Provide plaster trap for each sink, Jay R. Smith Model 8710 or 8730.

2D/3D Art Classrooms: Commercial grade, 18 gauge, Type 302 stainless steel, counter-mounted, with gooseneck faucet and wrist blades.

- Basis of Design: Elkay Model LRAD 2521, 3 hole, 6"deep with Chicago Faucet Model 201-GN2A-E3-317. Provide plaster trap for each sink, Jay R. Smith Model 8710 or 8730.

Jewelry: Commercial grade, 18 gauge, Type 302 stainless steel, counter-mounted, with gooseneck faucet and wrist blades.

- Basis of Design: Elkay Model LRAD 2521, 3 hole, 6"deep with Chicago Faucet Model 201-GN2A-E3-317. Provide plaster trap for each sink, Jay R. Smith Model 8710 or 8730.

Photography: A photo processing sink will be provided (by others) and include a silver recovery system integral with the sink. Waste will be conveyed to the acid waste piping system:

- Basis of Design: To be determined.

Choral: Commercial grade, 18 gauge, Type 302 stainless steel, counter-mounted, with gooseneck faucet and wrist blades.

- Basis of Design: Elkay Model LRAD 2521, 3 hole, 6"deep with Chicago Faucet Model 201-GN2A-E3-317.

Band: Commercial grade, 18 gauge, Type 302 stainless steel, counter-mounted, with gooseneck faucet and wrist blades.

- Basis of Design: Elkay Model LRAD 2521, 3 hole, 6"deep with Chicago Faucet Model 201-GN2A-E3-317.

Child Lab Classroom: Commercial grade, 18 gauge, Type 302 stainless steel, double-bowl, counter-mounted, with gooseneck faucet, spray hose and wrist blades.

- Basis of Design: Elkay Model LWR-3322, 4 hole, Chicago Faucet Model 200-GN2A-E3-317.

Food Lab: Commercial grade, 18 gauge, Type 302 stainless steel, double-bowl, counter-mounted, with gooseneck faucet, spray hose and wrist blades.

- Basis of Design: Elkay Model LWR-3322, 4 hole, Chicago Faucet Model 200-GN2A-E3-317.

Teacher's Workroom: Commercial grade, 18 gauge, Type 302 stainless steel, counter-mounted, with gooseneck faucet and wrist blades.

- Basis of Design: Elkay Model LRAD 2521, 3 hole, 6"deep with Chicago Faucet Model 201-GN2A-E3-317.

Science Labs: Sinks within the science classrooms and prep rooms will be integral with the counter. Lab sinks and faucets will be furnished by the Casework Contractor and installed by the Plumbing Contractor.

- Basis of Design: Refer to Casework section.

D2010.05 Showers

Showers are to be constructed in-place and be equipped with pressure balanced, single handle mixers. Shower heads to be institutional grade, adjustable type, 1.8 gpm flow. Accessible showers will be equipped with a standard shower head and a shower head mounted on a wall slide bar, with flexible supply hose.

- Basis of Design: Symmons Model 96-1 (non-accessible) and Model C-96-500-B30-V -X(accessible).

D2010.06 Drinking Fountains/Coolers

Institutional grade, wall hung, stainless steel finish, self-contained electric water cooler type, dual height to satisfy Massachusetts Architectural Access Board (MAAB) requirements.

- Basis of Design: Halsey Taylor Model OVL-II SER-Q.

D2010.07 Mop sinks

Floor mounted, mop service basins, molded plastic composition, with stainless steel grid drain, chrome plated mixing faucet, bumper guards on basin rim, and stainless steel wall splash guard.

- Basis of Design: Fiat MSB-2424 with E-77 Bumper guards, MSG2424 stainless steel wall guards and 832-AA hose and hose bracket. Faucet to be Chicago #445CR 20089.

D2010.08 Emergency Plumbing Fixtures

Mechanical Rooms and Lab Waste Room: Emergency shower and eyewash units will be free-standing, stanchion type in mechanical areas and recessed type in Science classrooms.

- Basis of Design: Guardian G1902P

Science Rooms: Emergency shower and eyewash units to be recessed type.

- Basis of Design: Guardian GBF2160

Science Prep Rooms: Eyewash unit will be sink or countertop mounted swing-down type.

- Basis of Design: Guardian G1805 with point of use mixing valve

Jewelry: Eyewash unit will be sink or countertop mounted swing-down type.

- Basis of Design: Guardian G1805 with point of use mixing valve.

Nurse's Suite: Eyewash unit to be wall mounted, recessed pull down cabinet.

- Basis of Design: Guardian G1805 with point of use mixing valve.

D2010.09 Other Plumbing Fixtures

Exterior wall hydrants will be strategically placed around the building and mounted approximately 18 inches above grade. Units will be non-freeze type with integral vacuum breaker.

- Basis of Design: Jay R. Smith Model 5560QT recessed box

Interior hose bibbs, with loose key and integral vacuum breakers, shall be provided at all Toilet rooms (except single person type), Mechanical rooms, and rooms with floor drains.

- Basis of Design: Chicago #952-1/2CP for toilet rooms and Chicago #998-RCF for mechanical rooms.

D2020 Domestic Water Distribution

D2020.01 Cold Water

Cold water supply system will be extended 10'-0" outside the building and connected to the underground yard main system. Service entrance will be equipped with a strainer, backflow preventer and water meter that meets the requirements of the local water department.

Separate backflow preventers will be provided as needed for equipment and systems such as HVAC make-up, ice machines, dishwashers, and protected hot and cold water systems.

A main branch from the domestic cold water supply; provided with a reduced pressure backflow preventer provided in close proximity to the science rooms; will be used for protected cold water requirements for the lab sinks.

D2020.02 Hot Water

Domestic hot water will be provided by two ASME gas-fired condensing type water heaters in parallel. Each heater will be sized to provide 66% of the demand. Water will be delivered at 140 deg. F to the kitchen and 120 deg. F to all other fixtures throughout the school. Hand wash lavatories and showers will have integral temperature limit stops and/or point-of-use mixers to provide 110 deg. F. maximum temperature.

A main branch from the domestic hot water supply; provided with a reduced pressure backflow preventer provided in close proximity to the science rooms; will be used for protected hot water requirements for the lab sinks.

All domestic and protected hot water supply systems will be circulated using bronze circulating pumps controlled by immersion aquastats. The protected hot water circulation system will start downstream the backflow preventer and the temperature in the piping will be maintained by a local electric water heater.

Temperature maintenance cable for hot water will be provided on hot water supply piping shall be provided where needed as a supplement to or substitution for hot water recirculation to insure hot water delivery.

D2020.03 Piping Insulation

Insulation will be applied to cold water, hot water, hot water return, Insulation will be continuous through supports and include a vapor retarding jacket. Insulation for cold water piping 1" and smaller will be 1/2" thick. For cold water piping 1-1/4" and larger will be 1" thick. For hot water and hot water return piping, insulation shall be 1"thick. Insulation shields will be installed to protect insulation at all pipe hangers.

D2030 Sanitary Waste

D2030.01 Waste and Vent Piping

Piping will be designed to collect liquid wastes from all plumbing fixtures, equipment, and drains requiring waste connections. Horizontal collection of the vertical stacks will be primarily below the first floor slab, to minimize the potential for interference with work of other trades.

Several building drains will exit the building and connect by gravity to the site sanitary sewer system 10'-0" outside the building.

Kitchen waste will be piped separately by gravity to 10'-0"outside the building, to discharge into an exterior grease trap. Extension to exterior grease traps will be provided by the general contractor. A local grease interceptor shall provided inside the building to serve the triple pot sink.

D2030.02 Waste Piping Specialties

Floor drains will be cast iron body construction, heavy duty grade, PDI approved. Those for use in toilet rooms and other finished spaces shall be have rough bronze exposed finishes. Those for use in mechanical rooms and other unfinished spaces will be all cast iron.

Point-of -use grease traps will be provided to receive waste discharge at the kitchen triple pot sink. The grease trap will be floor recessed. The unit will be PDI and ASSE approved, supplied with a flush floor access plate where applicable, and equipped with automatic draw-off hose. All other kitchen waste will be conveyed to an exterior grease trap.

Indirect waste piping receiving cold liquid waste and subject to condensation will be provided with 1/2" thick insulation.

D2040 Storm Water Drainage/Optional Rainwater Harvesting System

The system will collect discharge of storm water from all roof drains. Where possible, the pipe routing will run directly from the roof drain locations, vertically down at building columns or chases and be collected below the first floor slab. Several building drains will extend by gravity to 10'-0" outside the building.

Rainwater harvesting system may be considered to flush the water closets and urinals in the building. If this option is selected by the owner, the building drain will be connected to the rainwater harvesting tank outside. The rainwater harvesting system will convey the collected storm water back into the building via a pump. The water will then be filtered, treated by ultraviolet light and dyed. This non-potable water will then be piped throughout the school to flush the water closets and urinals in the toilet rooms. During times of low rainwater run-off from the roof, the rainwater harvesting system will be supplemented with domestic water from the municipal system.

Roof drains will be cast iron construction, heavy duty, with flashing clamp for membrane roofing, under deck clamping device, and aluminum domes.

Insulation will be applied to all horizontal storm water piping and roof drain bodies to prevent condensation. Insulation will be 1/2" thick and be continuous through supports and include a vapor retarding jacket. Insulation shields will be installed to protect insulation at pipe hangers.

A secondary overflow roof drainage system will not be required.

D2050 Natural Gas System

The permanent natural gas service will be brought to the exterior of the building by the gas company and include a meter and primary pressure regulator as needed.

From the outlet of the meter/regulator set, natural gas piping will be extended throughout the building and serve all equipment requiring gas service. Gas pressure within the building will be low pressure, under 1/2 psig (14"wc).

The primary gas utilization equipment will be boilers, make-up air units, rooftop HVAC equipment, kitchen cooking appliances, science laboratory gas cocks, and central domestic water heating equipment.

Gas piping for each Science classroom will include an emergency master shut off valve in a wall-recessed box. Gas piping to cooking equipment will have an emergency gas shut-off valve that will automatically close upon operation of the kitchen exhaust hood fire suppression system.

D2060 Other Plumbing Systems

D2060.01 Lab Waste System

A lab waste and vent system will be installed to collect waste from all science classrooms and laboratories. The system will be centrally piped to a two-stage pH neutralization system.

The treatment system will consist of two 150 Gallon neutralization tanks in series, with mixers, acid and alkali tanks, automatic metering injection pumps, continuous pH monitoring and recording, local alarm, control panel and all control wiring. The pH neutralization system will be located in an interior, lighted and ventilated room with leak detection.

After treatment the discharge shall be piped independently to 10'-0" outside the building and connected to the site sanitary drainage system.

D2060.02 Protected Water Systems

Science classroom sinks will be supplied with isolated protected water systems to prevent contamination of the potable water systems. Protected cold, hot, and hot water recirculation systems will be provided and isolated from the domestic water systems by means of backflow preventers.

Insulation will be applied to protected cold water, protected hot water, protected hot water return piping. Insulation will be continuous through supports and include a vapor retarding jacket. Insulation for protected cold water 1" and smaller will be 1/2" thick. For protected cold water piping 1-1/4" and larger, insulation will be 1" thick. For all protected hot water and protected hot water return piping, insulation shall be 1" thick.

D2060.03 Tempered Water

A tempered water system will be fed from the domestic hot water system and created by installation of a fail-safe thermostatic mixing valve that will prevent hot water from being fed to emergency equipment. The mixing valve will be capable of delivering tempered water between 60 to 90 deg. F.

A central tempered water system will supply tepid water to emergency shower and eyewash units, where required. Emergency shower and eyewash units will be provided in science classrooms where chemical and/or gas services are accessible to students, in the lab waste neutralization room and in the boiler/maintenance areas where chemical treatment of systems is performed.

Tempered water will not be insulated or circulated. At the most remote end of the tempered water piping system, there will be an electric solenoid valve, operated by a time clock, that will periodically open to discharge water; so that fresh water will be introduced into the system.

There will not be floor drains at emergency equipment.

D2060.04 Trap Primers

Trap primer systems will provide make-up water to fixture and drain traps where necessary to maintain liquid trap seals. In general, trap primers will automatically operate based upon pressure fluctuation in the cold water system. Where multiple traps in one area require trap priming, an electric, time clock-operated automatic trap primer will be used.

Insulation will be applied to all trap primer piping above ground. Insulation will be continuous through supports and include a vapor retarding jacket. Insulation for trap primer piping will be 1/2" thick. Insulation shields will be installed to protect insulation at all pipe hangers.

D2060.05 Compressed Air

A central compressed air piping system will be provided for the Wood Shop. The system shall include tank mounted duplex air compressors with automatic alternating control panel, filters and refrigerated air dryer as needed.

D2090 Plumbing System Materials

D2090.01 Pipe and Fittings

Buried exterior water systems: Class 52 cement-lined ductile iron pipe with restrained mechanical joints.

Buried interior water system; Type K copper with brazed copper joints.

Above ground water piping: Type L with 95/5 soldered copper joints.

Buried storm, sanitary waste and vent: Cast iron bell and spigot with neoprene gasket joints

Above ground storm, sanitary waste and vent: No-hub cast iron with Mass. approved stainless steel clamps. 2" and smaller may be type DWV copper with soldered copper drainage pattern fittings.

Natural gas: 2" and smaller shall be Schedule 40 black steel with malleable iron threaded fittings. 2-1/2" and larger shall be Schedule 40 black steel with welded joints.

Lab waste and vent: Single-wall acid resistant drainage pattern polypropylene with mechanical joints within lab benches and heat fusion joints elsewhere. PVDF piping to be provided in ceilings designated as a plenum.

Compressed air piping will be Type L copper with brazed joints.

D2090.02 Valves

Water and Compressed Air: Shut off valves, 3" and smaller shall be full port ball valve, bronze body, chrome-plated bronze ball. Shut off larger than 3" shall be iron body, bronze mounted, inside screw, non-rising stem gate valve.

Balancing valves shall be approved circuit setters.

Water and Compressed Air: Check valves shall be bronze body, bronze swing disc.

Natural gas: 2" and smaller shall be Mass. approved threaded bronze ball valve. Larger than 2" shall be semi-steel, lubricated, wrench operated, plug valve.

D30 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

D3000 Design Basis

The school building will be provided with a hot water heating system for heating and ventilation of the proposed spaces through the use of perimeter radiation or through hot water coils in rooftop air handling units. Air conditioned spaces will largely be served from chilled water generated by a split-type air cooled chiller with piped distribution to the air handling units serving those spaces being air conditioned. Some of the proposed air conditioned spaces (e.g., the classrooms) will be partially air conditioned to temper the ventilation air.

The proposed equipment as shown in the accompanying drawings is as follows:

<u>Unit Designation</u>	<u>Size</u>	<u>Service</u>
Air Handling Units:		
AHU-1	79 Tons	North classroom pod
AHU-2	10 Tons	Auditorium stage
AHU-3	87 Tons	South classroom pod
AHU-4	8 Tons	Art Rooms
AHU-5	6 Tons	Chorus/Band
AHU-6	54 Tons	Auditorium
AHU-7	17 tons	Admin Area
AHU-8	38 Tons	Dining Area
AHU-9	23 Tons	Library
AHU-10	3 Tons	Computer Room
Heating and Ventilation Units:		
HV-1	6,000 CFM	South pod storage
HV-2	30,000 CFM	Gym
HV-3	14,000 CFM	Lockers, bathrooms
HV-4	6,000 CFM	Mechanical room
Make-up Air Unit:		
MAU-1	8,000 CFM	Kitchen
Boilers:		

B-1	3,000 MBH	Condensing boiler
B-2	3,000 MBH	Condensing boiler
B-3	3,000 MBH	Condensing boiler
Chillers:		
CH-1	350 Tons	Split air cooled chiller

D3000.01 Reference Standards

The Massachusetts State Building Code, Seventh Edition.
 International Mechanical Code (IMC), 2006.
 International Energy Conservation Code (IECC), 2006.
 NFPA 101 - Life Safety Code.
 Guide Books of The American Society of Heating, Refrigerating and Air Conditioning Engineers.

D3000.02 Outdoor Design Conditions

Summer: 87°F.D.B./74°F.W.B. (78°F.W.B. for chiller selection).
 Winter: 7°F.
 Source: The Massachusetts State Building Code, Seventh Edition.

D3000.03 Indoor Design Conditions

Summer Fully air-conditioned areas: 75°F dry bulb (db)/50% Relative Humidity.
 Partially air-conditioned areas: no absolute temperature control/60% RH
 Non-Cooled Spaces: 75°F db/no humidity control.
 Winter All spaces: 72°F db/no humidity control.

D3000.04 Outdoor Air Ventilation

Minimum outside air will be introduced as required by the greater of ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality," International Mechanical Code 2006, or the requirement to make up exhaust air.

D3010 Energy Supply

D3010.01 Gas Supply System

The boilers and kitchen rooftop make-up air unit shall be gas-fired. See Section D20 for details of natural gas service to the building.

D3010.02 Electric Supply Systems

All fans, pumps refrigerant system compressors and other HVAC systems will be electrically powered.

D3020 Heat Generation/Heat Generating Systems

D3020.01 Water Boiler Plant

The boiler plant will be comprised of gas-fired, condensing boilers sized for the full building heating load. Each boiler will have a constant-volume primary pump to directly serve its flow requirements as a primary loop configuration. The secondary loop will include three variable volume pumps (two as primary and one as standby) with VFDs to serve the building heating loads. The building loads will be controlled through the use of 2-way modulating valves for each terminal unit or heating coil. A modulating bypass valve will be located in the boiler room on the load-side of the pumps and sized to ensure minimum flow is maintained at low-load conditions, as defined by the minimum flow rate for a single pump.

The boilers as well as the gas-fired DHW heater will be direct-vent type and vented through the exterior of the building; assume separate flues for each condensing boiler.

Condensing Boilers: Provide three (3) 3,000 MBH input gas-fired condensing boilers with direct venting. Provide three (3) constant-volume, inline pumps, each 90 GPM and 25 ft. hd., each pump to be dedicated to a single boiler.

Secondary Pump Loop: Provide three base-mounted pumps, each with VFDs and each rated at 200 GPM and 80 ft. head (two as primary and one as standby). Provide a 3" modulating bypass valve to ensure minimum flow within the system at low-load conditions. New schedule-40 steel piping will provide distribution via the corridor ceilings throughout the school to terminal heating units. Equipment controls shall be provided separately through controls vendor, including valves and actuators.

Hydronic Specialties: Provide a 8" air separator, two medium-sized vertical expansion tanks (bladder type) and a makeup water connection.

D3020.02 Perimeter Heating

Perimeter heating will be provided by hot water by a combination of the following:

- Radiant ceiling panels - in classroom spaces
- Finned tube radiation (similar to Runtal) - in gym, cafeteria, library
- Recessed cabinet unit heaters (wall or ceiling type) - in vestibules, corridors and other common areas
- Unit heaters - in back-of-house and utility spaces

D3030 Refrigeration

D3030.01 Variable Speed Air-Cooled Chiller

A 350-Ton, variable speed, air-cooled chiller shall be provided to support the air conditioned spaces in the school. Distribution will be provided by three (3) 300 GPM, 80 ft. hd. (10 HP) primary-only pumps (two as primary, one as standby). There will be a 3" differential bypass control valve to maintain minimum flow to the chiller. Load temperature control will be provided through 2-way modulating valves through interface with the building management system (BMS).

New schedule-40 steel piping will provide distribution via the corridor ceilings throughout the school to terminal heating units. Controls to be provided separately through controls vendor, including valves and actuators.

Hydronic Specialties: Provide a 8" air separator piped in a side stream configuration, two medium-sized vertical expansion tanks (bladder type) and a makeup water connection.

D3030.02 Other Refrigeration Systems

Ductless split air conditioning systems will be complete with direct expansion cooling coil, supply fan, motors, and filter. Condensing units will be complete with compressors and condenser fans. The systems will be provided with equipment manufacturer's packaged controls including compressor anti-short cycle and low ambient start features. System operation will be monitored by the building management system through relay logic.

Provide ductless split air conditioners for each of the Tel/Data Closets. Allow for a quantity of three (3) 2-Ton units.

D3040 HVAC Distribution

D3040.01 Air Distribution System

Approximately 85% of the building will be air conditioned. The air conditioned spaces will be configured to be either fully air conditioned or partially air conditioned. The assignment of fully, partially or non-air-conditioned spaces is shown in the table below.

Space	Fully Air Conditioned	Partially Air Conditioned	Heating & Ventilation Only
Classrooms		X	
Large Group Instruction		X	
Art/Music		X	
Auditorium	X		
Media Center/Library	X		
Administration	X		
Media/TV Studio	X		
Custodial/Maintenance			X
Utility Spaces			X
Tel/Data Spaces	X		
Gymnasium			X
Locker Rooms			X
Weight & Dance Rooms			X
Cafeteria		X	
Kitchen			X

The fully and partially air conditioned spaces will be sized to maintain the respective design indoor temperatures listed in section D3000.03. The partially air conditioned spaces will be based on conditioning only the amount of air that is required for ventilation or to provide a minimum of four (4) air changes per hour. The fully air conditioned spaces will provide enough airflow to satisfy the full space conditioning requirements.

Rooftop air handling units will be of the following types according to the service and will be configured with sound attenuators to satisfy space acoustic requirements. Air delivery to the fully or partially conditioned spaces will be primarily through displacement ventilation, with supply air delivered at or near floor level through drops from the overhead distribution. Carbon dioxide sensors will be installed in all air conditioned systems in order to maintain acceptable levels of indoor air quality due to the varying occupancies.

- **Heating & Ventilation:** Heated and ventilated spaces will be served by rooftop air handling units incorporating a sensible energy recovery wheel, MERV 7 and MERV 13 air filters, heating coil, supply fan with VFD, and an exhaust fan with VFD. Air distribution to the spaces will be through overhead, medium-pressure, ducted distribution through two-position VAV terminal boxes to control occupied and unoccupied modes.
- **Full Air Conditioning:** Fully air conditioned spaces will be served by rooftop air handling units incorporating an enthalpy recovery wheel, MERV 7 and MERV 13 air filters, heating coil, chilled water coil, a supply fan with VFD, and an exhaust fan with VFD. Distribution will be through medium-pressure ductwork to VAV terminal boxes as overhead distribution to wall-mounted, floor-level diffusers to perform as displacement ventilation.
- **Partial Air Conditioning:** Partially air conditioned spaces will be served by rooftop air handling units incorporating an enthalpy recovery wheel, MERV 7 and MERV 13 air filters, heating coil, chilled water coil, sensible energy wheel, a supply fan with VFD, and a return or exhaust fan with VFD. Distribution will be through medium-pressure ductwork to VAV terminal boxes as overhead distribution to wall-mounted, floor-level diffusers to perform as displacement ventilation.

A make-up air unit will be provided to serve the requirements of the kitchen exhaust hoods. The MAU will be a rooftop unit with MERV 7 prefilters, a hot water coils and a centrifugal fan with duct-mounted temperature sensor for control.

Except as outlined below, the air distribution systems will be constructed of galvanized steel and constructed to the appropriate pressure class. Sound attenuators and/or sound lining will be provided as required to control system noise.

- Showers (as applicable): Welded aluminum; pitched towards grilles for drainage
- Dishwasher (as applicable): Welded aluminum; pitched towards appliance for drainage
- Kitchen Hood: Welded stainless or carbon steel; or double wall pre-fabricated duct system listed for the application
- Fume Hoods: Welded stainless steel

D3040.02 Special Exhaust Systems

Dedicated exhaust systems will be provided for the following spaces and equipment due to their significant heat rejection and/or contaminated air streams. Spark proof construction and dedicated makeup air will be provided as required.

- Kitchen Hood: grease exhaust fan
- Kiln Room: high-heat rated fan
- Electrical Closets: in-line or roof exhaust type
- Mechanical Room: in-line or roof exhaust type
- Garbage disposal areas: roof exhaust type
- Dishwasher: aluminum wheel
- Fume Hoods: packaged lab exhaust fan(s) with integral bypass damper
- Toilet Rooms: standard roof exhaust fan
- Shower Exhaust: aluminum wheel, roof exhaust type
- Acid Neutralization Room

D3060 HVAC Instrumentation and Controls

The facility will be provided with a microprocessor-based, direct digital control (DDC) building management system (BMS). The BMS will consist of equipment and building level controllers that communicate via a dedicated local area network

(LAN) to an operator workstation. Each controller will be capable of full, stand-alone operation and have integral permanent memory to maintain control and set points in case of network or power failure.

User interface with the BMS will be through a combination of a local operator workstation, portable operator workstations and WEB access. A dedicated phone line and modem(s) will be provided to allow for communication with the remote devices. All operator workstations will be provided with easy to use, color, graphics-based software for communicating with equipment controllers and between workstations. The Local Operator Workstation (a personal computer) will be located on site. One Portable Operator Workstation(s) (laptop personal computer) will be provided for communication in the field with individual equipment controllers to facilitate troubleshooting and maintenance.

All set points, hours of operation, maintenance alarms, critical alarms, trend logs and some sequences of operation and safeties will be user adjustable through the operator workstations. Most equipment will be provided with occupied and unoccupied modes of operation for energy savings.

The DDC system will provide scheduled start/stop control and monitor the operational status of equipment. It will also incorporate control algorithms to optimize the efficiency and performance of the school's HVAC systems.

All mechanical equipment provided with manufacturers control shall have open protocol capabilities so manufacturers control will seamlessly communicate with BMS. It is planned that the controls contractor will provide all proposed controls for the rooftop air handling units (no manufacturer-provided controls).

D3070 Systems Testing, Adjusting and Balancing

D3070.01 Piping Systems Testing, Adjusting and Balancing

The piping systems testing, adjusting and balancing will be performed by an Air Balancing Contractor certified by either Associated Air Balance Council (AABC), or National Environmental Balancing Bureau (NEBB).

D3070.02 Air Systems Testing, Adjusting and Balancing

The air systems testing, adjusting and balancing will be performed by an Air Balancing Contractor certified by either Associated Air Balance Council (AABC), or National Environmental Balancing Bureau (NEBB).

D40 FIRE-PROTECTION

D4000 General Design Considerations

D4000.01 Codes and Standards

Massachusetts State Building Code 780 CMR

Massachusetts Fire Prevention Code 527 CMR

NFPA codes and regulations

D4010 Wet-Pipe Sprinkler System

D4010.01 System Overview

The building will be protected throughout with an automatic combination wet standpipe/sprinkler system. The system will be hydraulically calculated to provide a water application rate of 0.10 GPM per square foot over the most remote 1500 square feet for light hazard areas, 0.15 GPM per square foot over the most remote 1500 square feet for ordinary hazard group 1 areas and 0.20 GPM per square foot over the most remote 1500 square feet for ordinary hazard group 2.

Light Hazard areas will include: Office areas, general classrooms, auditorium, computer labs, commons, library and cafeteria seating.

Ordinary Hazard Group 1 areas will include: Storage areas, gymnasium, kitchen, culinary, science rooms.

Ordinary Hazard Group 2 areas will include: Mechanical rooms and wood working.

Sprinklers will be recessed type, white sprinkler and white escutcheon, at hung ceiling areas and concealed with white cover plate at all gypsum ceilings

Mechanical rooms and other unfinished areas will be provided with exposed brass finish sprinklers. Sprinkler guards will be provided at the Gym and Mechanical and Storage rooms.

Areas of the building that will not be provided with wet sprinkler protection are:

- Areas above suspended ceilings
- Main Electric Switchgear Room
- Elevator shafts and pits
- Elevator machine rooms
- Emergency electrical closets

The sprinkler system will be separated into multiple zones per floor for the purposes of monitoring water flow. The inspector's test valves for each zone will be located in the stairwells above the entry door soffit with a vertical access panel for testing and maintenance. Test drain piping to discharge outside the building to an appropriate location.

Fire department valves will be provided at each side of the Stage/Auditorium area and at the entry vestibules to the auditorium.

D4020 Standpipes

A combination wet standpipe/sprinkler system will be provided for the 4 story building and shall comply with NFPA 14. A floor control valve assembly, including associated inspector's test valve and drain piped to outside, will be provided at each egress floor.

All standpipes shall be provided with the shut-off valves at the base of each standpipe risers.

Standpipes with 2-1/2" Fire Department valves and 1-1/2" reducers will be provided at each main floor landing of each stairwell. A roof manifold will be provided off the standpipe system.

D4030 Fire Protection Equipment

A minimum of two Fire Department pumper truck connections (FDC) will be provided around the building, one at the main lobby entrance and one at the fire protection water service entrance. The FDC's will be 4"x4" Storz type to match the requirements of the Grafton Fire Department.

A vertical double check valve assembly will be provided on the fire service, in the mechanical room. This device will be ASSE listed and Massachusetts Code approved.

A free standing post indicator valve will be provided outside the building, on the fire main. An alternate would be a wall type post indicator valve.

All shut-off valves will be UL listed and FM approved type, and be equipped with supervisory tamper switches. These switches along with the flow switches will be monitored by the building fire alarm system.

D4040 Fire Protection Specialties

D4040.01 Fire Extinguisher, Cabinets, and Accessories

Fire Extinguishers: Multi-purpose dry type, 20A-60BC.

Fire Extinguisher Cabinets: Fully-recessed cabinet; painted steel trim and door with full-glass panel, DSA glass. Baked enamel primer finish; field painted.

Fire extinguishers and cabinets will be provided by the general contractor and located to meet the requirements of NFPA 10.

D4040.02 Wet Chemical Fire Extinguishing Systems

Wet chemical fire extinguishing systems will be provided at kitchen exhaust hoods by the kitchen equipment contractor.

D4050 Materials

D4050.01 Pipe and Fittings

Sprinkler piping 2" and smaller to be Schedule 40, black steel with black cast iron screwed fittings.

Sprinkler piping 2-1/2" and larger to be Schedule 10 black steel pipe, roll grooved, with grooved end fittings.

D4050.02 Valves

Gate valves 2-1/2" and larger to be iron body, bronze mounted, taper wedge, outside screw and yoke, rising stem and flanged ends. Indicating valves to be butterfly type, bronze type with grooved ends.

D50 ELECTRICAL

D5001 Reference Standards

Massachusetts Electrical Code, 527 CMR, 2008 edition.

Life Safety Code NFPA 101

National Fire Alarm Code, NFPA-72 2007

Massachusetts Building Code, 780 CMR.

International Energy Conservation Code(IECC), 2006

D5010 Electrical Service and Distribution

D5010.01 Overview

New electrical service will originate from the existing National grid medium voltage overhead primary line on Providence Road, rising existing utility pole 140, and going underground to serve new building.

The service electrical transformer will be furnished, installed, owned and maintained by National Grid, and will be located adjacent to the building in close proximity to the building main electric room. The recommended distance from the transformer to the building is at least 10 ft. The transformer will be of the pad-mounted type with a primary voltage of 13.8 kV and a secondary voltage of 480Y/277 volts. The transformer will be sized by the utility company based on the load data provided by Symmes, Maini & McKee Associates.

Concrete pad and grounding grid for the pad-mounted transformer is provided by the Contractor per the National Grid standard.

Two 4 in. PVC conduits for the primary feeder installation from the existing pole 140 at Providence Road to the pad-mounted transformer will be provided by the Contractor. The conduits will be installed in the concrete encased duct bank. Pre-cast concrete manholes, 6ft. by 8ft., will be provided by the Contractor to facilitate the primary cables field installation.

Utility company will provide primary feeder cables from the existing utility pole via manhole(s) to the pad-mounted transformer, including terminations on the both ends.

Transformer secondary feeder of the copper conductors will be installed underground in the duct bank of (8) 4" PVC conduits from the pad-mounted transformer to the main electrical switchboard located in the electrical room. The secondary feeder and terminations at the switchboard side will be performed by the Contractor, and terminated at the transformer side by National Grid.

The new service will be metered at the primary voltage by National Grid.

D5010.02 Building Electrical Design Load

Electrical load is based on the estimated preliminary design data for the new Grafton High School building:

Site Lighting:	20 kVA
Field Lighting	20 kVA
Irrigation Well	5 kVA
Chiller plant with Pumps	500 kVA
Boilers with Pumps	35 kVA
Ventilation, A/C Split Systems, Heat Pumps, Exhaust and Air Handling Unit Motors	250 kVA
Interior Lighting Load	185 kVA
Computer and Small Power	370 kVA
Kitchen (full service)	80 kVA
Miscellaneous Power	70 kVA
Elevators (2)	70 kVA
Auditorium Lighting	70 kVA
Total Connected Load	1,675 kVA

Total connected load is 1,595kVA or 2,016 Amps at 277/480 volt 3 phase 4 wire system.

D5010.03 Main Electrical Switchboard

The main electrical switchboard will be fully metal enclosed, dead front, standard NEMA.1 indoor type construction. Switchboard will be front-connected, front-accessible, with fixed individually mounted main device, and panel mounted feeder devices. Switchboard sections will be rear aligned, designed for placement against a wall

The switchboard will be rated 2,500 Amperes at 480Y/277 volts, three phase, four wire.

Main protective device will be a power circuit breaker 100% rated, with a solid state trip unit capable of adjusting long time, short time, and ground fault protection characteristics. In general, feeder protective devices will be thermal-magnetic type molded case circuit breakers, but electronic type circuit breakers will be furnished for the devices 250 Amp and larger.

The switchboard will be furnished with a service entrance transient voltage surge suppression (TVSS) device rated for service entrance and digital metering unit to monitor voltage, current, power factor and demand kW.

If required, Utility metering compartment will be provided on the load side of the main protective device.

Main switchboard's short circuit rating shall be coordinated with National Grid, but estimated to be at 65 KAIC.

D5010.04 Interior Electrical Power Distribution

Building electrical power riser diagram is shown on the drawing E5.01

Electrical power distribution equipment will be installed in the main electrical room and in the electrical closets. Refer to the architectural floor plan for the main electrical room and closets location.

Electrical power distribution equipment in each electrical room or closet will support lighting, power, and HVAC loads in the associated areas.

A typical closet will house a 225 Amp 277/480 volt power panel as a power source for interior lighting and HVAC equipment (such as fan coil units, etc.) circuits, dry-type transformer sized from 45 to 75kVA and two 150 Amp or 250 Amp, 120/208 volt, 3 phase receptacle panelboards.

Roof-mounted HVAC equipment such as air handling units, energy recovery air handling units, make-up air units and exhaust fans will be power fed from the power panels of either normal or emergency (standby) power systems. The power panels will be located in the upper floor electrical closets.

Building DDC system panel, kitchen walk-in refrigerator/freezers, security and communication system, technology room cooling system, and boiler plant equipment including boilers with primary and secondary pumps will be power fed from the emergency (standby) power panel located in the mechanical room.

The building elevator controller will be power fed from the emergency (standby) power panel located in the mechanical room.

A dry-type 75 kVA transformer and 250 Amp, 120/208 volt, 3 phase panels will be provided for the Cafeteria and Kitchen loads.

The dedicated transformer and panel will be also provided for the Auditorium lighting dimming system.

Proposed manufacturers for the electrical power distribution equipment are: General Electric, Square D, Cutler-Hammer and Siemens.

D5010.05 Interior Electrical Dry-type Transformers

Interior electrical dry-type transformers will be provided to reduce 480 volt, three phase interior distribution voltage to 208Y/120 volts for small equipment power requirements, classroom power and convenience outlets. Transformers shall be of a general purpose dry type, air cooled, with indoor ventilated steel enclosure, energy efficient and shall comply with NEMA Standards ST 20 and TP-1. Where required to accommodate computer equipment and other non-linear type loads, the transformers shall be K-13 factor rated with an electrostatic shielding.

D5010.06 Electrical Branch Circuit Panelboards

Electrical branch circuit panelboards will be dead-front type with thermal-magnetic molded case circuit breakers. Panelboards will be provided with tin-plated phase and neutral busses and copper equipment ground bus.

Panelboards will be rated 480Y/277 volts, three phase, four wire for power and lighting loads and 208Y/120 volts, three phase, four wire for small power and convenience outlets.

Neutral bus, 200% rated, and TVSS device will be specified for the 120/208 volt panelboards serving sensitive electronic equipment (computers, Equipment and Telecommunication Rooms, etc.) and where substantial non-linear type loads are present. These panels will be fed by k-factor rated transformers.

All panelboards will be Underwriters Laboratories (UL) listed and labeled, and comply with NEMA standard PB1 for the panelboards. All 208Y/120 volts panelboards with sensitive equipment loads will have built-in TVSS protection.

D5010.07 Enclosed Safety Switches

Individual heavy-duty type switches in NEMA 1 for indoor and NEMA 3R for outdoor applications will be provided where equipment disconnecting means are required in accordance with Massachusetts Electrical Code.

D5010.08 Motor Controls

Individually enclosed combination motor starter/disconnect switches will be provided for the control and overload protection of the three-phase motors unless the starters are furnished as integral part of the packaged equipment. Motor starters will be magnetic type and have overload relays in each phase for three phase motors, hand-off-automatic selector switch, and control power transformer. Motor starters will comply with ANSI and NEMA standards.

D5010.09 Electrical Branch Wiring

In general, wiring will be insulated conductors installed in steel conduit or metallic tubing run concealed in the finished areas or exposed in the unfinished areas such as a storage, gymnasium, mechanical and electrical rooms. Minimum conduit size will be 1/2 inch.

Metal clad MC type cable may be used for branch circuit wiring in the above suspended ceiling spaces and in the dry wall partitions where it is allowed by Massachusetts Electrical Code.

All conductors will be copper, type XHHW or THHN/THWN rated 600 volt and for 75 degree C insulation level. Minimum wire size for power and lighting circuits shall be # 12 AWG. Conductors # 8 AWG and larger shall be stranded. Control wiring conductors shall be # 14 AWG.

Multi-phase 120 volt branch circuits will be provided with a dedicated neutral conductor for each phase conductor.

Underground conduits and conduits installed under a concrete slab will be PVC Schedule 40. Conduits exposed to weather, and penetrating foundation and concrete slabs will be galvanized rigid steel.

D5010.10 Wiring Devices

Duplex receptacles will be heavy duty, specification grade, grounding type, rated 20 Amp at 120 volt, UL listed. Duplex receptacles will be GFI and WR types where required by the Code.

Toggle switches will be 20 Amp at 120/277 volt, specification grade, UL listed.

D5020 Lighting

D5020.01 Interior Lighting

Complete interior lighting system with the illumination levels per IES recommended value for applicable activity type and in compliance with the IECC energy allowances and control requirements.

ILLUMINATION LEVELS

Location	Average Illumination Level
Common areas	35-40 FC
Offices, conference rooms, Library:	40-50 FC
Classrooms/Labs	45-50 FC
Utility and Storage rooms	20 FC
Corridors/Toilets/ Stairways	20 FC
Cafeteria	30-40 FC

In general, interior lighting fixtures will utilize fluorescent low-mercury, energy-efficient T5, T5HO or Super T8 lamps, compact fluorescent lamps and the electronic ballasts. The ballasts shall be .95 power factor or higher, sound rating Class A, and input harmonic distortion of 20% or less. All fluorescent lamps should contain low mercury level.

Classroom Lighting: Direct/Indirect pendant mounted fluorescent fixtures. Ambient light sensors will be also provided to control the light fixtures located along the exterior windows. Integrated Classroom Lighting System will give teachers the ability to switch between different lighting modes (general mode and audio/visual mode) in order to achieve appropriate lighting for different work task.

Lighting in the administration areas, corridors, staff and nurse's offices, teacher support areas, culinary arts labs, photography lab and in the similar areas will be fluorescent recessed 2ft. by 2 ft. and 2ft. by 4ft. of the direct/indirect type.

Lighting in the kitchen, locker rooms, preparation rooms, storage rooms, and in the similar areas will be fluorescent recessed 2ft. by 2 ft. and 2ft. by 4ft. with prismatic lens.

Multi-level lighting control will be an energy-efficient and cost-effective method to provide multiple illumination levels as required for the different working tasks and time of the day. Local switches and occupancy sensors will be provided for lighting control in the private offices and conference rooms

Ambient light sensors will be installed in the areas where daylight harvesting is available. These sensors in conjunction with the fluorescent dimming type ballasts will result in the substantial energy savings.

Low-voltage programmable lighting control system will be furnished to facilitate automatic lighting shutoff on a scheduled basis with an occupant override in compliance with the Energy Code.

Exit signs and egress lighting will be connected to the emergency power distribution system to provide illumination level required by the Code for emergency egress in a case of normal power failure.

D5020.02 Exterior Building and Site Lighting

Exterior building lighting will be provided at the building exits to comply with the Massachusetts Building Code.

Walkway and parking lot lighting fixtures will be pole mounted, with energy-saving LED lamps. Minimum maintained lighting level will be .5 FC at grade. The light standards will be capable to withstand a maximum wind load of 100 mph. Cast aluminum fixtures with glass lens. Prewired, 4" diam. Seamless cast aluminum pole, 20' height.

Atheletic lighting will be cast aluminum fixture with clear glass lens. 120 Light Emitting Diodes=175-watts. Prewired for 277 volts. 5" dia. seamless tapered steel pole, 25' height with anchor bolts

All exterior fixtures will be vandal resistant, enclosed, listed for wet locations and with full cut-off light distribution, with 0% lamp lumens above 90 degree plane.

Exterior building and parking lot lighting will be photocell and/or time switch controlled.

Lighting system will comply with energy use limitations of Massachusetts Building Code.

D5030 Communication and Security

D5030.01 Fire Alarm System

Addressable, non-coded, Class A supervised type fire detection and alarm system will be provided to meet the requirements of the Massachusetts Building Code, NFPA-72, Americans with Disabilities Act (ADA) and local fire department requirements. Fire alarm system will consist of a fire alarm control panel, remote annunciator, automatic smoke and heat detectors, manual pull stations, audible and visible alarm signals, connections to automatic fire suppression systems and a city master box for transmitting alarm signals to the local fire department.

FACP will provide an alarm and annunciation capability in case of activation of any manual fire alarm station, smoke detector, heat detector, duct smoke detector, sprinkler water flow switch or fire suppression system. The fire alarm control panel will be located in an area, as required, by the Fire Department.

Audible horns and visual high intensity strobes alarm devices will be installed per NFPA-72. In addition audible/visual alarm devices will be provided in all classrooms. A voice evacuation system is not required by the local Fire Department in any space in the building(this direction should be confirmed).

System type smoke detectors will be installed in the main electrical room, electrical closets, data/telephone rooms, school corridors, elevator machine room, elevator lobbies and at the top of the stairways. Addressable type duct smoke detectors will be installed in supply and return air ducts as required by NFPA-90A.

The system will be as manufactured by Siemens, Notifier or approved equal.

D5030.02 Security Access and Surveillance

A hard wired building security system will be provided to protect the building from unauthorized entry. This security system will consist of a main control panel, intrusion detection sensors, building access control using proximity readers, video intercom devices and CCTV surveillance. The security system design will include all power and routing devices necessary to the support the system.

The intrusion detection system will consist of door contact switches and dual technology motion detectors. When an intrusion event is detected, the system will programmed to transmit an alarm signal to the main office during school hours and to the local police department (or security company)during off-hours. System coverage will include motion detection in all first floor rooms with exterior windows or doors, in the first floor corridors, in rooms on upper levels that may be accessed from low roofs or adjacent building structures and in the rooms with high value equipment (i.e. computer labs) or where sensitive documents may be stored. Door contacts will be provided on all exterior doors to detect unauthorized entry or exit. The intrusion detection system will interface with the fire alarm system.

Access control will be managed using proximity card readers installed at main entries and at specified locations where high value equipment or sensitive documents may be stored. In addition video intercom devices will be provided at the main entries, equipped with electrified lock control to allow remote the door release from a desk mounted console.

Exterior mounted CCTV cameras will be provided at the entry to the parking lot including up to three wide angle views of the parking lots, areas where students will congregate (i.e. bus drop-off, garden area) and overlooking the dumpster area. Interior CCTV cameras will be located in corridors and as designated pending further discussions with the Owner. Video surveillance footage will be recorded to a network video recorder (NVR) and be visible over the network to selected individuals who have been granted access and a password code. The local Police may also be given password access to live and recorded surveillance content over the wide area network.

D5030.03 Voice and Data Systems

The School will be equipped with a voice and data distribution system providing connectivity from the work area voice/data outlets to the nearest patch panel in the Equipment Room (ER) or Telecommunications Room (TR). A fiber optic data and multi-pair copper voice backbone will provide connectivity from the each TR to the ER. All wiring, outlets and terminations will be installed to comply with EIA/TIA 568 standards. The ER and TRs will be strategically located so as not to exceed the maximum 300 ft. length of the horizontal distribution cabling to the workstation outlets. These rooms will be designed to provide efficient cable runs, easy access and flexibility for future growth. Power, lighting and mechanical systems will be specified in the MDF and IDFs to provide and maintain adequate ambient conditions for immediate and future users and systems.

The system design shall include specification of recommended support equipment, jacks, faceplates, installation methods and wiring requirements.

The voice and data distribution system shall consist of structured, Category 6, unshielded twisted pair (UTP) cabling systems and outlets for local area network (LAN) and voice communications. Outlets will be provided in the offices, classrooms, workrooms, library, computer labs, cafeteria, gymnasium, and utility rooms. The typical LAN/Voice outlet quantities in various spaces will be approximately:

- Classroom - Eight LAN outlets and one voice outlet.
- Computer - Thirty LAN outlets and one voice outlet.
- Science Lab - Sixteen LAN and one voice outlet.
- Office - Two LAN and one voice outlet.

An infrastructure to support wireless data network access will be provided.

Refer to section G4030.01 for a description of outside plant communications cable distribution plans.

D5030.04 Public Address and Program System

The School will be equipped with a public address, music and intercommunication system consisting of an main console, microphones, amplifiers, AM/FM tuner, CD player, speakers, wiring, telephone paging adapter, clock/program system interface, room call switches, and classroom telephone handsets. The system shall allow broadcasting of program tone signals for classroom changes, radio and CD deck program material, and microphone originated announcements to all areas throughout the building by individual area or on an all-call basis. Private two way communications can be

established between any classroom and the office, utilizing individual classroom telephone handsets. All electronic equipment will comply with applicable Electronics Industries Association (EIA) Standards.

A clock and program system will be generate and distribute time and time correction signals, and will initiating audible program signals. System will consist of a master control unit and indicating clocks. The master control unit will transmit time and time correction signals to clocks throughout the building and generate program tone signals for broadcasting over loudspeakers on the public address system.

D5030.05 Cable Television System

Each educational space or group space will be cabled for video system connectivity. The video system is to be bi-directional and will support the distribution of cable TV programming. System will consist of a head end rack mounted equipment, outlets, splitters, trunk and branch cabling. All wiring, outlets and terminations will be installed to comply with local CATV company standards.

A TV production studio will be provided that will support multi-camera recording, audio recording, video switching and editing. Selected locations, including the cafeteria, gymnasium and auditorium, will be equipped to transmit audio and video signals to the TV studio for multi-camera productions.

The cable television system head end will be connected to TV studio to allow programming to be distributed throughout the school and on to the community access channel. Remote connection for multiple cameras, audio and intercom from the TV studio to the auditorium, gymnasium and library will be provided.

Select public sites including Cafeteria, Media Center, Administrative Conference Room, Main lobby and primary circulation areas will be wired for flat screen television monitors. The television monitors will be furnished and installed under the Technology contract.

D5030.06 Audio Visual Systems

Local sound systems will be provided for the Auditorium, Gymnasium, Large Group Instruction Room, Band Room, Chorus Room, Ensemble Room, Fitness Center, Dance Room and Cafeteria. Systems will provide high quality sound reproduction for use during meetings, lectures, theatrical productions and public functions. In addition, high quality audio recording capabilities will be provided in Auditorium and TV studio. A professional grade audio recording system will be provided in the ensemble room.

The auditorium, cafeteria, gymnasium, fitness center, wrestling, dance room, performing arts studios and all academic classrooms will be wired for LCD projectors. Projectors will be furnished under the Technology contract; and will be sized to accommodate the conditions of each location.

All classrooms will be prepared for smart boards by installation of conduit. Smart boards, including installation and wiring, will be provided under the Technology contract.

D5090 Other Electrical Systems

D5090.01 Packaged Engine Generator System

A packaged engine-generator system will be provided to supply power to building life safety and standby loads upon loss of the normal electric utility power source. The generator unit shall start automatically on loss of normal power and transfer to the emergency power system within 10 seconds.

Generator-set power loads:

- Life-safety emergency power loads
 - 1) Emergency exit and egress lighting (interior and exterior)
 - 2) Fire alarm system
 - 3) Fire pump (if any)

- Standby power loads
 - 1) Heating system boilers with associated pumps
 - 2) Boiler control panel and DDC panels
 - 3) Kitchen walk-in refrigerator/freezer
 - 4) Elevators controller
 - 5) Nurse/medical areas lighting and power
 - 6) Security system equipment
 - 7) Communication systems (telephone and public address systems)
 - 8) Technology Rooms cooling system

The generator power system design will include:

- Outdoor soundproof type diesel-generator set 350 kW (estimated, exact size will be determined at subsequent design phase) with a skid-based fuel tank for at least 24 hours of the generator operation without re-fueling. Fuel tank shall be of double-wall construction and shall be furnished with leak detection system.

- Two automatic transfer switches (ATS) and the associated power distribution panels

- Lighting panels, dry-type transformers and branch panelboards to serve the emergency life safety loads. Emergency (life safety) power distribution equipment including ATS, panelboards and feeders shall be installed in 2-hour fire-rated closets and shafts in compliance with the requirements of the Massachusetts Electrical Code.

- Power panels, dry-type transformers and branch panelboards to serve the standby loads.

D5090.02 Grounding

All exposed, non-current carrying metallic parts of electrical equipment, the raceway system, and the neutral conductor of the wiring system will be grounded in accordance with the Electrical Code.

A ground bus will be provided in the main electrical room. It shall terminate electric service grounding conductor to the main switchboard ground bus, grounding electrode conductors to the water service pipe and building structural steel, and a conductor to the ground bus in the communication closet.

Separate copper equipment grounding conductor will be installed with all feeder and branch circuits.

Grounding cable connections to structural steel, grounding rods and other grounding cables will be of the thermal fusion type. Grounding rods will be copper clad steel, 5/8-inch diameter.
