9 NARRATIVE BUILDING SYSTEMS DESCRIPTIONS


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Florence Roche Elementary School - MSBA Module 4 Schematic Design - Sustainability Narrative

The Groton-Dunstable Regional School District and the design team identified sustainability as an important goal for the project early-on in the process and have developed the design with sustainability best practices in mind. The project is following Advisory 61, dated November 2019 and intends to pursue a minimum LEED for Schools v4 'Certified' level of certification for MSBA compliance and will be designed to exceed the energy code baseline by 20% as required to qualify for the 2 additional reimbursement points through the MSBA Sustainable Building Design Green Schools Policy.

Making sustainable choices for the built environment requires the intense collaboration of all design disciplines in an integrated process –not only with the architect, but also involve the client, consultants and needs of the end users, the students and teachers. To that end the team conducted an initial workshop to help expand on these goals and to outline tasks and responsibilities going forward.

The goals for a sustainable project include designing a low impact site and energy-efficient building that serves as an educational tool for staff, students and visitors. Daylighting and acoustics will be key design elements to improve the interior environmental quality. Sustainable features will be further reviewed as the design develops. To the extent possible, the design team will seek to select building materials and furniture that are low-emitting and have a reduced environmental impact. Per MSBA requirements, the building systems, including the envelope and HVAC systems will be commissioned to ensure they operate efficiently and as designed.

The project must achieve a minimum of 40-49 points to be LEED for Schools 'Certified'. Currently, the project is tracking 50 points as 'Yes' and another 38 identified as 'Maybe'. See below for a summary of the credits being targeted as 'Yes'. Note that the USGBC recently released the beta version of the LEEDv4.1 rating system which is intended to serve as an update to (and improvement upon) LEEDv4. Recent guidance issued by the USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. Credits this project intends to pursue using the LEED v4.1 criterion have been denoted with (v4.1) adjacent to the credit name below.

Location & Transportation

- LTc4 Surrounding Density & Diverse Uses: Project is located within ½ mile walking distance of 9 diverse uses.
- LTc7 Reduced Parking Footprint (v4.1): The proposed parking plan results in a 44% reduction compared to the calculated ITE base ratio.
- LTc8 Electric Vehicles (v4.1): Electric-vehicle charging will be provided for 2% of the total parking capacity of the project.

Sustainable Sites

- SSc1 Site Assessment: Early analysis was completed to assess the impacts of the site topography, hydrology, climate, vegetation, soils, human use, and potential human health effects.
- SSc4 Rainwater Management (v4.1): The project will be able to treat and manage 80th percentile storm events on-site using low-impact development and green infrastructure.
- SSc6 Light Pollution Reduction: Exterior lighting meets the backlight, uplight, and glare requirements of Lighting Zone 2.
- SSc8 Joint Use of Facilities: The project will include spaces that are designated for joint-use.

Water Efficiency

- WEc1 Outdoor Water Use Reduction: The project's landscape water requirement will be reduced by at least 50% from the calculated baseline for the site's peak watering month.
- WEc2 Indoor Water Use Reduction: Potable water use will be reduced by at least 25% compared to the baseline for indoor plumbing fixtures.
- WEc4 Water Metering: Submeters will be provided for indoor plumbing fixtures, domestic hot water, and process water.

Energy & Atmosphere

- EAc1 Enhanced Commissioning: As required by the MSBA, a third-party commissioning agent will be brought on board to perform enhanced commissioning activities for the building systems and envelope.
- EAc2 Optimize Energy Performance: The design case has a proposed EUI of 33.9 kBtu/sf/yr and demonstrates a 36% reduction in GHG emissions and source energy compared to the ASHRAE 90.1-2010 LEEDv4 baseline.

Materials & Resources

- MRc1 Building Life-Cycle Impact Reduction (v4.1): A life cycle analysis is being performed for the building's structure and enclosure to determine the impact that the specified materials have on the following categories: global warming potential, depletion of stratospheric ozone layer, acidification of land water and water sources, eutrophication, formation of tropospheric ozone, and depletion of nonrenewable energy resources.
- MRc2 Building Product Disclosure & Optimization – EPDs (v4.1): The project manual will be developed to include language for environmental product declarations for at least 20 different, permanently installed products.
- MRc2 Building Product Disclosure & Optimization – Material Ingredients (v4.1): The project manual will be developed to include language for healthy materials with disclosure documentation in the form of health product declarations, Declare Labels, Cradle-to-Cradle Certification, or Product Lens certification for at least 20 different, permanently installed products.
- MRc5 Construction and Demolition Waste Management (v4.1): Project will divert at least 75% of the total construction and demolition material using at least 3 different waste streams.

Indoor Environmental Quality

- EQc1 Enhanced IAQ Strategies: MERV 13+ filtration media will be installed for all units delivering supply air. Cross-contamination measures (i.e. negative pressure, automatic door closers, etc.) will be provided for all hazardous chemical storage areas. Walk-off mats will be provided at all regularly used entrances. All densely occupied spaces will be provided with CO2 monitoring.
- EQc2 Low-Emitting Materials (v4.1): The project manual will be developed to include language for low-emitting materials for project finishes such as adhesives & sealants, paints & coatings, flooring, ceilings, insulation, and composite wood.
- EQc3.1 Construction IAQ Management Plan: The project will require the contractor to develop and implement an IAQ management plan that requires compliance with all applicable control measures of the SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3.
- EQc5 Thermal Comfort: The project will meet the thermal comfort criteria established by ASHRAE 55-2010 for applicable spaces. At least 50% of individual occupant spaces and all multi-occupant spaces will be equipped with thermal controls.
- EQc6 Interior Lighting: At least 90% of individual occupant spaces and all multi-occupant spaces will be equipped with lighting controls.
- EQc8 Quality Views: At least 75% of the regularly occupied floor area will have access to quality views.

Innovation

- INc1.1 Purchasing Lamps: The lighting design is 100% LED.
- INc1.2 Economic and GHG Analysis of Mechanical Systems: A life cycle cost analysis and GHG-impact analysis has been performed for different mechanical system options being considered by the project design team.
- INc1.3 Integrative Analysis of Building Materials: The project will use at least 3 different permanently installed products that have a documented qualitative analysis of the potential health, safety and environmental impacts of the product in five stages of the product's life cycle (product assembly/manufacturing, building product installation, product use product maintenance, end of product life/reuse).

- INc2 LEED Accredited Professional: Multiple principal project participants are LEED Accredited Professionals.

The team will continue to evaluate design options against LEED requirements with the goal to design and construct a building which minimizes its impact on the environment, creates an engaging and healthy space for occupants and reduces operating costs. While the project seeks to achieve certification under LEED for Schools v4, our approach is not one of "point chasing" to maximize a LEED score. Rather, we will use LEED as a validation tool to check our performance, but in general will not base design decisions strictly on achieving LEED certification.

Refer to the attached LEED-S v4 scorecard that represents the preliminary assessment against the LEED for Schools v4 requirements. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of the project. Once the project is approved to proceed into Design Development, the LEED project will be registered with the USGBC, locking in the project under the current LEED for Schools version 4 rating system.

MODULE 4: SCHEMATIC DESIGN REPORT

STRUCTURE

NEW CONSTRUCTION

Structural: Designed in accordance with the 9th Edition of The Massachusetts State Building Code and incorporating IBC 2015 with Massachusetts amendments.

The proposed scheme will consist of construction of a new, two story structure behind the existing school Site with the following dimensions: 111,656 GSF Total.

SUBSTRUCTURE

Foundations

Based on the recommendations of the Geotechnical Engineer, the columns of the proposed structure would bear on reinforced concrete spread footings and the perimeter foundation walls would bear on continuous reinforced concrete strip footings extending at least 4 ft. – 0 in. below grade. With the recommended bearing capacity of the soil of 2 tons/sf, a typical interior footing would be 9 ft. – 0 in. x 9 ft. - 0 in. x 24 in. deep and the typical exterior footings would be 8 ft. – 0 in. x 8 ft. – 0 in. x 24 in. deep in the two story areas. In the single story areas, typical interior footings would be 7 ft. – 0 in. x 7 ft. – in. x 24 in. deep and typical exterior footings would be 6 ft. – 0 in. x 6 ft. - 0 in. x 24 in. deep. Typical interior and exterior footings at the Cafeteria and Gymnasium would be 8 ft. – 0 in. x 8 ft. – 0 in. x 24 in. deep. The exterior foundation walls would be 14 to 16 in. thick, reinforced cast-in-place concrete walls on 24 to 36 in. wide continuous reinforced concrete strip footings around the perimeter of the building extending a minimum of 4 ft. – 0 in. below finished grade.

Slabs-on-Grade

Based on the existing school construction, the lowest level of the proposed structure would be a 5 in. thick concrete slab-on-grade reinforced with welded wire fabric over a vapor barrier on 2 in. thick rigid insulation on 12 in. of compacted granular structural fill over natural sand.

SUPERSTRUCTURE

Floor Construction

Typical Floor Construction
A 4 ½ in. normal weight concrete composite metal deck slab reinforced with welded wire fabric on wide flange steel beams spanning between steel girders and columns. The weight of the structural steel is estimated to be 14 psf for the typical framing.

Roof Construction

Typical Roof Construction

The roof construction would be galvanized, corrugated 3 in. deep, Type 'N' metal roof deck spanning between wide flange steel beams and girders. The roof deck at the Lobby and the Connector would be acoustic, galvanized, corrugated 3 in deep, Type "NA". At locations of roof supported mechanical equipment, a concrete slab will be provided similar to the typical supported slab. The roof structure will be designed as a PV Ready roof to receive roof mounted photovoltaic panels in the future. The weight of the structural steel is estimated to be 14 psf.

Gymnasium and Cafeteria Roof Framing

The roof construction would be acoustic, galvanized, corrugated 3 in. deep, Type 'NA" metal roof deck at the Gymnasium and the Cafeteria, spanning between long span steel joists. The roof structure will be designed as a PV Ready roof to receive roof mounted photovoltaic panels in the future. The weight of the steel joists and structural steel framing is estimated to be 13 psf.

Canopy Framing

The roof construction would be similar to typical roof construction. The canopy framing members will be detailed to minimize thermal bridging between the canopy framing members and the building structure. The weight of steel is estimated to be 18 psf.

Roof Screens

The roof screens will be supported by HSS steel frames. The framing will be isolated from the main roof framing members by thermally insulated material to reduce thermal bridging between the roof framing steel and the roof screen steel. The weight of steel is estimated to be 8 psf.

Vertical Framing Elements

Columns

Columns will be hollow structural steel columns. Typical columns would be HSS 8 x 8 columns and the columns at the double height spaces would be HSS 12 x 12.

Lateral Load-Resisting System

The typical lateral load resisting system for the school would be ordinary concentric braced frames (as defined in the International Building Code) comprised of HSS structural steel members.

Expansion Joints

The school will be divided in to three parts separated by way of two expansion joints separating the two Academic wings from the core spaces of the school.

Fire Walls

Firewalls shall be reinforced concrete masonry walls braced to the adjacent building structure on both sides of the wall with break-away pre-release connectors.

9.3 Plumbing & HVAC

The following Plumbing and HVAC Narratives are provided by RW Sullivan.

A Life Cycle Cost Analysis is available in Appendix 21/9.3 – Life Cycle Cost Analysis.

III. D20 PLUMBING SYSTEMS

A. D2000 - Codes and Standards:

1. 780 CMR – Massachusetts State Building Code, 9th Edition
2. 248 CMR - Massachusetts State Plumbing Code
3. Massachusetts Fuel Gas Code
4. National Fire Protection Association (NFPA)
5. All state and local zoning and building laws and regulations.
6. All applicable local codes, amendments and ordinances.
7. Applicability of Standards: United States of America National Construction Industry standards will be used as a minimum except where more stringent requirements are included in the Design Criteria. Latest edition of each standard will apply.
    a. Underwriters Laboratories (UL)
    b. American National Standard Institute (ANSI)
    c. American Society of Mechanical Engineers (ASME)
    d. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

B. D2001 - General

1. All piping, fittings, valves, fixtures, supplies and stops, meters, outlets etc. shall be compliant with the “Reduction of Lead in Drinking Water Act”; NSF 61 section 9 compliant.
2. Kitchen staff shall have their own restrooms per code.
3. Teachers/staff and students shall have independent restrooms per code.
4. Permitting – submit all required Trade documentation per Town of Groton Building Department requirements.

C. D2010 – Plumbing Fixtures

1. All plumbing fixtures shall be High Efficiency Type (HET) water conserving, lead free fixtures that meet accessibility requirements and safe drinking water standards. The architect and the owner shall make the selection of fixtures and accessories.
2. All fixtures must be MA State Plumbing Board approved.
    a. Water closets

1) Sensor operated flush valves. Dual flush 1.6/1.1 GPF

b. Lavatories

1) Sensor type, 0.35 GPM

c. Urinals

1) Sensor operated flush valves. 0.125 GPF

d. Kitchen Sinks

1) 1.0 GPM

e. Janitor's closets

1) 2.5 GPM faucet

f. Emergency eye/face washes

1) Shall be provided with tempered water and a remote strobe/horn activated upon water flow.

2) The mechanical room as well as each janitor's closet shall have an emergency eye/face wash; required where chemicals are present or handled.

g. Frost proof hose bibs shall be located at grade through the façade adjacent entry ways and no more than 100ft apart along the building façade.

h. All trash rooms, mechanical rooms, common area toilet rooms, loading docks etc. shall be provided with hose bibs.

i. Kitchen shall have a HW/CW mixing hose valve station.

j. A non-freeze mixing HW/CW hose bibb shall be provide on the patio outside the STEAM area. The patio shall have a drain to storm to handle rain water (by civil).

D. D2020 – Domestic Water Distribution

1. A 4" cement lined ductile iron water service shall be brought into the water service room. A water meter will be provided per the Groton Water standards and installation requirements.

2. Distribution main in the building shall be a 4" CW.

3. A reduced pressure backflow preventer shall isolate local hazards within the building:

a. Commercial dishwashers

b. Pot wash sinks

c. Chemical dispensers (janitor's closets)

d. HVAC makeup

4. Hot Water

a. Storage type, gas fired water heaters, ECM circulation pumps and controls.

b. Water heaters shall be ASME:

i. (2) gas fired water heaters (HTP ELX-400FVWHN with rack), or approved equal. 399 MBH input each, 3.5-14" WC
ii. (2) 119 gallons, 316L Stainless steel storage tanks (HTP or approved equal).

c. Flue shall be AL29C under installed under division 23, under the division 22 permit.

d. Cold, hot and hot water circulation will be distributed to the fixtures requiring such. All risers shall have a shutoff and drain valves at the base. Circulation balancing valves (thermostatic type) will be located to maintain hot water within 6 feet of all sensor operated faucets.

e. An ECMV (electronically controlled mixing valve) as manufactured by Powers, Leonard or Armstrong will provide a constant distribution temperature out to the building of 125°F, with 120F return.

f. Local mixing valves at the sinks/faucets will limit hot water temperature to 110°F.

g. Hot water circulation shall be accomplished with VFD or ECM circulation pumps with the control based on pressure, balancing valves shall be circuit solver thermostatically controlled balancing valves (flow based on temperature).

h. 140°F hot water supply in the kitchen shall be accomplished via an independent 140°F hot water supply and circulation system.

5. Shutoff valves will be provided on the riser takeoffs on each floor for isolation.

6. All fixture batteries will be provided with water hammer arrestors.

7. Piping

a. Type L copper with roll groove connections 2-1/2" and larger, Pro-Press connections 2" and smaller. Can also be sweat connections where more cost effective.

E. D2030 - Sanitary, Waste and Vent

1. Sanitary, waste and vent will be piped at each toilet/bathroom group, kitchen, break room sink and classroom sink. Each stack will be independently vented through the roof, vent terminations will be 25ft or more from fresh air intakes and building openings.

2. Stacks will be piped down through the building, offsetting below the 1st floor slab with horizontal below slab piping out to 10ft beyond the inside of the foundation wall.

3. Sewage ejectors will be located in the elevator pits on the first floor and will discharge though an oil separator prior to connecting to the building sanitary drainage system.

4. Kitchen Waste and Vent

    a. The kitchen will require local grease traps to serve fixtures and floor drains:

        1) Pot sink (dedicated grease trap in the floor)

        2) Floor drains and floor sinks (to a below the floor grease trap)

        3) Dishwashers (indirect waste to a floor sink)

        4) Garbage disposals shall not discharge to a grease trap.

    b. Central grease trap

        1) A central grease trap shall be provided for the cafeteria. Shall be vented back to the building, through the roof.

        2) The central grease trap shall be a high efficiency manufactured unit of resin plastic or precast concrete depending on local DPW standards and requirements.

5. Piping

    a. Will be no hub cast iron above grade, service weight cast iron below grade.

    b. Kitchen waste and vent piping shall be epoxy coated cast iron.

F. D2040 – Rainwater Drainage

1. Storm stacks will be piped from each roof drain down through the building, offsetting below the slab with horizontal below slab piping out to 10ft beyond the inside of the foundation wall.

2. Emergency roof drainage will be accomplished via independent overflow roof drains, that discharge 18” above grade.

3. Gutters and downspouts (under miscellaneous metals) will be provided with downspout boots and be piped to the site storm drainage system for entry canopies.

4. Piping

    a. Will be no hub cast iron above grade and service weight cast iron below grade. Horizontal storm piping will be insulated to prevent condensation.

G. D2050 – Gas

1. A gas service shall be run to the building and piping shall be distributed to the gas fired HVAC equipment (boilers), domestic water heaters and the kitchen equipment.

2. Piping

   a. Will be schedule 40 black steel with mega press connections 2” and smaller, welded connections 2-1/2” and larger.

H. D2051 - Drainage Specialties

1. General floor drains shall be cast iron body and nickel bronze strainer, heel proof grate. Jay R. Smith, Zurn or Josam.

2. Mechanical room floor drains shall be cast iron body and nickel bronze strainer, loose set tractor grate and sediment bucket. Jay R. Smith, Zurn or Josam.

3. Roof drains shall be cast iron body with nickel bronze dome strainer. Overflow shall be the same, with standpipe set to a height determined by structural for the allowable roof ponding.

4. Kitchen areas shall have 316 stainless steel floor drains with stainless steel strainer. Partial grate for receiving indirect waste.

5. Floor drains shall be located in all mechanical rooms near water-based system equipment, at backflow preventers, water meters, trash rooms, etc.

6. All common area bathrooms shall have a floor drain and hose bib.

7. Cleanouts

   a. Floor cleanouts shall consist of dura-coated cast iron body, no hub or speed set outlet, tapered threaded plug, adjustable nickel bronze top, J.R. Smith, Zurn, Josam or Watts.

   b. Tile or carpet recess as required for floor finish.

I. D2052 - Insulation:

1. Insulation shall be as follows:

   a. Hot water and hot water circulation piping (105ºF – 140ºF):

      1) Pipe size less than 1 ½”: insulation shall be 1" thick (R3.7) and have a thermal conductivity not exceeding 0.27 Btu per inch/hr · ft2 ·°F.

      2) Pipe size 1 ½” and greater: insulation shall be 1 ½” thick and have a thermal conductivity not exceeding 0.27 Btu per inch/hr · ft2 ·°F. (R 5.5)

3) All 140ºF hot water and hot water circulation piping shall be insulated with 1 ½" thick insulation that has a thermal conductivity not exceeding 0.27 Btu per inch/hr · ft2 ·°F. (R 5.5)

b. Cold water piping: insulation shall be 1" thick and have a thermal conductivity not exceeding 0.27 Btu per inch/hr · ft2 ·°F.

c. Horizontal storm water conductors and clear water waste piping: insulation shall be 1" thick and have a thermal conductivity not exceeding 0.27 Btu per inch/hr · ft2 ·°F. Where the piping turns vertical within 30 feet of the drain or receptor the vertical portion shall also be insulated down to the first penetration through the floor.

d. Piping and fittings exposed to the elements or not concealed shall have PVC jacket applied over the factory applied 8 ounce canvas finish or pre-sized glass cloth jacket.

e. All insulation and jacketing/fittings located in air plenums shall be smoke-proof and non-combustible, in compliance with the flame and smoke spread ratings of ASTM E84 (plenum rated).

J. D2053 - Identification

1. The piping of each system shall be identified in the following locations and where directed by the Architect.

   a. Pipe mains and branches – every 10'-0"

   b. At each valve.

   c. Each wall penetration (both sides)

   d. Each riser including branch risers from mains.

   e. At each piece of equipment.

   f. At each change of direction

   g. Near each access panel

2. All equipment used in the plumbing systems shall have a permanently attached nameplate identifying the manufacturer, service, size, serial number or model number, etc. The nameplates shall be kept clean and readable at all times.

3. Each item of equipment such as pumps, water heaters, grease traps, interceptors, etc., shall be identified by a permanently attached nameplate.

4. A legend showing the service and an arrow indicating the direction of flow shall be applied on each pipe installed by the Plumbing Subcontractor.

5. Provide neat circular brass valve tags of at least 1 ½" in diameter, attached with brass hook to each valve stem or handle as determined by Architect. Stamp on these

valve tags, in letters as large as practical, the number of the valve and the service, such as “HW”, “HWC”, “CW”, for hot water, hot water circulation, cold water. The numbers of each service shall be consecutive. Obtain approval of Architect prior to installation.

K. D2054 – LEED

1. WEc
   a. The water efficiency credit will be served by reduction in consumption of water by interior fixtures. The fixture flow rates will be as designated in the “Plumbing Fixture” section herein before.

2. Water Metering
   a. Water metering credit shall be obtained by the following:
      i. Whole building water metering
      ii. At least two water sub-systems
         1) Indoor plumbing fixtures (building water meter less process meter)
         2) Domestic Hot Water Meter
            a. Meter hot water and hot water circulation
         3) Process meter: Process water to the kitchen area: dishwasher, clothes washer, janitor’s sink.

L. D2055 - Submittals

1. Provide testing and documentation in accordance with project requirements for LEED submission to achieve the target score indicated in NC for Schools V4 MEP REQUIREMENTS and LEED Scorecard.

2. Submit coordination drawings (1/4” scale), electronic format, for review. The subcontractor shall compare his specifications and any drawings with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, This Subcontractor shall make proper provisions to avoid interference in a manner approved by the Architect. All changes required under this division caused by this Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction. This Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project may require additional time to coordinate all Trades. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Owner.

3. Submit installation, operation, and maintenance manuals for all equipment and systems.

4. Submit record documents, including as-built drawings.

IV. D30 HVAC SYSTEMS

A. D3000 - Codes and Standards:

1. 780 CMR – Massachusetts State Building Code, 9th Edition
2. 2015 International Building Code
3. 2015 International Mechanical Code
4. ASHRAE 90.1-2013 / IECC 2018 with 2020 MA Energy Code Amendments
5. MA Stretch Energy Code
6. All state and local zoning and building laws and regulations.
7. All applicable local codes, amendments and ordinances.
8. Applicability of Standards: United States of America National Construction Industry standards will be used as a minimum except where more stringent requirements are included in the Design Criteria. Latest edition of each standard will apply.
   a. Air Moving and Conditioning Association (AMCA)
   b. American National Standard Institute (ANSI)
   c. Air Conditioning and Refrigeration Institute (ARI)
   d. American Society of. Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
   e. American Society of Mechanical Engineers (ASME)
   f. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   g. Thermal Insulation Manufacturers Association (TIMA)
   h. U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) for Schools V4
   i. National Fire Protection Association (NFPA)
   j. Underwriters Laboratories (UL)

B. D3001 - Design Criteria

1. Outdoor Design Conditions:

   Summer: 90°F DB, 73°F WB
   Winter: 0°F DB

2. Indoor Design Conditions - the building will be fully air-conditioned:

   a. Classrooms: 75° F +/- 2°F; less than 55% RH

   b. Common Spaces: 75° F +/- 2°F; less than 55% RH

   c. Office Spaces: 75° F +/- 2°F; less than 55% RH

   d. Electrical Rooms: 85° F +/- 10°F

   e. IDF Rooms: 75° F +/- 2°F; no humidity control

   f. Mech. Rooms: Ventilation only, for 10°F rise above ambient

3. Air Filtration

   a. Occupied areas: combination MERV 8 (30-35%) & MERV 15 (95%) rated filters for units treating outside air.

   b. Mechanical rooms: MERV 8 (30-35%) rated filters only.

4. Mechanical Ventilation:

   a. Fresh Air – 30% greater than ASHRAE 62.1-2010. All occupied areas will be designed to maintain 800 PPM carbon dioxide maximum through use of demand controlled ventilation.

   b. Exhaust Rates:

      1) Bathrooms: 75-cfm per toilet fixture, continuous

      2) Janitor, Trash, Recycle: 15 ACH, continuous

5. Duct Sizing Criteria:

   a. Pressure Drop (max):

      1) Medium Pressure Systems – 0.2” w.c. per 100-ft

      2) Low Pressure Systems – 0.06” w.c. per 100-ft

   b. Velocity:

      1) Medium Pressure Systems – 2000-fpm max

      2) Low Pressure Systems – 1700-fpm max

      3) Low Pressure Systems (within classrooms) – 750-fpm max

6. Building Pressurization:

   a. Corridors: Positive

b. Classrooms: Neutral

c. Toilet/Trash/Janitor: Negative

7. Acoustics: spaces to meet the following Noise Criteria (NC) pending acoustical consultant's review:

   a. Classrooms: NC 30

   b. Meeting Rooms: NC 30

   c. Offices: NC 40

   d. Corridors: NC 45

8. LEED Requirements: refer to LEED NC for Schools V4 MEP Requirements and LEED Scorecard. Specific credits to be achieved with HVAC systems include:

   a. EApr1 – Fundamental Commissioning

   b. EApr2 – Minimum Energy Performance

   c. EApr4 – Fundamental Refrigeration Management

   d. EAc1 – Enhanced Commissioning

   e. EAc1 – Optimize Energy Performance – 14 points

   f. EQpr1 – Minimum IAQ Performance

   g. EQpr3 – Minimum Acoustical Performance

   h. EQc1 – Enhanced IAQ Strategies

   i. EQc5 – Thermal Comfort and Controllability

C. D3002 HVAC Preferred Option – Chilled and Hot Water Plants with VAV and Displacement Ventilation AHU's

1. D3020 Central Heating Plant

   a. The central heating plant shall be located in the main mechanical room on the first floor. The central boiler plant shall serve the heating needs for the entire building, including outside air pre-heat at the main air handling units, reheat coils, and perimeter heating units.

   b. Three (3) 2,500-MBH gas-fired, high efficiency condensing hot water boilers shall be provided. The boilers shall be of a fire-tube design, high mass, manufactured from high grade stainless steel. Design hot water supply temperature shall be 160°F. Hot water supply temperature shall be reset downward inversely to outside air temperature whenever possible to ensure maximum efficiency and condensing operation.

c. The hot water plant shall include two (2) 400-gpm, 25-hp main hot water distribution pumps in a duty-standby configuration, complete with variable frequency drives (VFD's), inline pumps for each boiler, air separator, expansion tank, and water treatment system. Flues for the boilers shall terminate above the roof of the main building.

d. VFD driven pumps shall be provided with shaft grounding rings to minimize stray currents that can damage motor bearings.

2. D3021 Hot Water Distribution

a. Hot water distribution piping shall originate with 6-inch diameter supply and return piping from the main mechanical room.

b. Hot water shall be distributed in loops at both the first and second floor levels to serve terminal heating units, perimeter radiant panels in the classrooms, and the AHU preheat coils. Piping above the roof shall be heat traced and insulated.

c. Piping passing the 2-hour rated firewall/building expansion joints shall be provided with 4" travel stainless steel braided expansion loops.

3. D3030 Central Cooling Plant

a. The central cooling plant shall serve the chilled water needs for the entire building, which shall be fully air-conditioned.

b. Provide one (1) 300-ton high efficiency air-cooled chiller utilizing variable speed magnetic bearing centrifugal compressors. Low sound package shall be provided and shall include compressor wraps. Condenser fans shall incorporate EC motors and ultra-low noise blade technology for added sound reductions. Efficiency shall meet or exceed 1.01 KW/ton at full load and 0.58 KW/ton part load IPLV. The chiller shall be located at the roof, on dunnage, with spring vibration isolators.

c. The chilled water system shall utilize a 15°F temperature differential. AHU coils shall be selected for temperatures of 43°F entering, 58°F leaving. Pumping shall be variable primary only.

d. The chilled water plant shall include (2) 480-gpm, 30-hp chilled water distribution pumps in a duty-standby configuration, complete with VFD's, air separator, expansion tank, and water treatment system. All equipment shall be located in the main mechanical room.

e. VFD driven pumps shall be provided with shaft grounding rings to minimize stray currents that can damage motor bearings.

f. All building air handlers will have air-side economizers, and thus the chiller will not be needed to operate during the winter, nor require water-side economizer. The chilled water system shall therefore be designed for operation on plain water. A winter freeze protection system shall be provided for seasonal draining of the chiller and outdoor piping. Freeze protection make-up fluid shall be provided via a pumped system to a mix of 40% propylene glycol and 60% water, that draws from

a minimum 50 gallon glycol tank to prevent dilution. Glycol tank and pump shall be located in the main mechanical room, with piping connected directly to the outdoors piping and chiller on the roof.

4. D3031 Chilled Water Distribution

   a. Chilled water distribution piping shall originate with 8-inch diameter supply and return piping from the main mechanical room.

   b. Chilled water shall be distributed in a loop at the first and second floor levels and shall serve the AHU cooling coils. The AHU's shall be assumed to be located on the low and high roofs. Piping above the roof shall be heat traced and insulated.

   c. Piping passing the 2-hour rated firewall/building expansion joints shall be provided with 4" travel stainless steel braided expansion loops.

5. D3040 Central Air Handling Units & Distribution

   a. Multiple central air handling units (AHU's) shall serve the building HVAC requirements. The units shall be variable volume in nature to provide heating and cooling as described herein, and to provide the minimum ventilation required based on return air and individual room CO2 levels.

   b. AHU capacities and types shall be as follows:

      1) AHU-1: 12,000-cfm (Admin/Offices – overhead VAV supply)

      2) AHU-2: 24,000-cfm (Classrooms - displacement VAV with energy recovery)

      3) AHU-3: 24,000-cfm (Classrooms - displacement VAV with energy recovery)

      4) AHU-4: 24,000-cfm (Classrooms - displacement VAV with energy recovery)

      5) AHU-5: 12,000-cfm (Cafeteria – overhead VAV supply with energy recovery)

      6) AHU-6: 7,500-cfm (Gymnasium – overhead VAV supply with energy recovery)

   c. AHU-1, AHU-2, AHU-3, AHU-4: the multi-zone VAV AHU's shall be located on the roof above the spaces served. The units shall be of modular or semi-custom construction, outdoor rated, and shall have the following features:

      1) 2" double-wall thermal break cabinet construction, thermal break doors, with R-13 insulation value

      2) MERV 8 and MERV 15 pre-filters

      3) Mixing box with outside air flow station and intake hood

      4) Energy recovery wheel (AHU-2, 3, 4)

      5) Sensible dehumidification wheel or heat pipe (AHU-2, 3, 4)

6) Air blender (AHU-1 only)

7) Hot water coil with blend pump

8) Chilled water coil. Coil sized at less than 450-fpm.

9) Piping vestibules

10) Supply fan section with VFD

11) Return fan section with VFD

12) All fans shall be direct drive with shaft grounding rings to minimize stray currents that can damage motor bearings.

13) Supply and return air silencers (duct mounted)

14) The AHU's shall utilize single duct VAV boxes to serve each classroom, the corridors, and each office space. VAV box quantities shall be as follows:

    a. One (1) VAV box per classroom/work room

    b. One (1) VAV box per every two enclosed offices

15) AHU-1: Supply distribution shall be to louvered square ceiling diffusers. VAV boxes shall have hot water reheat coils. Return air shall be via a grille mounted in the ceiling. Return air system shall be fully ducted.

16) AHU-2, 3, 4: Supply distribution shall be to low-wall mounted displacement diffusers. The typical classrooms will require two displacement diffusers. Larger classrooms such as kindergarten and music will require three displacement diffusers. Smaller support spaces in the classroom wings will require one or two displacement diffusers depending on the size of the space. VAV boxes do <u>not</u> require hot water reheat coils (heating shall be via the radiant panels only). Return air shall be via a grille mounted in the ceiling and shall be fully ducted.

17) Provide CO2 demand controlled ventilation to maintain less than 800-ppm CO2 concentrations in each classroom zone.

18) Provide perimeter wall-to-wall linear radiant ceiling panels for heating in the classrooms and offices. Provide cabinet unit heaters in the corridors near the building entrances and in each vestibule.

d. AHU-5, AHU-6: the cafeteria and gymnasium AHU's shall be located on the roof. The units shall be of modular or semi-custom construction and shall have the following features:

1) 2" double-wall thermal break cabinet construction, thermal break doors, with R-13 insulation value

2) MERV 8 and MERV 15 pre-filters

3) Energy recovery wheel

4) Mixing box with outside air flow measuring station and intake hood

5) Hot water coil with blend pump

6) Chilled water coil. Coil sized at less than 450-fpm

7) Piping vestibules

8) Supply fan section with VFD

9) Return fan section with VFD

10) All fans shall be direct drive with shaft grounding rings to minimize stray currents that can damage motor bearings.

11) Sensible dehumidification wheel or heat pipe

12) Supply and return air silencers (duct mounted)

13) Supply fan, return fan, and outside air intake connections shall be furnished with airflow measuring stations.

14) Units shall be single zone VAV, variable temperature and variable volume, with exposed overhead spiral ductwork. (Note: no VAV boxes are required)

15) Provide multiple low returns with heavy duty grilles in each space

16) Provide CO2 demand controlled ventilation to maintain less than 800-ppm CO2 concentrations in each space.

6. D3041 COVID-19 Considerations (per ASHRAE School Re-Opening Guidance)

"Protecting the health, safety and welfare of the world's students, faculty, and administrators from the spread of SARS-Cov-2 (the virus that causes the COVID-19 disease) is essential to protecting the entire population."

a. ASHRAE guidance for coronavirus mitigation addresses key elements in the specification of central air handling systems – ventilation, filtration, and air cleaning.

b. Selection of the central AHU's for this project meet or exceed the minimum ventilation and filtration requirements set forth by exceeding ASHRAE 62.1 ventilation rates and having provisions for MERV-13 and MERV-15 filter banks. In addition, the displacement ventilation systems in the classrooms provide a means for once through ventilation, where highly filtered fresh air replaces the "stale" air, using buoyancy to drive the displacement process without mixing the room air.

c. Additional technologies for air cleaning, such as germicidal ultraviolet air disinfection (UV-C lamps) and bipolar ionization, may be retrofitted to the AHU's if the current coronavirus pandemic continues, or in the event a new airborne pandemic would arise in the future.

7. D3042 Specialty Ventilation Systems

   a. Art Rooms - provide a roof mounted exhaust fan in each art room for once through ventilation per ASHRAE 62.1

   b. Kiln Room – provide stainless steel canopy hood over the Owner-furnished kilns. Provide high temperature rated exhaust dan on the roof. Furnish ductwork for the kiln downdraft exhaust fan and duct to a gooseneck on the roof (each kiln).

   c. STEM Room – provide a roof mounted exhaust fan for once through ventilation per ASHRAE 62.1

   d. Nurses Office – provide a roof mounted exhaust fan for the exam room to ensure continuous negative pressure to adjacent spaces (isolation room)

   e. Gymnasium – provide two (2) 12-ft diameter high volume, low speed overhead industrial grade ceiling fans to de-stratify the space. Provide variable speed motors with manual and automatic speed control.

8. D3043 Bathroom Exhaust Systems

   a. Provide exhaust ductwork extending to roof mounted exhaust fans. Fans shall be roof mounted up-blast centrifugal units.

9. D3044 Kitchen Make-Up & Hood Exhaust System

   a. Provide a dedicated 100% outside air ventilation system for the kitchen. The make-up air handler shall be located on the roof above the kitchen, with the following features:

      1) MUA-1: 5,000-cfm (approximate – assumes the remainder of kitchen hood make-up air is transfer air from the cafeteria)

      2) 2" double-wall, thermal break cabinet construction, with R-13 insulation value

      3) MERV 8 and MERV 13 pre-filters

      4) Direct-fired high efficiency gas furnace

      5) Supply fan section with VFD; fan shall be direct drive with shaft grounding rings to minimize stray currents that can damage motor bearings.

      6) Supply air silencer

      7) Outdoor air shall be ducted to louvers in perimeter wall/areaways. Sound attenuation shall be provided.

b. The kitchen hood shall be provided with a UL 762 listed grease exhaust fan:

1) KEF-1: 6,000-cfm (approximate – must be matched to grease hood)

2) Double wall stainless steel factory built grease duct to fan termination outdoors.

3) VFD for demand controlled ventilation

4) Provide hood thermal and smoke monitoring system for demand control of both the exhaust fan and make-up air unit.

10. D3050 Split System DX Cooling Systems

a. Provide 2-ton split system cooling units for the main telephone & data room and the elevator machine room.

11. D3051 Miscellaneous Heating, Ventilating, and Exhaust Systems

a. Vestibules, entryways, and stairwells shall be heated with hot water cabinet unit heaters. Heaters shall be wall or ceiling mounted depending on architectural configuration of the spaces.

b. Mechanical spaces, plumbing rooms, electrical rooms, and small telephone & data rooms shall be heated with hot water unit heaters with integral thermostats where necessary. Provide exhaust ductwork extending to roof mounted exhaust fans. Fans shall be roof mounted up-blast centrifugal units.

c. Trash/Recycle Rooms and Janitor's Closets shall be exhausted with a minimum of 15 air changes per hour. Ductwork shall extend to roof mounted exhaust fans. Fans shall be roof mounted up-blast centrifugal units.

d. The elevator hoistway shall be ventilated with a louver and motorized damper located at the top of the elevator overrun, per MA elevator code, 524 CMR 35.00, for hoistway temperature control.

e. The emergency generator (furnished and installed by others, at grade) shall be provided with an engine exhaust flue extending from the unit enclosure up to 10-ft above the roof of the building.

D. D3060 Automatic Temperature Controls:

1. A direct digital control building management system (BMS) shall be provided for monitoring, scheduling and controlling all building HVAC equipment, including but not limited to the central plant HVAC equipment, air handlers, exhaust systems, and terminal units.

2. System shall be native BACnet with web-based interface.

3. BACnet interface shall be provided for major standalone units including the chiller, boilers, each VFD, and kitchen demand controlled ventilation system.

4. The control system shall consist of all thermostats, temperature transmitters, controllers, automatic valves and dampers, damper operators, switches, control panels, and other accessory equipment along with a complete system of electrical wiring (in conduit) to fill the intent of the specification and provide for a complete and operable system. All control equipment shall be proportioning, except as noted otherwise.

5. Provide UPS in each BMS panel; circuit to standby power distribution panel.

6. Provide all thermostats, humidistats, CO2 sensors, local switches, and interlocking wiring to all terminal equipment.

E. D3070 HVAC Balancing, Adjusting, Testing, Cleaning, and Welding

1. All HVAC systems (hydronic, air) shall be balanced by the TAB subcontractor. All testing shall be in accordance with NEBB or AABC National Standards. A written report shall be submitted for review.

2. All HVAC systems shall be tested and found tight. Any leaks developed shall be corrected prior to Owner's acceptance of the systems.

3. All strainers and filters shall be cleaned and all systems blown free of dirt and other accumulation.

4. All welding shall be performed in accordance with ANSI Standard Code for Pressure Piping, Section I and applicable portions of ASME Boiler and Pressure Vessel Code, Section I.

F. D3071 HVAC Commissioning

1. This project shall be completely commissioned with the participation of the following parties:

   a. Owner Representative

   b. Commissioning Agent

   c. Construction Manager

   d. HVAC Contractor

   e. T&B Subcontractor

   f. ATC Subcontractor

G. D3090 HVAC Outline Specifications:

1. Major HVAC Equipment – acceptable manufacturers include:

   a. Chiller – Multistack, Arctic Chill, AAON, or equal

   b. Boilers – Viessmann, Cleaver-Brooks, Fulton, or equal

c. Pumps – Taco, Armstrong, Bell & Gossett, or equal

d. Air Handlers – Semco, Venmar, Annexair, NovelAire, or equal

e. Make-up Air Unit – Greenheck, Valent, Addison, or equal

f. Fans – Greenheck, Twin City, Loren-Cook, or equal

g. DX Split Systems – Mitsubishi, Daikin, LG, or equal

h. Terminal Heating Units – Sterling, Rittling, Vulcan or equal

i. Radiant Heating Panels – TWA, Sterling, Price, or equal

j. VFD's – ABB, Yaskawa, Eaton, or equal

k. Sound Attenuators – Price, Vibro-Acoustics, Ruskin, or equal

l. VAV boxes – Price, Titus, Nailor, or equal

m. Diffusers – Price, Titus, Nailor, or equal

n. Dampers – Greenheck, Ruskin, TAMCO or equal

o. Grease Duct, Flues and Stacks – Schebler, Selkirk, Jeremias, or equal

p. Automatic Temperature Controls – Johnson Controls, Schneider Electric, Siemens, Alerton, Distech, Automated Logic, or equal.

2. Piping

a. Chilled water, hot water, and vent piping shall be Schedule 40, ASTM A53 with screwed fittings up to 2" size and welded for sizes 2 1/2" and up, A106, Schedule 40. Copper will be allowed as an alternate to steel, provided dielectric unions are installed between dissimilar metals.

b. All drain piping shall be copper Type "L", 95/5 solder.

c. For water piping, Pro-Press (copper) couplings are allowed. Welded piping or Victaulic couplings only above 3".

d. Make proper provisions for expansion and contraction in all parts of piping systems wherever possible by means of pipe bends, pipe offsets, swing connections or changes in direction of piping. Where piping network cannot be employed to absorb expansion and contraction in the piping systems, provide expansion joints. Provide anchors and guides as required to direct expansion towards loops or joints.

3. Chemical Treatment

a. The services of reputable Water Treatment Contractor shall be provided to install a complete water treatment service, designed to minimize corrosion and scale formation in the chilled water and hot water systems. This service shall be provided for a period of one (1) year following the initial start-up of the systems, as well as chemicals and service for initial start-up and system cleaning.

b. Provide glycol skid and manually operated pump for chiller winterization

c. All equipment such as panels, pumps, meters solenoid valves, bleed-off valves, chemical drains, etc., shall be provided by the Chemical Treatment Contractor.

4. Sheetmetal Ductwork

a. All sheetmetal shall be G90 galvanized steel and shall be stiffened by cross breaking and by use of galvanized rolled steel angles as required by SMACNA for its respective static pressure class.

b. Medium pressure supply ductwork shall be SMACNA 6" w.g. pressure rated.

c. Low pressure ductwork shall be SMACNA 2" w.g. pressure rated.

d. All ductwork shall be 24 gauge or heavier.

e. Pressure test all medium pressure ductwork and low pressure ductwork risers.

f. Exposed ductwork shall be spiral seam circular or flat-oval.

g. Duct liner shall be hospital grade, fiber-free only.

5. Chimneys and Stacks (Gas-fired Boilers and Water Heaters)

a. The breeching and stacks for the hot water boilers and domestic hot water heaters shall be factory built Category IV double wall vent pipes (AL29-4C stainless steel inner wall and 304 stainless steel outer wall) with 1" air space.

b. When connected to gas-burning appliances with a maximum continuous flue-gas temperature of 550 deg F, flue shall be capable of being fully enclosed vertically by combustible materials at 1" clearance to combustibles. The vents shall comply with UL 1738. Terminate minimum five (5) feet above finish roof.

c. All units shall be closed combustion with ducted PVC or galvanized steel intakes.

6. Chimneys and Stacks (Diesel Generator)

a. The flue stack for the generator shall be factory-built pressure rated UL 103 chimney piping, 2" double wall with 304 stainless steel inner pipe and 304 stainless steel outer shell. Flue system shall be rated to exhaust temperatures up to 1400°F.

b. Provide with explosion relief valve, bellows expansion joints, anchor base plate, and wall guides. Terminate stack ten (10) feet above the facility roof.

7. Insulation

a. Duct Insulation: all interior supply ductwork and concealed return ductwork shall be insulated with 2" thick, 1.0 pound per cubic foot fiberglass wrap. In addition, ductwork in mechanical rooms shall be insulated with 2" thick fiberglass board. All exterior ductwork shall be insulated with 3" thick fiberglass board with EPDM jacket.

b. Pipe Insulation:

1) Utilize ASJ glass fiber insulation in molded sections. Glass fiber insulation shall have minimum density of 3¼ pounds per cubic foot with a thermal conductivity ("K" value) of 0.23 at 75°F mean temperature.

2) Chilled water piping 1-1/2" and smaller shall be provided with 1" thick insulation. Chilled water piping 2" and larger shall be provided with 1-1/2" thick insulation. Exterior piping to the chiller shall be weather jacketed and heat traced.

3) Hot water piping 1-1/2" and smaller shall be provided with 1-1/2" thick insulation. Hot water piping 2" and larger shall be provided with 2" thick insulation.

4) Condensate drain piping shall be provided with 1" thick insulation.

8. Vibration Isolation

a. Noise and vibration isolation systems shall be provided to prevent the transmission of excessive structure borne noise or vibration to critical and non-critical areas of the building as characterized by noise criteria levels.

b. All pumps, fans, air handling units and the chiller shall be equipped with vibration isolation springs and all piping within the mechanical rooms shall be hung with hangers equipped with spring vibration isolators.

c. All pumps shall be installed on inertia bases and piping shall have flexible hose connections.

9. Permitting – submit all required Trade documentation per Town of Groton Building Department requirements.

10. Submittals

a. Provide testing and documentation in accordance with project requirements for LEED submission to achieve the target score indicated in NC for Schools V4 MEP REQUIREMENTS and LEED Scorecard.

b. Submit for approval product data for all HVAC and Automatic Temperature Control equipment.

c. Submit coordination drawings (1/4" scale), electronic and hardcopy, for review. The HVAC subcontractor shall compare his specifications and any drawings with those of other Trades as well as the Architectural drawings and specifications,

and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the HVAC work. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, This Subcontractor shall make proper provisions to avoid interference in a manner approved by the Architect. All changes required in the HVAC work caused by this Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction. This Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project may require additional time to coordinate all Trades. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Owner.

d. Submit installation, operation, and maintenance manuals for all equipment and systems.

e. Submit record documents, including as-built drawings.

9.4 Fire Protection

The following Fire Protection system narrative is provided by RW Sullivan.

V. D40 FIRE PROTECTION SYSTEMS

A. D4000 - Codes and Standards:

1. 780 CMR – Massachusetts State Building Code, 9th Edition
2. National Fire Protection Association (NFPA) 13, 14 and 20
3. All state and local zoning and building laws and regulations.
4. All applicable local codes, amendments and ordinances.
5. Applicability of Standards: United States of America National Construction Industry standards will be used as a minimum except where more stringent requirements are included in the Design Criteria. Latest edition of each standard will apply.
    a. Underwriters Laboratories (UL)
    b. American National Standard Institute (ANSI)
    c. American Society of Mechanical Engineers (ASME)
    d. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
6. Permitting – submit all required Trade documentation per Town of Groton Building Department requirements.

B. D4010 - Fire Protection

1. An 8” cement lined ductile iron fire protection service shall be brought into the water service room on the first floor. An isolation valve will be installed in the vertical position just above the floor slab.
2. The building will be isolated with a 6” double check valve assembly located in the water service room.
3. Based on preliminary hydraulic calculations and review of the proposed ceilings a fire pump will not be needed to serve the automatic sprinkler system. The municipal water supply is adequate to serve the automatic sprinkler system per code.
4. A 6” riser check valve will alarm and isolate the building and allow flow testing of the service. The sprinkler distribution to the most remote portion of the building will be 6”.
5. Storz pumper connection (up to 750 GPM) will be provided for the sprinkler system.
6. A dry pipe valve will be installed to protect the loading dock.
7. All flows, tampers and pressure switches will be wired to the building fire alarm system.

8. The sprinkler system on each level will be isolated by floor with a floor control valve station and inspector's test. The piping and valving will be enclosed in a ceiling where possible and accessed via access panels.

9. Hydrant flow test information

    1) Testing company: R.W. Sullivan Engineering & Groton DPW

    2) Date: 5/20/2020

    3) Time: 9AM

    4) Static: 78 PSI (Hydrant elevation @ 335ft)

    5) Residual: 71 PSI, flowing 1216 GPM (Hydrant elevation @ 332ft)

10. Piping will be as follows:

    a. Wet systems: schedule 40 black steel. Threaded 1", roll groove 1 ¼" and larger.

    b. Dry system (loading dock): schedule 40 black steel. Threaded 1", roll groove 1 ¼" and larger. Air supply shall be via a nitrogen generator with automatic purge system.

11. The building shall be fully sprinklered as follows:

    a. Offices, Classrooms, Corridors, Toilet Rooms, Etc.:

        1) 0.10 GPM/ft^2 over 1500ft^2, 100 GPM hose.

    b. Mechanical Rooms and Storage Areas:

        1) 0.20 GPM/ft^2 over 1500ft^2 or area of room (whichever is less), 250 GPM hose.

    c. Raised presentation platform:

        1) 0.20 GPM/ft^2 over 1500ft^2 or area of room (whichever is less), 250 GPM hose.

    d. Loading dock:

        1) 0.20 GPM/ft^2 over entire area, 250 GPM hose.

    e. Gymnasium
        1) 0.15 GPM/ft^2 over 1500ft^2, 250 GPM hose.

12. All system test drains will be piped to grade.

C. D4020 – Standpipe Systems

1. Standpipes are not required per the Massachusetts State Building code because the highest occupiable floor is less than 30 feet above fire department vehicle access.

D. D4030 – Fire Protection Specialties

1. Sprinklers:

a. Class Rooms, Offices, Corridors:
   1) Shall be 5.6K, quick response, standard coverage, pendants with flat, white cover plates.
   2) In areas with decorative ceilings the cover plates shall be ordered from the factory to color-match the surface.

b. Mechanical Rooms

   a) Shall be 5.6K, quick response, standard coverage, pendants and uprights with protective cages.

c. Kitchen

   a) Stainless steel, intermediate temperature, 5.6K, quick response, standard coverage.

d. Gymnasium

   a) Shall be 5.6K, quick response, standard coverage, concealed pendants

2. Identification

a. The piping of each system shall be identified in the following locations and where directed by the Architect.

   1) Pipe mains and branches – every 10’-0”

   2) At each valve.

   3) Each wall penetration (both sides)

   4) Each riser including branch risers from mains.

   5) At each piece of equipment.

   6) At each change of direction

   7) Near each access panel

b. All equipment shall have a permanently attached nameplate identifying the manufacturer, service, size, serial number or model number, etc. The nameplates shall be kept clean and readable at all times.

c. Each item of equipment such as compressors, dry pipe valves, main alarm valves, floor control valve stations, etc., shall be identified by a permanently attached nameplate.

d. A legend showing the service and an arrow indicating the direction of flow shall be applied on each pipe installed by the Plumbing Subcontractor.

e. Provide neat circular brass valve tags of at least 1 ½" in diameter, attached with brass hook to each valve stem or handle as determined by Architect. Stamp on these valve tags, in letters as large as practical, the number of the valve and the service, such as "SP", SPR", "DR", for STANDPIPE, SPRINKLER, DRAIN. The numbers of each service shall be consecutive. Obtain approval of Architect prior to installation.

3. Submittals

a. Provide testing and documentation in accordance with project requirements for LEED submission to achieve the target score indicated in NC for Schools V4 MEP REQUIREMENTS and LEED Scorecard.

b. Submit coordination drawings (1/4" scale), electronic and hardcopy, for review. The subcontractor shall compare his specifications and any drawings with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, This Subcontractor shall make proper provisions to avoid interference in a manner approved by the Architect. All changes required under this division caused by this Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction. This Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project may require additional time to coordinate all Trades. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Owner.

c. Submit installation, operation, and maintenance manuals for all equipment and systems.

9.5 Water Capacity

The municipal water supply is adequate to serve the automatic sprinkler system per code. Refer to the Section 9 FP Narrative.

9.6 Fire Pump

Based on preliminary hydraulic calculations and review of the proposed ceilings, a fire pump will not be needed to serve the automatic sprinkler system. Refer to the Section 9 FP Narrative.

9.7 Electrical

The following Electrical system narrative is provided by RW Sullivan.

VI. D50 ELECTRICAL SYSTEMS

A. D5010 - Utility Services

1. Electrical Service (Normal Power)

   a. Coordinate with Electric Company for estimated utility back charges, assume a line item allowance for cost estimating purposes.

   b. Assume utility pad-mounted transformer on property. Provide utility approved precast transformer pad, grounding, steel protection bollards, (2) 5”C PVC in concrete encased underground primary ductbank to the utility connection point.

   c. Underground Secondary Electric Service – provide from the utility transformer; one 2500Amp, 480Y/277V, 3 phase, 4 wire secondary electric service to terminate on a front and rear aligned switchboard.

      i. Switchboard “SWBD” shall be rated for 2500A, 480Y/277 volt, 3-phase, 4-wire, service entrance rated, front access only, rear aligned main switchboard group mounted type construction with integral bus mount SPD surge protection, CT cabinet provisions, 100kAIC @240V. The main breaker and any feeder breakers rated 1200A or greater shall be insulated case type, feeder breakers less than 1200A shall be molded case type. All breakers 480V, 1000A or greater shall be LSIG electronic trip type.

      ii. The main switchboard shall consist of the following sections:

         a. Section 1: Unmetered Solar PV tap section

         b. Section 2: Pull section with integral SPD

         c. Section 3: 2500A main breaker section with CT compartment and utility metering

         d. Section 4: Distribution section with feeder breakers to serve major building loads and panelboards.

   d. The electrical distribution equipment shall have integral main switchboard mounted digital metering collector to provide status on electrical power characteristics on LCD backlight display and remote output data to the data acquisition metering system.

2. Telecommunication Service

   a. Assume the utility companies’ telecommunications service to originate from their service connection point at the street. Provide (3) 4” conduits routed to the building’s main telecommunication equipment room.

b. Provide (3) 4" conduits routed between the Florence Roche Elementary School main telecommunication equipment room and the existing Groton Dunstable Regional Middle School's main telecommunication equipment room.

B. D5020 - Normal Power Distribution System

1. Each electric room will include panelboards, dry-type transformers lighting control panels, sub-metering equipment, fire alarm terminal cabinets and battery power supply cabinets.

2. Normal /optional standby/ panelboards shall be copper bus with door in door type trims, molded case circuit breaker types.

3. Emergency panelboards shall be copper bus with fuse circuit breaker type.

4. Refer to HVAC, Plumbing, Fire Protection, Architectural, Civil documentation for equipment requiring electrical power.

5. A power system and short circuit study for the complete electrical system distribution equipment will be a submittal item and included in the O&M manuals.

C. Generator Power Distribution System

1. An exterior mounted, self-contained factory level 2 sound attenuated weatherproof non-walk in enclosure, 225kW, 480Y/277V, 3 phase, 4 wire diesel engine generator. This generator and all associated ATS and miscellaneous generator equipment shall be priced under a separate line item/category or deduct alternate.

   It is our understanding the Town of Groton is working with the municipal utility to discuss providing a demand response generator system that will support the entire school. This will be a private contract between the Town of Groton and the municipal utility.

2. Provide radiator mount load bank for automatic load test NFPA 110 with regenerative power absorption features. Provide with factory 10' exhaust stack.

3. Coordinate with the Architect and the Acoustical Sound Consultant for exterior wall acoustical treatment with enough height above the generator roof enclosure to block off and attenuate acoustical noise to the property line to meet Town of Groton ordinance purposes. Recommend that a cost line item to be identified for such treatment. Provide alternate price for custom walk-in enclosure such as Pitchard Brown.

4. Automatic transfer switch shall be 100KAIC@480V for withstand and closing rating.

   a. Assume the following ATS:
      i. Emergency: 100A
      ii. Optional Standby: 250A

5. Assume the following building loads will be desired to be on generator power backup in event of a prolonged utility power failure.

a. Emergency and optional standby general lighting.

b. Kitchen walk-in coolers and freezers.

c. Central heating plant – boilers, circulator pumps, controls, boiler room motorized dampers.

d. Gymnasium – including all associated electrical and HVAC.

e. Main administration office receptacle loads.

f. Telecommunications rooms power and small cooling loads serving those rooms.

g. Security and access control system.

h. Paging/Intercom System

i. Telephone System

j. Network servers and switches

k. Central Clock System

l. Local AV systems

D. Sustainable Design Intent LEED

1. Sustainable Design Intent compliance will include:

a. Advanced measurement and verification of HVAC, lighting, receptacle power via electronic sub-meters equal to E-Mon Class 5000 3-phase kWh and demand meters. Measurement and verification metering will be monitored by the Building Management System (BMS).

b. Advanced lighting controls include a low voltage lighting control system with time schedule control for common areas, vacancy/occupancy sensors and photocells for daylight harvesting.

c. Switchboard will consist of a unmetered tap section for the solar photovoltaic (PV) system tie in.

d. Light pollution reduction for exterior lighting through the use of full cutoff and low glare luminaires.

E. Lighting Systems and Controls

1. Provide controls to meet the 2018 IECC and LEED requirements, such as: occupancy sensor controls, time-switch controls, light-reduction controls, and daylight-responsive controls. All storage rooms, janitor's closets will be provided with vacancy sensor switches; toilet/rest rooms will be provided with occupancy sensor switches. Classrooms, offices and common areas/spaces will be provided with vacancy sensors and local dimming controls.

2. Corridors will be provided with a relay panel control occupancy sensor programmed to be active after school hours which will only trigger the lights to come ON when the space is occupied. During school hours, the lights will remain ON.

3. All LED lighting fixtures shall be Design Lights Consortium certified.

4. Recess LED down lights shall be Energy Star certified.

5. All LED exit fixtures and selected lighting fixtures in egress pathways shall be wired to the emergency life-safety generator system.

F. Branch Circuitry

1. Assume Type MC Cable THHN/THWN 600V in concealed areas for 20amp branch circuitry for lighting and wiring devices, use EMT conduit for exposed areas and where Type MC is prohibited by Code.

2. Assume RGS conduit for exterior exposed, under slab and 5' from footings, with XHHW-2 600V wiring.

3. PVC SCH 40 underground, and copper wiring with 600V THHN/THWN insulation for branch circuits, 600V XHHW-2 insulation for feeders.

4. All conductors to be copper.

5. All feeders serving life-safety panelboards and systems to be type 2-hr rated MI-cable.

G. Fire Alarm System

1. Fire alarm system shall be an addressable fire alarm general voice evacuation system that complies with 780CMR and NFPA 72 requirements. The system shall include, but not limited to: Fire Alarm Control Panel, digital dialer, rotating beacon, remote annunciator panel with one-way microphone, double-action manual pull stations with Stopper Covers, photoelectric smoke detectors, fix-temp/rate-of-rise heat detectors, monitoring of building fire protection system flow, tamper and pressure switches, kitchen ANSUL systems, duct smoke detection, notification appliances, etc.

2. The fire alarm system will be monitored by a central station via cellular and UDACT dial out for alarm, supervisory and trouble conditions conforming with NFPA 72 (2013).

3. Fire alarm remote annunciator panel with microphone pickup and paging zones at the building main entry designated location as approved by the local Fire Department.

4. Manual pull stations will be located within 5' of all egress doors and at the stairwell entrances to each floor of Stairs A, C and D.

5. Fire alarm notification appliances shall be combination type adjustable watt tap speaker/ADA strobes located throughout all areas including, but not limited to; common corridors, mechanical rooms, classrooms, art rooms, cafetorium, gym, kitchen and other similar public spaces. Audibility and intelligibility of voice evacuation will require denser spacing of speakers and lower watt tap settings in large open areas. Assume corridor and public areas speaker/ADA strobes at 30' spacing, every classroom to have one speaker/ADA strobe.

6. System type smoke detectors will be provided throughout all corridors, stairwells, elevator machine room and lobbies, electric rooms and telecommunication rooms for early warning purposes. Heat detectors shall be provided in janitor's closets and mechanical rooms to avoid nuisance alarms. All electrical and communication rooms will have smoke detector remote indicator outside the door.

7. Duct smoke detection systems will be provided for HVAC air handling units producing greater than 2000cfm on the supply and return side. System shall consist of system type photoelectric smoke detector and duct housing, equipment shut-down relay, sampling tube and key switched remote test station.

8. The fire alarm system will monitor the pull stations, smoke detectors, heat detectors, sprinkler system flow and tamper switches and duct smoke detectors. Signaling line circuits shall be Class 'A' and the notification appliance circuits shall be Class 'A'.

9. The activation of a manual pull station or an initiating device will activate the building fire alarm notification devices and will transmit an addressable "alarm" signal to the fire alarm control panel and annunciator panel.

10. The system shall be provided with a battery back-up rated for a minimum of 24 hours stand-by and 15 minutes alarm backup capacity.

11. Key repository box will be provided at both the fire department primary and secondary building entrances.

12. Carbon monoxide protection will be provided in any rooms containing fossil fuel burning equipment such as, but not limited to: mechanical rooms, kitchen, classrooms.

H. Emergency Responder Radio System

1. An Emergency Responder Radio Coverage system will be provided for fire department and police department in compliance with Massachusetts 780 CMR 916 requirements, NFPA 72 requirements, and local Emergency Responders requirements.

2. The Emergency Responder Radio Coverage system shall consist of two separate BDA's, one VHF and one UHF.

   a. Fire Department: FD RX 453.8375 PL 151.4 TX 458.8375 PL 151.4
   b. Police Department: PD RX 155.580 PL 94.8 TX 159.000 PL 94.8

I. Wiring Devices and Specific Programming Needs

1. Refer to architectural programming/user group documentation for any specific wiring devices requirements. If such information is not available or limited, assume the following to supplement the design criteria

2. In all classrooms and special resource rooms, assume duplex receptacle wiring device every 12' on blank walls. Teacher's desk location should have double duplex receptacle wiring devices.

3. Coordinate with Architect if Classrooms/Art rooms will have computer PC workstation and smart board. If so, provide power, data, and A/V at each PC workstation and smart board.

4. For offices, guidance, counseling rooms, assume double duplex receptacle at desk location and one duplex receptacle on the other walls. Assume dedicated circuits for copiers, laser printers and similar office printing equipment.

5. In main Office, teacher's/staff room, library provide duplex receptacles at work stations plus dedicated duplex receptacles for copiers and laser printer locations.

6. One (1) duplex receptacle every 50' along corridors, gym, cafetorium, auditorium and other open areas.

7. Assume convenience GFCI duplex receptacle in restrooms, janitorial, mechanical and electrical rooms, and where located within 6' from a sink.

8. All non-locking type 125V, 15A and 20A receptacles shall be listed tamper-resistant.

J. Lightning Protection System

1. Provide a complete design build UL Master Label Lightning Protection (traditional lightning rods) System with interior concealed down leads and grounding with bonding to main electric service grounding.

K. Solar Photovoltaic (PV) Systems

1. Refer to Architectural program information and the Solar PV Consultant for future design build solar photovoltaic (PV) system. Electrical shall allow for provisions for future PV system interface.

L. Electric Vehicle Charging Stations

1. EV Ready Spaces: provide infrastructure for future one (1) dual-port electric vehicle charging station. The infrastructure shall include but not limited to: two (2) 40A-2P circuit breakers and branch circuits in 1" conduit identified with "EV READY" in the panelboard circuit directory and at the proposed EVSE stub-up location.

M. Permitting – submit all required Trade documentation per Town of Groton Building Department requirements.

N. STEM Room

1. Assume eight (8) ceiling power cord reels and ceiling receptacles. Use Hubbell InReach HBLI45123GF220M1 or approved equal.

O. Kiln Room

1. Provide power to electric kilns. Assume two (2) 60A-2P(ST) shunt-trip circuit breakers and branch circuits. Include safety disconnect switches, special receptacles and emergency power off (EPO) switch outside the Kiln Room to shunt-trip power at circuit breaker.

P. LEED

1. Provide testing and documentation in accordance with project requirements for LEED submission to achieve the target score indicated in NC for Schools V4 MEP REQUIREMENTS and LEED Scorecard.

A New Vision For Integrated Technology At Florence Roche Elementary

VANTAGE

Reliable and Effective Technology for Florence Roche Elementary School

The Groton Dunstable Regional School District is committed to providing reliable, safe, and effective technology throughout the new school, from classrooms outfitted with presentation technology systems to assembly spaces with enhanced feature sets.

The school's vision for learning and assembly space technology will provide the teaching, learning and presentation tools that faculty and students need today while establishing technical standards and providing a clear path for future growth in technology.

Contents

01
INTRODUCTION

Executive Summary

The Florence Roche Elementary school located at 342 Main St. in Groton offers a unique opportunity to inject new digital tools to shape the current methods and future vision of teaching. The new elementary school project is a great opportunity for teachers and learners to use "technology as a tool" to support new teaching methods and engage students. The new school will bring teaching technologies to current standards with the flexibility to adapt to technological and pedagogical shifts into the future.

Guiding Principles

As the design team collaborates with the Groton-Dunstable Regional School District, our decisions are being navigated by the following values:

Supportability & Usability

Comparing past user and support staff experiences with new ideas will assist in shaping the design intent of technology systems. The technology must be easily supportable on day one and convenient enough for faculty and students to operate so that they feel empowered with their new digital teaching tools.

Minimizing Cost

Different types of learning spaces fulfill different student and faculty needs. By focusing on simple, reliable and economical approaches in many spaces, classroom systems will be ubiquitous. Users will share the roles and responsibilities of digital competency throughout the faculty community.

Mobility

A digital shift in the pedagogy for elementary education has demanded flexibility for students and teachers to connect devices anywhere and at any time. The building infrastructure and systems required for these new methods of teaching will support, not only the current curriculum, but also adapt to changes in the future.

Improving Outcomes

Technology must always serve pedagogy, not the other way around. Rapid changes in instructional technology are allowing teachers to move beyond simple PowerPoint presentations to compelling multimedia experiences. Students now routinely use multiple devices as personalized learning tools. Classroom technology will facilitate pedagogical evolution by actively supporting these and other emerging trends.

02
AUDIOVISUAL SYSTEMS

Current audio-visual technologies offer a tremendous amount of options to build flexible systems that cover specific use cases. Below are some comparisons and descriptions of different pieces of audio-visual technologies that may be considered for the audio-visual systems.

Visual Display Systems: Projectors vs. Flat-Panel Video Monitors

Projectors produce larger image sizes, and screens can be retracted when not in use. Flat-panel video monitors provide superior image quality, but sizes are limited. Most are not big enough to provide adequate legibility in all but the smallest classrooms. They also perform better in brightly lit spaces (rejection of ambient light), can be used interactively, and do not have replaceable parts.

Writing Surfaces: Whiteboards vs. Annotation of Electronic Content

Writing surfaces, whether traditional or electronically enhanced, support both delivery of information and collaboration in the classroom. Traditional whiteboards, which can be as big as the wall on which they are located, provide ample space for conveying large amounts of information. Annotation of electronic content is limited to the size of the visual display, but allows interaction with electronic presentation material, which can be saved for future reference.

Audio-Visual Connectivity: Wall Plate vs. Wireless Connectivity

In the ideal world of the future, every teaching and learning device would be wirelessly connected to the network and content from each could be easily directed to the visual display. For the time being, as we prepare for ubiquitous wireless connectivity, wall plates may be required to connect laptops and other devices in some rooms.

System Control: Button Control Panels vs. Touchscreens

Button control panels are familiar to most users but can become confusing if too many functions (and buttons) are included. If the system is complex, touchscreen panels are easier to navigate, but they are expensive. In some rooms, cost factors may outweigh the ease-of-use advantage of these devices.

Online Testing

Online testing is becoming the standard mechanism where students may access testing materials within the classroom via their laptops. Adequate wireless network bandwidth is required for instances where a majority of students will be testing simultaneously, and virtualized exam proctoring will be considered.

Document Cameras

Document cameras can stretch beyond typical digital overhead projectors. The HD camera and USB connection can integrate with the right software, offering a lot of flexibility. For instance, the camera can be turned upward for videoconferencing or in-room video capture and test scoring can be automated using augmented reality software.

Active Learning

Active learning is a form of learning in which each student actively engages in the learning process. When integrated with technology tools and multimedia, active learning strategies such as collaborative learning groups, "think-pair-share" exercises, and reaction to movies and games facilitate the learning experience and enhance the atmosphere of the classroom.

Remote Management

There is often a heavy burden on support staff who manage large deployments of technology systems. Many devices that make up these systems have network connection capabilities which enable the opportunity to support them remotely. The ability to proactively monitor assets, system status, firmware updates, remote control access, etc. takes out much of that burden.

Room Types

Typical Classrooms

Includes: General Classroom, Special Education Classroom, Art Classroom, Small Group Room, and Resource Room

These spaces are designed to bring digital presentation and collaboration tools to empower teachers and engage students. The audio-visual system will allow teachers to interactively present digital material onto a video display and to collaborate wirelessly with students.

Video

- one (1) wall-mounted, interactive, ultrashort throw projector will be used as the main display screen

Audio

- one (1) voice-lift system with a lapel and handheld microphone
- ceiling mounted loud-speakers for voice-lift and program audio playback
- connection panel for a portable assistive listening system

Sources / Connectivity

- one (1) HDMI wall plate connection
- one (1) wireless presentation tool for collaborating wirelessly via laptops, tablets and mobile devices
- one (1) document camera with USB connection

Control

- one (1) wall-mounted control panel, simple button-type with volume knob for program playback level adjustment

Project Area

The Project Area is designed with simple digital presentation and collaboration tools and added features to enable software-based video conferencing (using Zoom, Skype, Google Hangout, etc.).

Video

- one (1) wall-mounted, interactive video display will be used as the main display screen

Audio

- display mounted speakers
- connection panel for a portable assistive listening system

Sources / Connectivity

- one (1) laptop HDMI connection panel, wall-mounted below the video display
- one (1) wireless presentation tool for collaborating wirelessly via laptops, tablets and mobile devices

Control

- one (1) wall-mounted control panel, simple button-type with volume knob for program playback level adjustment

Music Classroom

The Music Room technology is similar to the General Classrooms with additional audio features including wall mounted loudspeakers for improved sound/music reproduction and ceiling microphones for capturing rehearsals and/or performances. The space also includes a wall-mounted video display for presentation purposes.

Video

- one (1) wall-mounted, interactive, ultra-short throw project will be used as the main display screen

Audio

- one (1) voice-lift system with a lapel and handheld microphone
- two (2) wall-mounted, full range loud-speakers for program audio playback
- one (1) audio amplifier
- ceiling-mounted microphones for audio capture
- connection panel for recording device
- connection panel for a portable assistive listening system

Sources / Connectivity

- one (1) dedicated computer in fixed teaching station connected via HDMI wall plate connection
- one (1) Blu-ray/CD player in fixed teaching station
- one (1) document camera with USB connection to dedicated computer

Control

- one (1) wall-mounted control panel, simple button-type with volume knob for program audio level adjustment

Media Center

The Media Center is an interactive space with technology to support research and access to the most current digital information. Small workspaces will be provided to support group projects and individual work. General presentation capabilities via a wall mounted video display and voice-lift will be included to support professional development workshops and faculty assemblies.

Video Display

- an interactive, ultra-short throw projector will be used as the main display screen for the classroom
- there will be a video display within the space which will default to digital signage. They include AvoIP capabilities to merge and connect the space by wirelessly mirroring content ubiquitously.

Audio

- one (1) voice-lift system with a lapel and handheld microphone
- twelve (12) ceiling mounted loud-speakers for voice-lift and program audio playback

Sources / Connectivity

- one (1) dedicated computer in a fixed location connected via HDMI wall plate connection
- one (1) wireless presentation tool for collaborating wirelessly via laptops, tablets and mobile devices
- one (1) document camera with USB connection to dedicated computer
- one (1) guest laptop input panel

Control

- one (1) wall-mounted control panel, simple button-type with volume knob for program playback level adjustment

Cafeteria

The Cafeteria offers flexibility to be used not only as a dining area but also as a general assembly space. The area will have digital signage displays for cafeteria menu and general announcements, a large format projector and general presentation purposes, a distributed audio system with wireless microphones, and auxiliary audio and video inputs.

Video

- TBD video displays located with dual purpose use as menu boards and auxiliary video display monitors during presentations
- one (1) ceiling-mounted rear thrown projector

Audio

- one (1) wireless microphone system with two (2) handheld microphones
- wall-mounted loud-speakers for speech reinforcement and program audio playback
- one (1) auxiliary audio input panel
- connection panel for a portable assistive listening system
- loudspeaker paging via integrated VoIP network
- floor box I/O panel for wired microphone connections

Sources / Connectivity

- wall-mounted guest laptop HDMI connection panels

- wireless presentation tool for collaborating wirelessly via laptops, tablets and mobile devices
- two floor boxes onstage; each with one (1) guest laptop connection, two microphone inputs, and two monitor loudspeaker outputs.

Control

- one (1) wall-mounted control panel, simple button-type with volume knob for audio level adjustment
- one (1) table-top touch panel for technical control of the combine/divide room modes with enhanced audio and video routing features. Functions include:
  - system on/off
  - combine/divide state
  - screens up/down
  - source selection
  - display routing
  - program volume up/down/mute
  - microphone volume up/down/mute
  - basic audio mixing control – fader control, only

Gymnasium

The Gymnasium is used primarily used as physical education classroom space and may also be used as an assembly area for the school. There are two modes in which the space can be used: presentation and performance mode. In the presentation mode, the gym can be used as a standalone audiovisual presentation system. In performance mode, the gym may be used for theatrical, music and similar types of assemblies.

Video

- one (1) ceiling-mounted rear thrown projector
- one (1) video matrix switcher

Audio

- Loudspeakers:
  i) wall-mounted stereo point source loudspeakers
  ii) flown right and left delayed right channel point source loudspeakers.

Sources / Connectivity

- one (1) guest laptop connection wall plate on the west wall.
- one (1) wireless presentation tool for collaborating wirelessly via laptops, tablets and mobile devices
- one (1) Bluetooth connections
- one (1) assistive listening system with permanently installed transmitter, thirty-six (36) receivers, and nine (9) neck loops. The receivers and neck loops will be shared with the portable ALS transmitter(s) deployed throughout the school.
- one (1) wireless microphone system, each with one (1) handheld microphone and (1) head worn microphone.

Control

- two (2) table top control panels, one at plan north and one at plan south; simple button-type with volume knob. Functions include:
  - system on/off
  - screens up/down
  - source selection
  - program volume up/down/mute
  - microphone volume up/down/mute

Installation Equipment

- one (1) 45RU equipment rack shared with the Cafetorium located in the Storage Room.

STE Classroom / iLab

The STE Classroom will be used for technology room teaching and learning. The technology is similar to a typical Classroom with enhanced infrastructure to provide group work. A video production area with enhanced audio and video recording capabilities will be located in this space to assist with student media projects.

Video

- one (1) wall-mounted, interactive, ultra-short throw project will be used as the main display screen
- video recording system for student green screen production projects with the ability to connect student devices.

Audio

- one (1) voice-lift system with a lapel and handheld microphone
- ceiling mounted loud-speakers for voice-lift and program audio playback
- connection panel for a portable assistive listening system

Sources / Connectivity

- one (1) dedicated computer in fixed teaching station connected via HDMI wall plate connection
- one (1) wireless presentation tool for collaborating wirelessly via laptops, tablets and mobile devices
- one (1) document camera with USB connection to dedicated computer

Control

- one (1) wall-mounted control panel, simple button-type with volume knob for program playback level adjustment

Offices / Meeting Spaces

Includes: Principal Office and Conference Rooms

The design in these rooms offers simple presentation capabilities as a tool for local presentations and software-based videoconferencing for meeting with remote participants while conducting meetings.

Video

- one (1) wall-mounted 65" video display will be used as the main display screen
- one (1) wall-mounted USB video camera for software-based videoconferencing
- one (1) video matrix switcher

Audio

- tabletop microphones for videoconferencing
- two (2) ceiling mounted loudspeakers for program and videoconference audio playback
- connection panel for a portable assistive listening system

Sources / Connectivity

- one (1) dedicated computer
- one (1) tabletop laptop connection panel, located in cable cubby on conference table and connected to the video display via a floor box

- one (1) wireless presentation tool for collaborating wirelessly via laptops, tablets and mobile devices

Control

- one (1) tabletop control panel, simple button-type with volume knob for program playback level adjustment

Digital Signage

A streaming digital signage system will be used to display school announcements and cafeteria menus. The school's IT network will be used to distribute packaged high definition digital content via encoders and decoders to the main office, media center, and cafeteria. An owner appointed administrator will manage all of the digital content that is streamed to each wall-mounted video display throughout the building.

Each Digital Signage location will receive the following:

Video

- one (1) wall-mounted 55" video display, location to be confirmed with the Owner

Streaming Media Encoders/Decoders

- one (1) decoder

Paging System

A 70-volt paging system will be provided. All headend paging equipment will be located in the MDF and IDF, as required. Spaces which have audio reinforcement systems in place may be integrated into the paging system to share ceiling speakers with the classroom AV system(s). In spaces which there are no audio reinforcement systems, ceiling mounted speakers will be provided to support the paging system.

The master station will be located at Secretary and General Office area.

All paging zones will be coordinated and confirmed by the Owner.

Remote Management

In order to support the audio-visual systems effectively and efficiently throughout the building, there will be a single dashboard for asset management, system status, firmware updates, and remote control. The audio-visual devices will connect via the IT network and the remote management software will reside on an owner provided management server located in the MDF.

03 INFORMATION TECHNOLOGY INFRASTRUCTURE

General

This section focuses on the building's information transport system (ITS), the structured cabling system necessary to support the required services. It does not describe the applications, software, or services that will reside on the data networks. It does describe the features of servers, routers, telephone sets, or other hardware connected to the ITS.

Services

We expect that services will be required to support the following systems:

- Administrative data and computing functions
- Academic data and computing functions
- Security
- Audiovisual
- Building Management
- Telephone
- Fire Alarm
- Wireless
- Clocks

We assume services for all the above systems will use a common structured cabling system, although the network may use VLANs or QoS to virtually segregate or prioritize services.

Infrastructure

General

All infrastructure will be sized to allow 50% expansion of day-one requirements.

Telecommunications Spaces

1) New services will enter the building from the nearest manhole to the building's Main Point of Entry (MPOE), which will serve as the Entrance Facility (EF) and Equipment Room (ER). Equipment located in this room will serve as the Point of Presence (POP).
2) New Telecommunication Rooms (TRs) on each floor of each area will serve each respective part of the building.
3) Services to each TR will be provided from the building's core network switch, located in the EF/ER.
4) 208 VAC (L6-30R) and 120 VAC (L5-20R) will be provided above each equipment rack.
5) 4-post equipment racks will be installed in the EF/ER; 2-post equipment racks will be installed in TRs.

Wireway

Outside Plant

1) Outside plant pathways will consist of 4" conduits (quantity to be determined) from the nearest manhole to the EF/ER for access provider cabling to MSP equipment located in that room.
2) 24-strand single mode fiber optic cable will also enter the EF/ER from that manhole.
3) A temporary pathway is required between the new and existing buildings.

Backbone Cabling

1) 24-strand single mode fiber optic cable will be homerun from the EF/ER to each TR.
2) Multipair Cat 3 cabling is not required.

Horizontal Cabling

1) Four Cat 6 cables will be run from a patch panel in each TR to each face plate within the area served by that TR. Some locations, such as floor boxes or video surveillance cameras, may require different quantities.
2) Two Cat 6A cables will be run from a patch panel in each TR to a biscuit block above each wireless access point location.
3) Horizontal cabling will support PoE, 802.3at.

Grounding

1) A dedicated grounding system will be installed, as described in ANSI/TIA-607-C, as well as all applicable national, state, and local codes. If conflicts exist between the codes or between the codes and standards, the most stringent requirement will apply.

Faceplates and Outlets

1) Faceplates will typically consist of four copper connections on a 1-gang faceplate. Some locations, such as floor boxes or video surveillance cameras, may have different requirements. Terminations will use RJ-45 connectors. T568B pinout will be used on all RJ-45 connectors.
2) Faceplate finishes will be as directed by the Architect.

Patching, Switching, & Routing

1) Rack-mounted fiber enclosures with adapter panels will be provided in the EF/ER and each TR for patching fiber optic cabling to network switches. Termination types are to be determined.
2) All data network cross connects will be done via rack-mounted patch panels in the EF/ER and each TR. Patch cords will be supplied under the construction contract for installation by the Owner.

Wireless Network

1) Wireless network service will be provided throughout the building. The Owner will determine the locations of all wireless access points (WAPs) within the project and provide heat maps to the design team for coordination. WAPs will be supplied and installed by the Owner. Wiring and infrastructure, including junctions boxes and conduits, will be provided by the General Contractor.
2) Two Cat 6A cables will be run to each WAP location and terminated as directed by the Owner.

Network Electronics

1) All network electronics – switches, routers, etc. – will be supplied and installed by the Owner in racks within the EF/ER and TRs.

Uninterruptable Power Supplies and Power Distribution

1) An uninterruptable power supply (UPS) will be supplied, and rack mounted in the EF/ER and each TR by the Owner.
2) Power Distribution Units (PDUs) will be supplied and installed in racks within the EF/ER and TRs. The EF shall receive one (1) 30 amp/208V circuit per 2 racks using L6-30R outlets. Every rack must have at least 1 L6-30R. Four (4) standard 20 AMP 110/120V receptacles per rack.
3) A typical TR shall receive one (1) 30 amp/208V circuit using L6-30R outlets. Four (4) standard 20 AMP 110/120V receptacles per rack.
4) One (1) PDU per rack shall be provided per rack in each TR and two (2) PDU per rack shall be provided in the EF. Each PDU shall consist of L6-30P (input) and a minimum of (30) C13 outlets and (6) C19 outlets. Each PDU must have a digital ammeter display and integrated circuit breakers.

Television Distribution

1) Television distribution may be achieved via IPTV. If this work is required, wall space in the EF/ER and each TR will be available for wall-mounted devices.

Master Clock

1) An IP-based Master Clock system with an integrated paging speaker will be provided. The Master Clock system shall utilize the building's ITS for communication to each end point via NTP headend.

Phone System

1) The phone system will be provided via VoIP using the Mytel platform.
2) All phones and head end equipment will be provided by the Owner.
3) Locations include desktop phones at admin areas and wall-mounted at classroom doors.

Preferred Manufacturers

1) As a public facility, products may not be able to be specified as sole-source without justification. However, the ITS will be specified as a complete end-to-end system such that the permanent link will be certified for the rated performance.


Our World
Our Communities
Our Schools
TOGETHER WE ACHIEVE