

Mechanical, Electrical, Plumbing and
Fire Protection Systems
Concept Design Narrative

For

Middlebrook School
Wilton, CT

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OVERVIEW:

The following describes the proposed mechanical, electrical, plumbing and fire protection systems upgrades recommended for Middlebrook School, located in Wilton, Connecticut.

This narrative is meant to assist in the development of a conceptual pricing estimate for the purchase and installation of the MEP systems.

DIVISION 21 - FIRE PROTECTION SPRINKLER SYSTEM

Corridors throughout the original portion of building:

- Provide new sprinklers and any necessary branch piping rework to accommodate new ceilings. Sprinklers shall be concealed, fully recessed in finished areas with ceilings. Quick response sprinkler heads shall be used in light hazard locations. Sprinklers shall have a ½” orifice and a 165°F temperature rating.

6-Classroom Wing:

- Provide new sprinklers, mains, and branch piping for this area of the building, extended from the existing sprinkler system. Sprinklers shall be concealed, fully recessed in finished areas with ceilings. Quick response sprinkler heads shall be used in light hazard locations. Sprinklers shall have a ½” orifice and a 165°F temperature rating.

Piping for any required branch piping rework shall be steel pipe, ASTM A 53; Schedule 40 seamless carbon steel. Schedule 10 pipe shall be allowed for pipe sizes larger than 2” diameter when roll grooved mechanical couplings are used.

Fittings shall be grooved mechanical fittings: ANSI A21.10 ductile iron; ASTM A47 grade malleable iron. Couplings shall be ASTM A 536 ductile iron or malleable iron housing, EPDM gasket with nuts, bolts, locking pin, locking toggle or lugs to secure roll grooved pipe and fittings.

DIVISION 22 - PLUMBING SYSTEMS:

Boys and girls locker rooms:

- Provide new fixtures for the gang bathrooms in the boys and girls locker rooms.
 - All plumbing fixtures required to be accessible shall be in accordance with the Americans with Disabilities Act (ADA), 504 and UFAS standards.
 - Water closets and urinals shall be wall hung, vitreous china, low consumption by American Standard or approved equal. Flush valves shall be hardwired and sensor operated, and by Sloan or approved equal.
 - Lavatories shall be wall hung, solid synthetic surface with integral soap dispensers, by Bradley. Faucets shall be low consumption, manually operated.

- Wall hangers for water closets, urinals, and lavatories shall be heavy duty adjustable height type installed within chase spaces provided behind fixtures, by J.R. Smith or approved equal.
- Cast iron floor drains shall be installed at all single and gang toilet rooms. Heavy-duty cast iron floor drains & floor sinks shall be installed in the mechanical room. Floor sinks shall be provided in the kitchen area to receive indirect waste connections from kitchen sinks and other equipment. Floor sinks in the kitchen shall include $\frac{1}{2}$ or $\frac{3}{4}$ top grates as needed. Floor drains shall be by J.R. Smith or approved equal. Trap primers shall be provided for floor drains, floor sinks and indirect drains.

DIVISION 23 - MECHANICAL SYSTEMS

- The mechanical systems are based on heating and cooling the building while meeting the objective for energy efficiency. Heating design shall be 70 degrees and cooling design shall be 75 degrees.

23 09 23 HVAC Controls

“Old Gym”:

- Provide two packaged rooftop units with DX cooling and hot water heating coils. One unit for each side of the “Old Gym”. Each rooftop unit will be a single zone variable air volume system. Each unit will have a 8,000 cfm supply fan and return fan, an integral heating hot water coil (250 MBH) and DX cooling coil with modulating hot gas reheat (22 Tons). The Air handler shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO₂.

“New Gym”:

- Provide new chilled water coil in existing Trane air handling unit serving the “New Gym”. Provide modulating control valve, balancing valve, strainer and shutoff valves at chilled water coil.

Locker Rooms:

- Provide new hot water fin-tube radiation at perimeter.
- Provide new packed rooftop energy recovery ventilator (ERV) to serve both locker rooms. ERV shall be a single zone variable air volume system. The unit will have a 2,000 cfm supply fan and return fan, an integral heating hot water coil (100 MBH) and packaged DX cooling coil with modulating hot gas reheat (7 Tons). The ERV shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO₂. Provide new supply and exhaust ductwork, diffusers and registers.

Cafeteria:

- Provide two packed rooftop units to replace existing rooftop units. Each rooftop unit shall be a single zone variable air volume system. Each unit will have a 5,000 cfm supply fan and return fan, an integral heating hot water coil (180 MBH) and packaged DX cooling coil with

modulating hot gas reheat (15 Tons). The Air handler shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO2.

Corridors throughout the original portion of building:

- Provide new lay-in 2x2 diffusers and return grilles and any associated branch ductwork as required in all corridor ceilings in the original portion of the building.

Auditorium:

- Provide one grade-mounted packaged outdoor air handling unit with DX cooling and hot water heating coil. The unit will be a single zone variable air volume system. The unit will have a 20,000 cfm supply fan and return fan, an integral heating hot water coil (625 MBH) and DX cooling coil with modulating hot gas reheat (55 Tons). The Air handler shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO2. Provide new supply and return ductwork to replace existing in same location.

Stage:

- Provide one grade-mounted packaged outdoor air handling unit with DX cooling and hot water heating coil. The unit will be a single zone variable air volume system. The unit will have a 3,000 cfm supply fan and return fan, an integral heating hot water coil (95 MBH) and DX cooling coil with modulating hot gas reheat (8 Tons). The Air handler shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO2. Provide new supply and return ductwork to replace existing in same location.

Media Center:

- Provide four new packed rooftop units to replace existing four rooftop units. Each rooftop unit shall be a single zone variable air volume system. Each unit will have a 5,000 cfm supply fan and return fan, an integral heating hot water coil (180 MBH) and packaged DX cooling coil with modulating hot gas reheat (15 Tons). Each Air handler shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO2. Existing ductwork to remain.

Administration Offices:

- Provide two new packed rooftop units to replace existing two rooftop units. Each rooftop unit shall be a single zone variable air volume system. Each unit will have a 2,500 cfm supply fan and return fan, an integral heating hot water coil (90 MBH) and packaged DX cooling coil with modulating hot gas reheat (8 Tons). Each Air handler shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO2. Existing ductwork to remain.

6-Classroom Wing:

- Provide new packaged rooftop energy recovery ventilator (ERV) to replace existing ERV. ERV shall be a single zone variable air volume system. The unit will have a 2,700 cfm supply fan and return fan, an integral heating hot water coil (120 MBH) and packaged DX cooling coil with modulating hot gas reheat (8 Tons). The ERV shall be by Trane or approved equal.

The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO₂. Existing ductwork to remain. Existing VRF units to remain.

8-Classroom Wing:

- Provide new indoor dedicated outdoor air handling unit to replace existing unit. Unit shall have hot water and chilled water coils. Unit shall be by Trane or approved equal.
- Provide eight new fan coil units to replace existing eight fan coil units. Existing ductwork to remain.
- Extend existing Honeywell BMS to this wing of the building. Provide new field controllers for fan coil units and new temperature sensors in each space. Provide new hot water and chilled water control valves.

Two-Story Addition:

- Provide new 240-ton split air-cooled chiller to replace existing chiller. Unit shall be by Trane or approved equal.

All Classrooms in Original Portion of Building:

- Remove existing unit ventilators and block up existing through-wall vents.
- Remove existing condensing units serving unit ventilators and associated refrigerant piping.
- Provide four 2,000 CFM packaged rooftop energy recovery ventilators (ERV). ERVs shall be single zone variable air volume systems. Each unit will have a 2,000 cfm supply fan and return fan, an integral heating hot water coil (100 MBH) and packaged DX cooling coil with modulating hot gas reheat (8 Tons). The ERV shall be by Trane or approved equal. The unit will also incorporate demand control ventilation which will modulate the amount of outside air to the space based on occupancy and CO₂.
- Provide new roof mounted supply and exhaust ductwork from each ERV to classrooms served below. Each ERV shall serve a group of four classrooms and be located directly above the corridor in the middle of all four classrooms. Provide new diffusers and registers in each classroom.
- Provide new fin-tube radiation at exterior connected to existing hot water supply and return piping. provide new DDC control valves and thermostats connected to existing Honeywell BMS.

The existing Honeywell Building Management System (BMS) shall be extended to control and monitor all new HVAC equipment, control devices, and sensors.

- The system shall include a personal computer with graphics based display and capabilities for alarming off-site.
- The BMS shall provide temperature control for all HVAC systems and control select lighting in the building.
- The system shall be programmed for occupied/unoccupied cycles for the air handling equipment, with an override feature for spaces that would be utilized after-hours.
- The system shall monitor occupancy sensing devices and carbon dioxide sensing devices to control the amount of outside air being brought in to each classroom to assist in energy conservation.

- The BMS shall be accessible from any Web browser and mobile device with proper authorization.

Motors:

- All motors (fan and pump) 3 HP and larger shall be high efficiency and provided with VFD. VFDs shall be by ABB or approved equal.

Materials and Methods

Include the following basic materials and methods of construction:

- All ductwork and accessories shall meet SMACNA standards.
- Provide all HVAC equipment with extra set of filters.
- Seismic restraints shall be designed and installed as required per State of Connecticut Building Code and Fire Safety Code which requires the seal of a licensed professional engineer. Abovementioned professional engineer will be required to verify installation is correct and complete per seismic code. This includes piping, ductwork, equipment, and equipment bases.
- Provide glass fiber insulation for all hydronic piping and ductwork. Insulation shall be installed to meet the Energy Conservation Code.
- Provide firestopping around mechanical penetrations in accordance with fire stopping requirements. System shall be capable of maintaining against flame and gases. System shall be UL listed and comply with ASTM E814.
- Provide mechanical identification for mechanical systems. Identification shall comply with ANSI A13.1.
- All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Swing joints, expansion loops and expansion joints with proper anchors and guides shall be provided where shown.
- Provide vibration isolation for hydronic piping, ductwork, and equipment.
- Hydronic piping 2 1/2"φ and under shall be Type L copper. Piping 3" φ and over shall be ASTM A 53; Schedule 10 black steel pipe with welded, flanged or grooved joints.
- All equipment served by hydronic piping shall have isolation valves on the supply and return lines. Isolation valves shall also be provided at branch take-offs.

DIVISION 26 - ELECTRICAL SYSTEMS

Electrical Distribution

Provide power for all new HVAC equipment.

Lighting Systems

1. The following fixtures should be provided throughout the entire building:
 - (2) 2x4 Recessed LED fixtures in each office with dimming to support daylighting controls where practical.

- 2x2 LED recessed fixtures, 12 feet on center throughout the corridors.
 - 2x2 LED recessed fixtures in Classrooms. Spaced to satisfy required light levels.
 - (1) 12-foot run of Pendant mounted direct/indirect LED fixtures in conference rooms.
 - LED edge-lit exit signs, where required by code.
 - (1) 12-foot run of LED Perimeter mounted light fixtures in all bathrooms.
 - 4-foot industrial fixtures with wire guards in all electric rooms, mechanical spaces and unfinished areas without suspended ceilings. Space 10' on center.
 - Accent, exterior building mounted and feature lighting will be provided as selected by the Architect or Owner, in areas such as corridors, main lobby etc. and shall be controlled by a lighting control panel with BMS integration.
2. Exterior lighting will be provided at each egress door. Typical fixture shall be LED and wired to emergency generator or battery backup.
 3. Emergency lighting shall be accomplished using the Life Safety distribution system powered by generator or battery backup and shall be provided in all egress pathways and those areas described as having generator back-up power.
 4. Typical lighting illumination levels include:
 - 15fc - Corridors, toilet rooms, storage rooms and stairways
 - 30fc - Library, offices, cafeteria and utility rooms
 - 50fc - Gymnasium
 - 40fc – Classrooms, music, art, technical education, science room and kitchen
 5. Daylight sensors and dimming control shall be provided in all classrooms and other select rooms containing exterior window walls as required by code. The light fixture row closest to the window wall will be dimmed via a daylight sensor. The two remaining rows of lights will be able to be manually dimmed to 50% light output by the occupants via a pushbutton switch. There will be a media zone that controls the front of classroom fixtures separately. There will be one master on/off toggle switch for all the lighting in the room. This will allow turning off the lights and overriding the sensors.
 6. Occupancy sensors shall be provided in all lit areas except in utility rooms and other rooms exempted by code.
 7. Occupancy sensor switches with wall override shall be provided in all small offices, single occupancy toilet rooms, storage rooms and janitors closets.
 8. Corridor and stairwell lighting shall remain on during occupied hours, but will be controlled by occupancy sensors during unoccupied times. This will require communication with the building management system.
 9. Cafeteria and Gymnasium lighting shall be controlled via high bay occupancy sensors.

10. The Stage shall be provided with a theatrical lighting system as follows:

- Small scale Theatrical dimmer cabinet with relays capable of controlling (12-24) lighting circuits.
- Control board with computer and software.
- Stage lighting consisting of:
 - Remote spotlights – (20) LED color changing and movable fixtures
 - On-stage spotlights – (20) LED color changing and movable fixtures
 - On-stage wash lights – (20) LED color changing and movable fixtures
 - 6 stage pockets containing multiple circuits (2 SR, 2 SL, 1 rear and 1 on stage front) for lighting trees and miscellaneous applications.

 - On-stage lights will be mounted on support piping that is capable of being flown in and out for aiming, alteration and maintenance.

 - All lighting locations shall have DMX control wiring and multiple additional lighting circuits.

 - Stage will also be equipped with separately controlled 1x4 LED house lights.
- House lighting shall be multi-zoned LED fixtures capable of 100% dimming and independent of each zone. System shall consist of low voltage wall stations, and control interfaces.

Miscellaneous Systems

1. In each single occupancy toilet room, an emergency call-for-aid system will be provided. This will consist of a pull string located near the toilet and a combination buzzer/strobe located above the exterior of the door.