CONSULTANT NARRATIVES

FIRE PROTECTION, PLUMBING, MECHANICAL & ELECTRICAL

APPX. A - f

WMGLD
480 North Avenue
Wakefield, MA 01880
Tel. (781) 246-6363 Fax (781) 246-0419

Peter D. Dion, General Manager

December 7, 2020

Gilbert Castera, Jr.
Bala Consulting Engineers
522 Temple Place
Boston, MA 02111

RE: Northeast Metrotech Regional High School
Gas Service Availability
Bala Project No. 60-20-409

Dear Gilbert,

We have reviewed your letter of requested service and the responses to your stated questions can be found below:

1. Verification that the gas company will be able to extend a new gas service for this very important high school project.

Yes, extension of the gas main and a subsequent service is possible for purpose of this project.

2. Verification that the proposed gas service routing indicated on the attached site plan is feasible or would the gas company propose an alternate routing for consideration by the project design team?

Yes, the proposed route is feasible but WMGLD will confirm final route once a contractor is selected and the project is discussed with them.

3. Will there be a cost associated with extending the proposed gas service to the project site? Based on this preliminary gas service pipe routing can a preliminary range for the installation cost be identified?

Yes, there will be costs associated with the new main/service as well as a cost for metering and regulation and associated labor.
The approximate cost for metering and regulation is $15,000-$20,000.
The cost to extend the main would be approximately $230,000 depending on bids received from contractors. We can recommend that you have your contractors do the excavation as it would lower our cost to labor and materials which would be roughly $30,000. Your contractor must be qualified in gas work and approved by WMGLD prior to start of work. It is always an option to have us do the complete package at approximately $250,000 but that decision will be up to you and the cost will also be variable depending on bids received as well as changes in material price.

4. Will the preliminary total connected gas load be available to be supplied to the proposed building?

> *Yes, the preliminary total connected load of 20,950 CFH will be available to be supplied to the building*.

If you have any further questions, please feel free to contact us.

Sincerely,

Jimmy Brown

Jimmy Brown
Gas Superintendent

Cc: Raven Fournier – WMGLD
Vladimir Lubetsky – DRA
KJC, KJA, Bala

WMGLD
P.O. BOX 190 480 North Ave.
Wakefield, MA 01880
Tel. (781) 246-6363 Fax (781) 246-0419

Peter D. Dion, General Manager

December 2, 2020

Dear Kevin Alles,

The Wakefield Municipal Gas & Light Dept currently provides power to Northeast Metro Tech at 100 Hemlock Rd, Wakefield MA. We understand a new school is being planned and will be built next to the existing school. WMGLD is committed to providing power to the new Northeast Metro Tech and maintaining power to the existing school until it is no longer needed.

Regards,

Vinnie McMahon
Senior Engineer, WMGLD
vmcmahon@wmgld.com

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT – BASE REPAIR OPTION

I. FIRE PROTECTION

A. General:

1. The following systems narrative applies to the Base Repair building option based on the existing building area of 239,114 SF.
2. All existing sprinkler system piping and equipment is beyond its normal useful life expectancy and shall be demolished. All new systems shall be provided.
3. All occupiable and accessible areas of the building will be protected with a complete combination standpipe and wet suppression sprinkler system.
4. Work shall be performed using the “Method “B” Shared Design” process, from a “Fully Engineered” “design” set of documents which outlines the system and requires the Fire Protection Contractor to provide the “installation” set of documents, in conformance with the design criteria as set forth in the bid documents. Works shall be performed in accordance with the Building Code, NFPA, and the Local Authority.

B. System Requirements and Criteria are as follows:

1. Complete combination standpipe and hydraulically calculated, automatic overhead, wet suppression sprinkler systems, providing proper coverage to all areas of the high school building to be renovated. Dry sprinkler system for all exterior spaces if any that would be subject to use for storage as a loading dock or for any similar activity.

2. Eight inch dedicated/primary sprinkler water service which shall be extended from the site water main to all devices, equipment and heads. An 8 inch back up water supply is to also be planned from the opposite end of the building. (PIV if required). (Note: All dedicated site water piping, fire hydrants, etc., are required by law to be installed by a licensed Sprinkler Contractor.).

3. Double check type backflow preventor with supervised valves, repair kid, certified test and DEP permit for each of the two building service entries: primary and secondary.

4. Building fire department connections. Two shall be planned at this time based on the overall high school size and site configuration. Each fire department connection shall be located as to ensure access by the fire department and a fire hydrant located within 100 feet of each connection.
5. New water flow tests information will need to be obtained to allow hydraulic calculations, to verify whether or not a fire pump system will be required to support the proposed fire suppression system. Until that can be verified, we recommend that a fire pump system be assumed to be required.

6. Alarm check valves, valves and all piping, hangers, sprinkler heads and accessories. Quantity of alarm check valves anticipated sprinkler zone requirements for each high school building option will need to be established.

7. Based on the overall building area, each major building segment with an area not to exceed 52,000 SF per floor will be fed via a separate alarm check valve/system riser. Each of these risers are to supply a combination fire sandpipe and sprinkler system.

8. The fire standpipe system within a building segment will generally consist of a standpipe riser to be located in each required exit stairway and where otherwise required by code such as at the stage and at remote area of building segments that can't be reached with a 200 foot hose from a required hose valve connection. Each standpipe riser is to supply a hose valve per floor.

9. The sprinkler system within each building segment will start from one of the required fire standpipe risers with a control valve assembly for each floor.

10. Fire standpipe and sprinkler system zoning is to be consistent with the project phasing.

C. Specific Program requirements are as follows:

1. In general, the building will be designed as a light hazard occupancy and therefore a sprinkler spacing not exceed approximately 196 SF for all academic, administration and common area type spaces. Assume 150SF or less due to space configuration.

2. Shop type areas as the follow spaces: Automotive, Automotive/Body, Metal Fabrication, Plumbing, Electrical, Carpentry, Electrical, HVACR, Robotics and Automation will need to be designed as ordinary hazard group 2 and therefore sprinkler spacing not to exceed 120 SF. Assume 100 SF due to space configuration and irregularities. The more stringent requirements are to also apply to the following building spaces: kitchen, mechanical and utility rooms, storage rooms and similar spaces.

D. Additional requirements:

1. On the basis that phasing and temporary conditions will be required, the following should apply: capping and valving of services for future extension, maintaining of existing limited fire protection system and temporary and permanent service shutdowns will need to be coordinated with the phasing of the project.

1. Based on the extent and configuration of the existing building to be renovated, it is anticipated that (6) new system risers/alarm check valves will be required from which complete coverage is to be provided.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT – BASE REPAIR OPTION

I. PLUMBING

A. General:

1. The following systems narrative applies to the Base Repair building option based on the existing building area of 239,114 SF.

2. All existing plumbing systems are beyond their normal useful life expectancy and shall be demolished. All new systems shall be provided.

3. All work shall be performed in strict accordance with the State Building Code, the State Plumbing and Fuel Gas Codes, the plumbing inspector and all Local Codes and Ordinances.

B. System Requirements and Criteria are as Follows:

1. Six inch primary domestic water service to 10 feet-0 inch outside building wall for the existing high school building to be renovated. Four inch back up domestic water service to come in at the opposite end of the building. In the absence of water flow test data and based on the proposed site configuration, a domestic booster pump system is to be planned at this time.

2. A new natural gas service is being coordinated to be brought to the site. For the existing high school to be renovated, a new natural gas system is to be provided for the new Science Rooms, for the new heating plant, for the new Culinary classrooms and Restaurant and for the new domestic hot water heating plant with work beginning at the gas company meter. Each of the major gas system components such as Science Room gas outlets shall each be supplied with a dedicated gas system to be fed via a gas meter that shall also be monitored via the building automation system.

3. Internal storm water roof drainage systems from all flat roof areas, consisting of roof drains and all rainwater piping and accessories to points 10 feet outside of the building walls. It is to be assumed at this time that most building roof areas will need to be provided with a secondary roof drainage system. At this time, it is to be assumed that only a few isolated building roof segments may not require a secondary roof drainage system. This will need to be verified based on input and coordination with the Architect.

4. Complete sanitary, waste and vent system connecting to all fixtures and inlet connections and running to points 10 feet outside of the building walls.

5. Dedicated tempered water system including master mixing valve and dedicated tempered water circulation system to supply all emergency shower and eyewash units with a non-stagnant system for the science classrooms. A system will need to be planned for the vocational tech areas.

6. Dedicated special waste piping system serving Science Rooms and related areas susceptible to receive non-conventional waste and this system is to consist of:

    a. Central pH adjustment and monitoring system.

7. Reduced pressure backflow preventers on hot and cold water supply to the Science Classrooms. This dedicated system is to also include a circulation system with an integral hot water maintenance system.

8. Dedicated "grease waste" piping system from the Kitchen area and from the Culinary area and restaurant to 10 feet outside building wall, for continuation by Site/Civil from the site grease tank/interceptor. One central grease trap for the kitchen and separate for Culinary since these spaces are located apart. Refer to the Kitchen and Culinary areas for the extent of the plumbing work required to support the intended equipment. Provide allowance for two interior grease interceptors to support kitchen and restaurant. Provide allowance also for floor drains to support the intended equipment.

9. Domestic hot water shall be set up to be generated by gas fired hot water systems for the high school. Each set up shall have a mixing valve, all accessories and devices and a building pumped recirculation loop. Each Major building area will be supplied by a separate hot water system:

    a. Plumbing fixtures that are located too far away from the hot water systems described above will need to be supplied by separate point-of-use water heaters wherever feasible.

10. Complete interior sanitary, waste, vent, gas, cold water, 120°F hot water, 140°F hot water and two recirculation piping systems.

11. Main water meter with monitoring via building automation system. A sub-meter for each major system including the following: Kitchen, domestic hot water system.

12. Plumbing fixtures and trim, all new, commercial grade and high efficiency types for an anticipated approximately 40 percent water saving: 1.28/1.1 GPF dual flush water closets, 1/8 GPF urinals, 0.35 GPM lavatories, 1.5 GPM showers, 1.5 GPM Kitchen faucets, etc.

13. Freezeproof wall hydrants around the perimeter of all construction.

14. Drains, hose bibbs, valves, fittings, hangers and all miscellaneous pipeline accessories, including seismic support requirements.

15. Cleaning and testing of all fixtures, equipment and piping systems.

16. Disinfection of all domestic water piping systems.

17. Waste outlets to accept HVAC condensate and sprinkler waste discharges.

18. Insulation of all domestic water piping, roof drain bodies, storm water piping, water cooler drain piping and all exposed piping at handicapped fixtures.

19. All floor drains shall be provided with automatic trap primers.

20. Include allowance for floor drainage and hose bibbs in all mechanical type spaces and large toilet rooms (with two or more fixtures).

21. It is to be assumed that the following shops will be required to be provided, at a minimum, with a compressed air system to serve all required equipment and outlets, handwashing sink, a service sink, and all other required plumbing connections: Carpentry, Electrical, Robotics, and Automation, Metal Fabrication, Automobile, Auto Body, Plumbing, and HVAC/R. Some of these shops might be able to be supported from a single system. This will need to be verified.

22. It is to be assumed that according to current state elevator code, elevator pits will be required to include a drainage system. The system is to consist of a pit floor drain to discharge via gravity and is to be extended to the building sanitary system. At this time, we are proceeding under the assumption that each drain will discharge via an oil separator prior to the connection into the sanitary system

23. The Auto Body and the Automotive Shops will need to be provided with a dedicated floor drainage system that will need to be extended to a gas/oil separator system to be located outside the building.

24. A dedicated tempered water system shall also be planned to serve each of the emergency shower/eyewash unit required in the various shops noted above.

25. To satisfy the configuration of the building, it is anticipated that the building will be served by (2) central gas fired hot water systems and each system to include:

    1) 2) storage type units: For each option 250 gallon storage and 400 MBH input for 1250 students, 500 MBH for 1450 students, 600 MBH input for 1600 and 1660 students and 800 MBH input for 1722 students.

    2) Each unit to be of the condensing type as manufactured by PVI.

    3) For remote isolated areas away from the larger system, provide small storage type heaters similar to AO Smith DSE series.

26. Project consists of phased construction and phased demolition. Scope of Work is to include at a minimum the following:

    a. Capping of all services at the existing building exterior walls to allow demolition/removal of all interior plumbing systems as each existing building segment gets to be removed.

    b. Capping of all services that extend to supply the existing high school.

    c. All temporary and permanent service shutdowns to be completed shall be coordinated with the phasing of the project and with the corresponding site utility.

        1) Provide for all temporary service relocations to maintain existing building operational prior to demolition of existing systems to be replaced.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT – BASE REPAIR OPTION

I. HEATING, VENTILATING, AND AIR CONDITIONING

A. General:

1. The following systems narrative applies to the Base Repair building option based on the existing building area of 239,114 SF. System capacities are listed under Para. Q. System Capacities for Base Repair Option.

2. All existing HVAC systems are beyond their normal useful life expectancy and shall be demolished. All new systems shall be provided.

3. Systems are based on all electric heating and cooling for a large portion of the facility based on air-cooled variable refrigerant flow (VRF) systems or air-source hydronic heat pump systems.

4. A hot water boiler system is provided for pre-heating of outside air in rooftop air handling units, as well as heating at entrance vestibules, stairways, exit doors, loading dock, and utility spaces.

5. Air conditioning systems are all air-cooled.

B. Hot Water Heating System:

1. Provide three gas-fired condensing hot water boilers equal to Veissmann Vitocrosal Model 300.

2. Provide a pre-engineered Category 4 AL29-4C stainless steel vent system for each boiler. Provide direct combustion air to each boiler from an exterior louver.

3. Each boiler shall be provided with a constant volume primary boiler water circulation pump.

4. New boiler system shall include manufacturer’s boiler hot water reset controls and sequencing system.

C. Air-Source Hydronic Heat Pump Systems:

1. Units shall provide chilled water to serve zone sensible cooling fan terminal units and hot water to provide ventilation air reheating at the zone VAV terminal units.

2. Provide air-source modular or packaged hydronic heat pumps equal to Aermec, Technical Systems, or Multistack. Systems shall include primary hot water circulation pump package.

3. Units shall be capable of providing continuous heating down to -4 deg. F for preheating of rooftop unit ventilation air.

4. Units shall be capable of providing simultaneous heating and cooling.

D. Air-Source VRF Heat Pump Systems:

1. Units shall be variable refrigerant flow (FRF) air-source DX heat pump units serving all rooftop air handling units.

2. Multiple system modules shall be provided to meet capacity.

3. Units shall be capable of providing continuous heating down to -4 deg. F.

4. Units shall be capable of providing a changeover between heating and cooling as needed.

E. Pump Packages:

1. Provide three variable flow hot water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

2. Provide three variable flow primary chilled water pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

3. Provide three variable flow chilled water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

F. Piping:

1. The following piping distributions shall be provided.

a. Hot water secondary distribution from boiler system in main mechanical room to all rooftop air handling units and all heating terminals including cabinet unit heaters, unit heaters, radiant floors, and panel radiators.

b. Chilled water primary distribution from roof-mounted air-source hydronic heat pumps to main mechanical room.

c. Chilled water secondary piping distribution for air-source heat pump chilled water distribution from main mechanical room to chilled water coils in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/ changeover valve.

d. Hot water primary distribution from packaged primary pumps in roof-mounted air-source hydronic heat pumps to main mechanical room.

e. Hot water secondary piping distribution for air-source heat pump heating distribution from main mechanical room to heating coil in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/changeover valve for supplemental heat.

2. All main distribution piping 2-1/2” and larger shall be Schedule 40 carbon steel with welded joints or mechanical couplings equal to Victaulic. Piping 2” and less shall be Type L copper with mechanical coupling joints equal to Pro-Press.

3. Provide fiberglass pipe insulation with all service jacket on all piping to meet the MA energy code. Generally, 1-1/2” thickness required.

G. Classrooms:

1. Classrooms and support spaces shall be served by rooftop dedicated outside air ventilation supply air systems. Units shall be 100% outside air with total energy recovery wheels, MERV 8 and MERV 14 filters, and recirculation dampers. Cooling and primary heating shall be provided with a DX coil and remote VRF (variable refrigerant flow) heat pump condensing units. A hot water preheat coil shall be provided for preheating of outside air under low ambient temperature conditions. Supply and exhaust fans shall be variable speed with variable frequency drives.

2. Outside ventilation air shall be delivered to each classroom by connection to the primary VAV air inlet of the sensible cooling fan terminal unit.

3. Exhaust air shall be from a ceiling exhaust grille controlled by a VAV exhaust terminal.

4. Ventilation supply air to each classroom shall be controlled by a space carbon dioxide sensor.

H. Administration Area:

1. Provide a new variable refrigerant flow (VRF) heating and cooling system with ducted ceiling concealed fan coil units serving each zone. Locate heat recovery condensing unit on the roof and provide refrigerant piping distribution including branch selector boxes to serve each fan coil unit.

2. Provide a roof mounted energy recovery ventilator for ventilation air to all administration spaces. Provide constant volume supply ductwork distribution connected to the fan coil unit return air duct. Exhaust air shall be connected to ceiling diffusers in each space.

3. Library shall be provided with a separate VRF system and energy recovery ventilator.

I. Cafeteria/Kitchen:

1. Cafeteria shall be provided with a variable air volume rooftop air handling unit with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

2. Main kitchen and food trades kitchen air handling units shall be 100% makeup air units with recirculation capability interlocked with kitchen hood exhaust operation. Units shall have a DX cooling coil and hot water heating coil and remote VRF condensing units. Provide with mixing dampers, filters, and supply and return fans with variable frequency drives.

3. Provide kitchen hood exhaust fans for main kitchen and food trades kitchen. Fans shall be variable speed and interlocked with kitchen hood variable exhaust flow control system.

J. Auditorium & Stage:

1. Provide separate single-zone variable air volume rooftop air handling units with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

K. Shops:

1. Trade shops shall each be provided with an indoor heating and ventilating unit. All units shall have hot water heating coil, economizer mixing damper section, MERV 8 and MERV 13 filters, and variable speed supply fan with VFD.

2. H&V unit outside air shall be interlocked with exhaust system operation wherever possible.

3. Systems shall serve the following trade shops:

a. STEM Area

b. Electrical Shop

c. Maintenance Shop

d. HVAC Shop

e. Metal Fabrication Shop

f. Plumbing Shop

g. Carpentry Shop

h. Office Tech Area

i. Auto Body Shop

j. Auto Technology Shop

L. Concessions Building:

1. Provide energy recovery ventilator for Women's and Men's Rooms and concession space exhaust air and ventilation air. Unit shall be ducted for exhaust and outside air with connections to exterior louvers. Provide electric heating coil in the supply air for tempering.

2. Provide electric space heating units in each space: Women's, Men's, Concession, and Janitor's Closet.

M. Ductwork:

1. Ductwork systems serving spaces for ventilation, air conditioning, or heating shall be provided for the following:

a. Classroom dedicated outside air systems with central supply and exhaust distribution to each zone.

b. Rooftop air handling units serving dedicated areas with supply and return ductwork.

c. Supply and exhaust systems for energy recovery ventilators.

d. Local zone supply air ductwork for sensible cooling fan terminal units.

e. Local zone supply and return air ductwork for VRF fan coil units.

f. Local supply and return air ductwork distribution for trade shops.

2. All concealed supply ductwork shall be insulated with 2-inch duct wrap, R-6 minimum.

N. Specialty Exhaust Systems:

1. Provide separate dedicated exhaust systems including ductwork and exhaust fans to serve the following listed uses.

a. Laser cutter

b. 3D Printers

c. CNC machines

d. Art kilns with hoods and dedicated makeup air system

e. Dark room sink with hood.

f. Woodshop with outside dust collector

g. Vehicle exhaust

h. Paint spray booths with dedicated makeup air system

i. Welding booths

j. Welding benches

k. Science fume hoods.

O. Ductless Split heat pump Systems:

1. Provide separate dedicated ductless split cooling and heating systems including indoor fan coil unit and roof-mounted heat pump condensing unit to serve the following listed uses;

a. MDF room

b. IDF rooms

c. Elevator machine rooms

P. Automatic Temperature Controls:

1. Automatic temperature controls for building shall be direct digital DDC control building automation system (BAS) with web access interface. System shall be open protocol BACnet.

2. Manufacturer's controls for air-source heat pumps and boilers shall be integrated with the BAS via BACnet interface.

3. All VRF and ductless split system manufacturer's controls shall be integrated with the BAS through a BACnet interface.

4. All air handling units shall be provided with a DDC controller by the automatic temperature controls (ATC) sub-contractor. All field devices for unit operation shall be provided by the ATC sub-contractor.

5. Unitary controllers shall be provided for all terminal cooling and heating equipment including fan coil units, unit heaters, fin-tube radiation, fans, etc.

Q. System Capacities for Base Repair Option:

1. Building Area - 239,144 SF:

a. Gas-Fired Hot Water Boilers: (4) 1,400 MBH with 120 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 60 ton, 150 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 165 GPM, 7.5 HP ea.

2) Air-source heat pump primary chilled water: (3) 225 GPM, 7.5 HP ea.

3) Air-source heat pump secondary chilled water: (3) 225 GPM, 10 HP ea.

4) Air-source heat pump secondary hot water: (3) 225 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 11,000 CFM, (2) 24 ton VRF each.

2) Technology: (2) 12,000 CFM, (2) 25 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 7,500 CFM, 27 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 9,000 CFM, (2) 15 ton VRF

2) Cafeteria: 6,000 CFM, 20 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 30 tons

2) Media: 15 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 2,250 CFM

2) Media: 1,200 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 8,000 CFM

2) Automotive Technology: 12,000 CFM

3) Carpentry: 10,000 CFM

4) Electrical Technology: 11,000 CFM

5) HVAC Technology: 8,500 CFM

6) Metal Fabrication: 7,000 CFM

7) Plumbing & Pipefitting: 7,500 CFM

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT – BASE REPAIR OPTION

I. ELECTRICAL

A. General:

1. The following systems narrative applies to the Base Repair building option based on the existing building area of 239,114 SF.

2. All existing electrical systems are beyond their normal useful life expectancy and shall be demolished. All new systems shall be provided.

B. Main Electric Service:

1. Primary service will be provided from utility company primary services via an underground ductbank and manhole system to a new utility company pad mounted transformer.

2. Secondary service from the new pad mounted transformers will be underground to a main switchboard at 480/277V, 3-phase, 4-wire. Switchboard will be located in a main electric room.

C. New Normal Distribution System:

1. Main switchboard will be provided with surge protection (SPD) and ground fault protection on main and feeder devices.

   a. Switchboard will be double ended, rated 6,000A at 480/277V 3phase 4wire.

   b. Customer metering

   c. Separate free-standing section for fire pump feed

   d. PV breaker

   e. Remote shut off located in Administration area per fire dept.

   f. Include 25’L x 5’W x 5’D waterproof vault below switchboard for cable entry into bottom of switchboard.

2. 480/277V 3phase 4wire distribution will be provided to the following:

   a. 480/277V lighting panelboards located in electric closets within each building area on each floor.

   b. Transformers located in electric closets within each ground floor electric closet in each building to serve 208/120V distribution panels, distribution panels will serve 208/120 3phase 4wire panelboards within electric closets in each building, each floor.

c. 480/277V 3phase panelboard, step down transformer 480/277V to 208/120V 3phase 4wire, 208/120V 3phase 4wire panelboard at each Shop. Shop panelboards will be contactor controlled with remote push buttons within each Shop for emergency shutdown.

d. Transformer to serve Kitchen panelboard.

e. Transformer to serve Auditorium theatrical dimming system.

f. Distribution 480/277V 3phase 4wire distribution panel and panelboards located in each building to serve mechanical equipment.

g. Independent feeds from switchboard to large rooftop mechanical equipment.

h. Major mechanical throughout the building and located the roof.

i. Feeds to life safety and standby automatic transfer switches.

j. Distribution to Athletic field building. Distribution will be sized to serve building loads and athletic field lighting.

3. Surge protection will be provided in all 120/208V panelboards.

4. Distribution/panelboards and infrastructure to support PV system.

5. Underground distribution below building, include excavation for conduit routing, conduits stacked and supported by plastic spacers similar to concrete ductbanks outside of building footprint, concrete not required below building.

D. Emergency Distribution System:

1. Natural gas/Diesel (fuel source to be determined) generator.

2. Generator will be rated at 600kW, 480/277V 3phase 4wire, housed in a sound attenuated, ground mounted enclosure at the exterior of the building (with an integral base mounted fuel tank if diesel). Generator will be mounted on an elevated concrete platform for survivability.

3. Include integral 50% load bank and associated load bank breaker.

4. Include separate fire pump, life safety and standby power breakers.

5. Remote shut off located in Administration area per fire dept.

6. Separate automatic transfer switches shall be provided for Life Safety and Standby (non-life safety) loads.

7. Generator will power the following:

a. Emergency egress lighting and exit lighting in corridors, assembly areas, and stairwells.

b. Fire pump (if applicable).

c. Kitchen walk-in coolers and freezers.

d. Fire alarm system

e. Telephone system.

f. Security system.

g. IT MDF head-end equipment room and remote IT closets.

h. Cooling equipment associated MDF Room and IT closets.

i. Boilers and associated circulator pumps and controls.

j. Additional lighting in Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

k. HVAC ventilation equipment only (no air-conditioning) associated with the Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

l. Receptacles in Administration office area, Gymnasium and Cafeteria.

m. Elevator(s)

8. Life safety emergency panels will be located in two-hour rated electric closets. Emergency feeders not run underground or within two-hour vertical shafts will be two-hour MI type conductors.

9. Standby (non-emergency) loads will be located in separate closets.

10. A portable generator connection will be provided to meet National Electric Code Article 700 requirements to have a portable generator available while servicing the building generator.

E. Sustainable Design Intent LEED 4.0:

1. Sustainable Design Intent compliance will include:

a. Advanced measurement and verification of air conditioning, fans, lighting, and receptacle power via electronic sub-meters equal to E-Mon, D-Mon Class 2000 3-phase kWh and demand meters. Measurement and verification metering will be monitored by the Building Management System (BMS).

b. Plug and process load reductions through the use of vacancy/occupancy sensor controls for local convenience outlets in classrooms, offices, library and resource rooms. Open areas such as Media Center, and Kitchen will be equipped with relay panels controlled via the lighting control system, to reduce loads on a time schedule basis.

c. 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.

d. Empty conduit provisions will be provided for future green vehicles charger stations based on two percent of the available parking.

e. Empty conduits and space provisions will be provided for photovoltaic (PV) installations. Include conduits and space provisions for inverters at a minimum of three locations on Level 3 and/or Level 4 electric closets.

F. Lighting:

1. Luminaires will be dimmable LED. All luminaires will be suitable for respective utility rebate incentives.

2. Building mounted exterior lighting around the building perimeter, entry canopies, entry drives, parking areas, and walkways will be full cutoff LED type. All exterior lighting will be controlled via the building low voltage lighting control system.

3. Athletic field lighting will be provided.

G. Lighting Controls:

1. A low voltage lighting control system will be provided for all common areas including corridors, Cafeteria, Media Center, Gymnasium, exterior building and site lighting. Occupancy sensors and local system overrides will be provided at all locations.

2. Manual low voltage override switches to override the time of day lighting control schedules shall be provided. Override switches will permit extension of lighting control program as well as ON-OFF override for exiting the facility.

3. Lighting program for time of day schedules shall permit all lighting, including exterior to be turned off during non-occupied hours, reducing sky glow and light trespass. Activation of either fire alarm or intrusion detection system shall override the lighting program.

4. Vacancy and occupancy sensors will control lighting in all enclosed spaces including classrooms, offices, and utility type spaces. In addition, all spaces will be provided with local low voltage dimmable switching.

5. Daylight harvesting will be employed in all Cafeteria, Gymnasium, Media Center, perimeter classrooms, offices, and other spaces with substantial daylight utilizing daylight sensors in each space.

H. Auditorium:

1. A professional theatrical lighting system will be provided. (see theatrical lighting/dimming)

I. General Power:

1. Safety type duplex receptacles will be provided throughout the building in quantities to suit space programming.

2. Plug load reduction will be achieved by vacancy/occupancy sensors in classrooms, offices, and staff spaces, and circuits routed via relay panels, controlled via lighting control system time schedule for open areas such as Commons/Café, Kitchen and culinary areas.

3. Shops, duplex receptacles, heavy duty receptacles (20A, 30A, 40A 50A 120V and/or 208V 1phase), and/or direct connections with service disconnect switches will be provided at all shops to serve shop equipment in each respective shop.

4. Branch circuitry form building power and/or infrastructure from utility source to support Electrical Vehicle charging stations.

5. Connection will be provided at all mechanical equipment.

6. Connections will be provided all plumbing and fire protection equipment.

7. Connections will be provided at all motorized overhead doors, grates and partitions.

J. Fire Alarm System:

1. An automatic, fully supervised, analog addressable, voice evacuation system will be provided.

a. Manual pull stations (with tamperproof covers if applicable), at points of egress, and other locations as required to meet code.

b. Audible/visual units in corridors, classrooms, and throughout the building to meet code.

c. Visual only units in conference rooms, meeting rooms and small toilets.

d. Smoke detectors in corridors, electric, and telecommunications rooms, elevator lobbies, and elevator machine rooms.

e. Duct type smoke detectors with remote test stations at HVAC units per code, and within five feet of smoke/fire dampers including connections to all smoke/fire dampers.

f. Connections to all Fire Protection devices and Kitchen hood extinguishing system.

g. Connections to audio/visual systems, sound systems, and dimmed lighting controls.

h. Connections to roll-up/folding smoke/fire partitions.

i. 24 VDC magnetic hold open devices at smoke doors.

j. Remote annunciator at main entrance and secondary entrances as directed by Fire Department.

k. Master box and exterior beacon (quantity of beacons per Fire Department.

l. Wiring will be fire alarm MC cable.

m. Monitor Generator.

n. Monitor fire pump (if applicable)

K. Technology per Technology Section.

1. Cable tray will be provided at MDF Room and all IT Closets per IT scope.

2. Duplex receptacles and heavy-duty twist lock receptacles will be provided per IT scope.

3. Standby power will be provided to MDF Room and all IT Closets.

L. Integrated Intrusion, Access Control, CCTV, and Alarm System per Security Section.

M. System Capacities for Base Repair Options:

1. 239,114 KSF.

a. All systems as described above apply except, electric service would be 5,000A.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION B.2

I. FIRE PROTECTION

A. General:

1. The following systems narrative applies to the renovation/addition building option B.2 and applies to a range of building sizes based on student enrollment.

2. All existing sprinkler piping and systems shall be demolished, and new systems shall be provided.

3. All occupiable and accessible areas of the building will be protected with a complete combination standpipe and wet suppression sprinkler system.

4. Work shall be performed using the “Method “B” Shared Design” process, from a “Fully Engineered” “design” set of documents which outlines the system and requires the Fire Protection Contractor to provide the “installation” set of documents, in conformance with the design criteria as set forth in the bid documents. Works shall be performed in accordance with the Building Code, NFPA, and the Local Authority.

B. System Requirements and Criteria are as follows:

1. Complete combination standpipe and hydraulically calculated, automatic overhead, wet suppression sprinkler systems, providing proper coverage to all areas of the existing building to be renovated and the new high school building. Dry sprinkler system for all exterior spaces if any that would be subject to use for storage as a loading dock or for any similar activity.

2. Eight inch dedicated/primary sprinkler water service which shall be extended from the site water main to all devices, equipment and heads. An 8 inch back up water supply is to also be planned from the opposite end of the building. (PIV if required). (Note: All dedicated site water piping, fire hydrants, etc., are required by law to be installed by a licensed Sprinkler Contractor.).

3. Double check type backflow preventor with supervised valves, repair kid, certified test and DEP permit for each of the two building service entries: primary and secondary.

4. Building fire department connections. Two shall be planned at this time based on the overall high school size and site configuration. Each fire department connection shall be located as to ensure access by the fire department and a fire hydrant located within 100 feet of each connection.

5. New water flow tests information will need to be obtained to allow hydraulic calculations, to verify whether or not a fire pump system will be required to support the proposed fire suppression system. Until that can be verified, we recommend that a fire pump system be assumed to be required.

6. Alarm check valves, valves and all piping, hangers, sprinkler heads and accessories. Quantity of alarm check valves anticipated sprinkler zone requirements for each high school building option will need to be established.

7. Based on the overall building area, each major building segment with an area not to exceed 52,000 SF per floor will be fed via a separate alarm check valve/system riser. Each of these risers are to supply a combination fire sandpipe and sprinkler system.

8. The fire standpipe system within a building segment will generally consist of a standpipe riser to be located in each required exit stairway and where otherwise required by code such as at the stage and at remote area of building segments that can't be reached with a 200 foot hose from a required hose valve connection. Each standpipe riser is to supply a hose valve per floor.

9. The sprinkler system within each building segment will start from one of the required fire standpipe risers with a control valve assembly for each floor.

10. Fire standpipe and sprinkler system zoning is to be consistent with the project phasing.

C. Specific Program requirements are as follows:

1. In general, the building will be designed as a light hazard occupancy and therefore a sprinkler spacing not exceed approximately 196 SF for all academic, administration and common area type spaces. Assume 150SF or less due to space configuration.

2. Shop type areas as the follow spaces: Automotive, Automotive/Body, Metal Fabrication, Plumbing, Electrical, Carpentry, Electrical, HVACR, Robotics and Automation will need to be designed as ordinary hazard group 2 and therefore sprinkler spacing not to exceed 120 SF. Assume 100 SF due to space configuration and irregularities. The more stringent requirements are to also apply to the following building spaces: kitchen, mechanical and utility rooms, storage rooms and similar spaces.

D. Additional requirements:

1. On the basis that this option will include partial demolition, phasing and temporary conditions, the following should apply: capping and valving of services for future extension, maintaining of existing limited fire protection system and temporary and permanent service shutdowns will need to be coordinated with the phasing of the project.

2. Based on the extent and configuration of the existing building to be renovated, it is anticipated that (6) new system risers/alarm check valves will be required from which complete coverage is to be provided.

3. It will need to be confirmed if this option will require a fire standpipe system knowing that this requirement is normally only for buildings where the distance from the fire department access to the highest floor exceeds 30 feet. In any case, at a minimum a fire standpipe system will be require for the Auditorium/Stage. However, due to the extend of the building, size and configuration, assume at this time that the fire department will require a standpipe system.

4. A separate 8 inch water service will be provided to support a single alarm check valve that is to supply one sprinkler zone per floor for this proposed addition. The fire protection system for the building addition shall be interconnected with the main supply for the existing building to be fully renovated.

5. Assume a sprinkler system will not be required for the proposed 2-story parking garage to be classified as an open parking structure fully detached and separated from the remaining building structures, in which case a manual dry standpipe system shall suffice.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION B.2

I. PLUMBING

A. General:

1. The following systems narrative applies to the renovation/addition building option B.2 and applies to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. B. 30.

2. All work shall be performed in strict accordance with the State Building Code, the State Plumbing and Fuel Gas Codes, the plumbing inspector and all Local Codes and Ordinances.

B. System Requirements and Criteria are as Follows:

1. Six inch primary domestic water service to 10 feet-0 inch outside building wall for the new high school building. Four inch back up domestic water service to come in at the opposite end of the building. In the absence of water flow test data and based on the proposed site configuration, a domestic booster pump system is to be planned at this time.

2. A new natural gas service is being coordinated to be brought to the site. For the new high school, a new natural gas system is to be provided for the new Science Rooms, for the new heating plant, for the new Culinary classrooms and Restaurant and for the new domestic hot water heating plant with work beginning at the gas company meter. Each of the major gas system components such as Science Room gas outlets shall each be supplied with a dedicated gas system to be fed via a gas meter that shall also be monitored via the building automation system.

3. Internal storm water roof drainage systems from all flat roof areas, consisting of roof drains and all rainwater piping and accessories to points 10 feet outside of the building walls. It is to be assumed at this time that most building roof areas will need to be provided with a secondary roof drainage system. At this time, it is to be assumed that only a few isolated building roof segments may not require a secondary roof drainage system. This will need to be verified based on input and coordination with the Architect.

4. Complete sanitary, waste and vent system connecting to all fixtures and inlet connections and running to points 10 feet outside of the building walls.

5. Dedicated tempered water system including master mixing valve and dedicated tempered water circulation system to supply all emergency shower and eyewash units with a non-stagnant system for the science classrooms. A system will need to be planned for the vocational tech areas.

6. Dedicated special waste piping system serving Science Rooms and related areas susceptible to receive non-conventional waste and this system is to consist of:

a. Central pH adjustment and monitoring system.

7. Reduced pressure backflow preventers on hot and cold water supply to the Science Classrooms. This dedicated system is to also include a circulation system with an integral hot water maintenance system.

8. Dedicated "grease waste" piping system from the Kitchen area and from the Culinary area and restaurant to 10 feet outside building wall, for continuation by Site/Civil from the site grease tank/interceptor. One central grease trap for the kitchen and separate for Culinary since these spaces are located apart. Refer to the Kitchen and Culinary areas for the extent of the plumbing work required to support the intended equipment. Provide allowance for two interior grease interceptors to support kitchen and restaurant. Provide allowance also for floor drains to support the intended equipment.

9. Domestic hot water shall be set up to be generated by gas fired hot water systems for the high school. Each set up shall have a mixing valve, all accessories and devices and a building pumped recirculation loop. Each Major building area will be supplied by a separate hot water system:

    a. Plumbing fixtures that are located too far away from the hot water systems described above will need to be supplied by separate point-of-use water heaters wherever feasible.

10. Complete interior sanitary, waste, vent, gas, cold water, 120°F hot water, 140°F hot water and two recirculation piping systems.

11. Main water meter with monitoring via building automation system. A sub-meter for each major system including the following: Kitchen, domestic hot water system.

12. Plumbing fixtures and trim, all new, commercial grade and high efficiency types for an anticipated approximately 40 percent water saving: 1.28/1.1 GPF dual flush water closets, 1/8 GPF urinals, 0.35 GPM lavatories, 1.5 GPM showers, 1.5 GPM Kitchen faucets, etc.

13. Freezeproof wall hydrants around the perimeter of all construction.

14. Drains, hose bibbs, valves, fittings, hangers and all miscellaneous pipeline accessories, including seismic support requirements.

15. Cleaning and testing of all fixtures, equipment and piping systems.

16. Disinfection of all domestic water piping systems.

17. Waste outlets to accept HVAC condensate and sprinkler waste discharges.

18. Insulation of all domestic water piping, roof drain bodies, storm water piping, water cooler drain piping and all exposed piping at handicapped fixtures.

19. All floor drains shall be provided with automatic trap primers.

20. Include allowance for floor drainage and hose bibbs in all mechanical type spaces and large toilet rooms (with two or more fixtures).

21. It is to be assumed that the following shops will be required to be provided, at a minimum, with a compressed air system to serve all required equipment and

outlets, handwashing sink, a service sink, and all other required plumbing connections: Carpentry, Electrical, Robotics, and Automation, Metal Fabrication, Automobile, Auto Body, Plumbing, and HVAC/R. Some of these shops might be able to be supported from a single system. This will need to be verified.

22. It is to be assumed that according to current state elevator code, elevator pits will be required to include a drainage system. The system is to consist of a pit floor drain to discharge via gravity and is to be extended to the building sanitary system. At this time, we are proceeding under the assumption that each drain will discharge via an oil separator prior to the connection into the sanitary system

23. The Auto Body and the Automotive Shops will need to be provided with a dedicated floor drainage system that will need to be extended to a gas/oil separator system to be located outside the building.

24. A dedicated tempered water system shall also be planned to serve each of the emergency shower/eyewash unit required in the various shops noted above.

25. To satisfy the configuration of the building, it is anticipated that the building will be served by (2) central gas fired hot water systems each to consist of:

    1) (2) storage type units: For each option 250 gallon storage and 400 MBH input for 1250 students, 500 MBH for 1450 students, 600 MBH input for 1600 and 1660 students and 800 MBH input for 1722 students.

    2) Each unit to be of the condensing type as manufactured by PVI.

    3) For remote isolated areas away from the larger system, provide small storage type heaters similar to AO Smith DSE series

26. Dedicated garage drainage/waste system to support each parking garage structure option to extend to exterior gas/oil separator prior to extension into sanitary system.

27. Dedicated garage storm drainage system to support roof of parking structure for each of the parking structure options. Drainage system to extend to exterior gas/oil separator prior to extension into storm drainage system.

28. Parking structure to be provided from protected water system to feed hose bibbs for washdown as required.

29. Project consists of phased construction and phased demolition. Scope of Work is to include at a minimum the following:

    a. Capping of all services at the existing building exterior walls to allow demolition/removal of all interior plumbing systems as each existing building segment gets to be removed.

    b. Capping of all services that extend to supply the existing high school.

    c. All temporary and permanent service shutdowns to be completed shall be coordinated with the phasing of the project and with the corresponding site utility.

d. Provide for all temporary service relocations to maintain existing building operational prior to demolition and renovation.

30. To satisfy the variation of this option, it is anticipated a single gas fired hot water system will be able to supply the building except as noted below under item f). The system shall consist of (2) gas fired storage type condensing type water heaters:

a. 1250 students: 300 gallons and 800 MBH each.

b. 1450 students: 300 gallons and 1000 MBH each.

c. 1600 students: 400 gallons and 1200 MBH each.

d. 1660 students: 400 gallons and 1200 MBH each.

e. 1722 students: 400 gallons and 1,500 MBH each.

f. Remote isolated type spaces will be supplied each by a small electric type storage unit as manufactured by A.O. Smith DSE series. This requirement also applies to the Amenities Building.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION B.2

I. HEATING, VENTILATING, AND AIR CONDITIONING

A. General:

1. The following systems narrative applies to the renovation/addition building option B.2 and applies to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. Q. System Capacities for Enrollment Options.

2. All existing HVAC systems shall be demolished, and new systems shall be provided.

3. Systems are based on all electric heating and cooling for a large portion of the facility based on air-cooled variable refrigerant flow (VRF) systems or air-source hydronic heat pump systems.

4. A hot water boiler system is provided for pre-heating of outside air in rooftop air handling units, as well as heating at entrance vestibules, stairways, exit doors, loading dock, and utility spaces.

5. Air conditioning systems are all air-cooled.

B. Hot Water Heating System:

1. Provide three gas-fired condensing hot water boilers equal to Veissmann Vitocrosal Model 300.

2. Provide a pre-engineered Category 4 AL29-4C stainless steel vent system for each boiler. Provide direct combustion air to each boiler from an exterior louver.

3. Each boiler shall be provided with a constant volume primary boiler water circulation pump.

4. New boiler system shall include manufacturer’s boiler hot water reset controls and sequencing system.

C. Air-Source Hydronic Heat Pump Systems:

1. Units shall provide chilled water to serve zone sensible cooling fan terminal units and hot water to provide ventilation air reheating at the zone VAV terminal units.

2. Provide air-source modular or packaged hydronic heat pumps equal to Aermec, Technical Systems, or Multistack. Systems shall include primary hot water circulation pump package.

3. Units shall be capable of providing continuous heating down to -4 deg. F for preheating of rooftop unit ventilation air.

4. Units shall be capable of providing simultaneous heating and cooling.

D. Air-Source VRF Heat Pump Systems:

1. Units shall be variable refrigerant flow (FRF) air-source DX heat pump units serving all rooftop air handling units.

2. Multiple system modules shall be provided to meet capacity.

3. Units shall be capable of providing continuous heating down to -4 deg. F.

4. Units shall be capable of providing a changeover between heating and cooling as needed.

E. Pump Packages:

1. Provide three variable flow hot water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

2. Provide three variable flow primary chilled water pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

3. Provide three variable flow chilled water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

F. Piping:

1. The following piping distributions shall be provided;

a. Hot water secondary distribution from boiler system in main mechanical room to all rooftop air handling units and all heating terminals including cabinet unit heaters, unit heaters, radiant floors, and panel radiators.

b. Chilled water primary distribution from roof-mounted air-source hydronic heat pumps to main mechanical room.

c. Chilled water secondary piping distribution for air-source heat pump chilled water distribution from main mechanical room to chilled water coils in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/ changeover valve.

d. Hot water primary distribution from packaged primary pumps in roof-mounted air-source hydronic heat pumps to main mechanical room.

e. Hot water secondary piping distribution for air-source heat pump heating distribution from main mechanical room to heating coil in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/changeover valve for supplemental heat.

2. All main distribution piping 2-1/2” and larger shall be Schedule 40 carbon steel with welded joints or mechanical couplings equal to Victaulic. Piping 2” and less shall be Type L copper with mechanical coupling joints equal to Pro-Press.

3. Provide fiberglass pipe insulation with all service jacket on all piping to meet the MA energy code. Generally 1-1/2” thickness required.

G. Classrooms:

1. Classrooms and support spaces shall be served by rooftop dedicated outside air ventilation supply air systems. Units shall be 100% outside air with total energy recovery wheels, MERV 8 and MERV 14 filters, and recirculation dampers. Cooling and primary heating shall be provided with a DX coil and remote VRF (variable refrigerant flow) heat pump condensing units. A hot water preheat coil shall be provided for preheating of outside air under low ambient temperature conditions. Supply and exhaust fans shall be variable speed with variable frequency drives.

2. Outside ventilation air shall be delivered to each classroom by connection to the primary VAV air inlet of the sensible cooling fan terminal unit.

3. Exhaust air shall be from a ceiling exhaust grille controlled by a VAV exhaust terminal.

4. Ventilation supply air to each classroom shall be controlled by a space carbon dioxide sensor.

H. Administration Area:

1. Provide a new variable refrigerant flow (VRF) heating and cooling system with ducted ceiling concealed fan coil units serving each zone. Locate heat recovery condensing unit on the roof and provide refrigerant piping distribution including branch selector boxes to serve each fan coil unit.

2. Provide a roof mounted energy recovery ventilator for ventilation air to all administration spaces. Provide constant volume supply ductwork distribution connected to the fan coil unit return air duct. Exhaust air shall be connected to ceiling diffusers in each space.

3. Library shall be provided with a separate VRF system and energy recovery ventilator.

I. Cafeteria/Kitchen:

1. Cafeteria shall be provided with a variable air volume rooftop air handling unit with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

2. Main kitchen and food trades kitchen air handling units shall be 100% makeup air units with recirculation capability interlocked with kitchen hood exhaust operation. Units shall have a DX cooling coil and hot water heating coil and remote VRF condensing units. Provide with mixing dampers, filters, and supply and return fans with variable frequency drives.

3. Provide kitchen hood exhaust fans for main kitchen and food trades kitchen. Fans shall be variable speed and interlocked with kitchen hood variable exhaust flow control system.

J. Auditorium & Stage:

1. Provide separate single-zone variable air volume rooftop air handling units with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

K. Shops:

1. Trade shops shall each be provided with an indoor heating and ventilating unit. All units shall have hot water heating coil, economizer mixing damper section, MERV 8 and MERV 13 filters, and variable speed supply fan with VFD.

2. H&V unit outside air shall be interlocked with exhaust system operation wherever possible.

3. Systems shall serve the following trade shops:

a. STEM Area

b. Electrical Shop

c. Maintenance Shop

d. HVAC Shop

e. Metal Fabrication Shop

f. Plumbing Shop

g. Carpentry Shop

h. Office Tech Area

i. Auto Body Shop

j. Auto Technology Shop

L. Concessions Building:

1. Provide energy recovery ventilator for Women's and Men's Rooms and concession space exhaust air and ventilation air. Unit shall be ducted for exhaust and outside air with connections to exterior louvers. Provide electric heating coil in the supply air for tempering.

2. Provide electric space heating units in each space: Women's, Men's, Concession, and Janitor's Closet.

M. Ductwork:

1. Ductwork systems serving spaces for ventilation, air conditioning, or heating shall be provided for the following:

a. Classroom dedicated outside air systems with central supply and exhaust distribution to each zone.

b. Rooftop air handling units serving dedicated areas with supply and return ductwork.

c. Supply and exhaust systems for energy recovery ventilators.

d. Local zone supply air ductwork for sensible cooling fan terminal units.

e. Local zone supply and return air ductwork for VRF fan coil units.

f. Local supply and return air ductwork distribution for trade shops.

2. All concealed supply ductwork shall be insulated with 2-inch duct wrap, R-6 minimum.

N. Specialty Exhaust Systems:

1. Provide separate dedicated exhaust systems including ductwork and exhaust fans to serve the following listed uses;

a. Laser cutter

b. 3D Printers

c. CNC machines

d. Art kilns with hoods and dedicated makeup air system

e. Dark room sink with hood.

f. Woodshop with outside dust collector

g. Vehicle exhaust

h. Paint spray booths with dedicated makeup air system

i. Welding booths

j. Welding benches

k. Science fume hoods.

O. Ductless Split heat pump Systems:

1. Provide separate dedicated ductless split cooling and heating systems including indoor fan coil unit and roof-mounted heat pump condensing unit to serve the following listed uses;

a. MDF room

b. IDF rooms

c. Elevator machine rooms

P. Automatic Temperature Controls:

1. Automatic temperature controls for building shall be direct digital DDC control building automation system (BAS) with web access interface. System shall be open protocol BACnet.

2. Manufacturer's controls for air-source heat pumps and boilers shall be integrated with the BAS via BACnet interface.

3. All VRF and ductless split system manufacturer's controls shall be integrated with the BAS through a BACnet interface.

4. All air handling units shall be provided with a DDC controller by the automatic temperature controls (ATC) sub-contractor. All field devices for unit operation shall be provided by the ATC sub-contractor.

5. Unitary controllers shall be provided for all terminal cooling and heating equipment including fan coil units, unit heaters, fin-tube radiation, fans, etc.

Q. System Capacities for Enrollment Options:

1. 1,250 Students.

a. Gas-Fired Hot Water Boilers: (4) 1,800 MBH with 160 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 80 ton, 200 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 220 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 300 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 300 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 14,500 CFM, (2) 30 ton VRF each.

2) Technology: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 12,000 CFM, (2) 20 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 20 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,500 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 8,000 CFM

2) Automotive Technology: 15,000 CFM

3) Carpentry: 12,000 CFM

4) Electrical Technology: 14,600 CFM

5) HVAC Technology: 11,000 CFM

6) Metal Fabrication: 8,800 CFM

7) Plumbing & Pipefitting: 9,800 CFM

2. 1,400 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,000 MBH with 180 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 90 ton, 220 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 240 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 330 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 330 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 330 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

2) Technology: (2) 17,300 CFM, (2) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 13,000 CFM, (1) 20 ton & (1) 24 ton VRF

2) Cafeteria: 9,000 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 24 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,700 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 16,000 CFM

2) Automotive Technology: 17,000 CFM

3) Carpentry: 14,700 CFM

4) Electrical Technology: 13,400 CFM

5) HVAC Technology: 10,700 CFM

6) Metal Fabrication: 12,200 CFM

7) Plumbing & Pipefitting: 13,400 CFM

3. 1,600 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 100 ton, 240 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 360 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 360 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 17,600 CFM, (2) 36 ton VRF each.

2) Technology: (2) 19,600 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 15,600 CFM, (2) 27 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,000 CFM

2) Automotive Technology: 19,500 CFM

3) Carpentry: 15,500 CFM

4) Electrical Technology: 18,900 CFM

5) HVAC Technology: 14,250 CFM

6) Metal Fabrication: 11,200 CFM

7) Plumbing & Pipefitting: 12,700 CFM

4. 1,660 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 105 ton, 250 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 380 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 380 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,000 CFM, (2) 36 ton VRF each.

2) Technology: (2) 20,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,000 CFM, (2) 27 ton VRF

2) Cafeteria: 8,300 CFM, 27 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,700 CFM

2) Automotive Technology: 19,800 CFM

3) Carpentry: 16,200 CFM

4) Electrical Technology: 19,600 CFM

5) HVAC Technology: 14,400 CFM

6) Metal Fabrication: 11,600 CFM

7) Plumbing & Pipefitting: 13,000 CFM

5. 1,722 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 110 ton, 260 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 400 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 400 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,400 CFM, (1) 36 & (1) 40 ton VRF each.

2) Technology: (2) 21,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,600 CFM, (1) 27 ton & (1) 30 ton VRF

2) Cafeteria: 8,600 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 11,000 CFM

2) Automotive Technology: 20,600 CFM

3) Carpentry: 16,900 CFM

4) Electrical Technology: 20,200 CFM

5) HVAC Technology: 15,000 CFM

6) Metal Fabrication: 12,000 CFM

7) Plumbing & Pipefitting: 13,500 CFM

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION B.2

I. ELECTRICAL

A. General:

1. The following systems narrative applies to the renovation/addition building option B.2 and applies to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. M. System Capacities for Enrollment Options.

B. Main Electric Service:

1. Primary service will be provided from utility company primary services via an underground ductbank and manhole system to a new utility company pad mounted transformer.

2. Secondary service from the new pad mounted transformers will be underground to a main switchboard at 480/277V, 3-phase, 4-wire. Switchboard will be located in a main electric room.

C. New Normal Distribution System:

1. Main switchboard will be provided with surge protection (SPD) and ground fault protection on main and feeder devices.

   a. Switchboard will be double ended, rated 6,000A at 480/277V 3phase 4wire.

   b. Customer metering

   c. Separate free-standing section for fire pump feed

   d. PV breaker

   e. Remote shut off located in Administration area per fire dept.

   f. Include 25’L x 5’W x 5’D waterproof vault below switchboard for cable entry into bottom of switchboard.

2. 480/277V 3phase 4wire distribution will be provided to the following:

   a. 480/277V lighting panelboards located in electric closets within each building area on each floor.

   b. Transformers located in electric closets within each ground floor electric closet in each building to serve 208/120V distribution panels, distribution panels will serve 208/120 3phase 4wire panelboards within electric closets in each building, each floor.

   c. 480/277V 3phase panelboard, step down transformer 480/277V to 208/120V 3phase 4wire, 208/120V 3phase 4wire panelboard at each Shop. Shop

panelboards will be contactor controlled with remote push buttons within each Shop for emergency shutdown.

d. Transformer to serve Kitchen panelboard.

e. Transformer to serve Auditorium theatrical dimming system.

f. Distribution 480/277V 3phase 4wire distribution panel and panelboards located in each building to serve mechanical equipment.

g. Independent feeds from switchboard to large rooftop mechanical equipment.

h. Major mechanical throughout the building and located the roof.

i. Feeds to life safety and standby automatic transfer switches.

j. Distribution to Athletic field building. Distribution will be sized to serve building loads and athletic field lighting.

3. Surge protection will be provided in all 120/208V panelboards.

4. Distribution/panelboards and infrastructure to support PV system.

5. Underground distribution below building, include excavation for conduit routing, conduits stacked and supported by plastic spacers similar to concrete ductbanks outside of building footprint, concrete not required below building.

D. Emergency Distribution System:

1. Natural gas/Diesel (fuel source to be determined) generator.

2. Generator will be rated at 600kW, 480/277V 3phase 4wire, housed in a sound attenuated, ground mounted enclosure at the exterior of the building (with an integral base mounted fuel tank if diesel). Generator will be mounted on an elevated concrete platform for survivability.

3. Include integral 50% load bank and associated load bank breaker.

4. Include separate fire pump, life safety and standby power breakers.

5. Remote shut off located in Administration area per fire dept.

6. Separate automatic transfer switches shall be provided for Life Safety and Standby (non-life safety) loads.

7. Generator will power the following:

a. Emergency egress lighting and exit lighting in corridors, assembly areas, and stair-wells.

b. Fire pump (if applicable).

c. Kitchen walk-in coolers and freezers.

d. Fire alarm system

e. Telephone system.

f. Security system.

g. IT MDF head-end equipment room and remote IT closets.

h. Cooling equipment associated MDF Room and IT closets.

i. Boilers and associated circulator pumps and controls.

j. Additional lighting in Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

k. HVAC ventilation equipment only (no air-conditioning) associated with the Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

l. Receptacles in Administration office area, Gymnasium and Cafeteria.

m. Elevator(s)

8. Life safety emergency panels will be located in two-hour rated electric closets. Emergency feeders not run underground or within two-hour vertical shafts will be two-hour MI type conductors.

9. Standby (non-emergency) loads will be located in separate closets.

10. A portable generator connection will be provided to meet National Electric Code Article 700 requirements to have a portable generator available while servicing the building generator.

E. Sustainable Design Intent LEED 4.0:

1. Sustainable Design Intent compliance will include:

a. Advanced measurement and verification of air conditioning, fans, lighting, and receptacle power via electronic sub-meters equal to E-Mon, D-Mon Class 2000 3-phase kWh and demand meters. Measurement and verification metering will be monitored by the Building Management System (BMS).

b. Plug and process load reductions through the use of vacancy/occupancy sensor controls for local convenience outlets in classrooms, offices, library and resource rooms. Open areas such as Media Center, and Kitchen will be equipped with relay panels controlled via the lighting control system, to reduce loads on a time schedule basis.

c. 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.

d. Empty conduit provisions will be provided for future green vehicles charger stations based on two percent of the available parking.

e. Empty conduits and space provisions will be provided for photovoltaic (PV) installations. Include conduits and space provisions for inverters at a minimum of three locations on Level 3 and/or Level 4 electric closets.

F. Lighting:

1. Luminaires will be dimmable LED. All luminaires will be suitable for respective utility rebate incentives.

2. Building mounted exterior lighting around the building perimeter, entry canopies, entry drives, parking areas, and walkways will be full cutoff LED type. All exterior lighting will be controlled via the building low voltage lighting control system.

3. Athletic field lighting will be provided.

G. Lighting Controls:

1. A low voltage lighting control system will be provided for all common areas including corridors, Cafeteria, Media Center, Gymnasium, exterior building and site lighting. Occupancy sensors and local system overrides will be provided at all locations.

2. Manual low voltage override switches to override the time of day lighting control schedules shall be provided. Override switches will permit extension of lighting control program as well as ON-OFF override for exiting the facility.

3. Lighting program for time of day schedules shall permit all lighting, including exterior to be turned off during non-occupied hours, reducing sky glow and light trespass. Activation of either fire alarm or intrusion detection system shall override the lighting program.

4. Vacancy and occupancy sensors will control lighting in all enclosed spaces including classrooms, offices, and utility type spaces. In addition, all spaces will be provided with local low voltage dimmable switching.

5. Daylight harvesting will be employed in all Cafeteria, Gymnasium, Media Center, perimeter classrooms, offices, and other spaces with substantial daylight utilizing daylight sensors in each space.

H. Auditorium:

1. A professional theatrical lighting system will be provided. (see theatrical lighting/dimming)

I. General Power:

1. Safety type duplex receptacles will be provided throughout the building in quantities to suit space programming.

2. Plug load reduction will be achieved by vacancy/occupancy sensors in classrooms, offices, and staff spaces, and circuits routed via relay panels, controlled via lighting control system time schedule for open areas such as Commons/Café, Kitchen and culinary areas.

3. Shops, duplex receptacles, heavy duty receptacles (20A, 30A, 40A 50A 120V and/or 208V 1phase), and/or direct connections with service disconnect switches will be provided at all shops to serve shop equipment in each respective shop.

4. Branch circuitry form building power and/or infrastructure from utility source to support Electrical Vehicle charging stations.

5. Connection will be provided at all mechanical equipment.

6. Connections will be provided all plumbing and fire protection equipment.

7. Connections will be provided at all motorized overhead doors, grates and partitions.

J. Fire Alarm System:

1. An automatic, fully supervised, analog addressable, voice evacuation system will be provided.

a. Manual pull stations (with tamperproof covers if applicable), at points of egress, and other locations as required to meet code.

b. Audible/visual units in corridors, classrooms, and throughout the building to meet code.

c. Visual only units in conference rooms, meeting rooms and small toilets.

d. Smoke detectors in corridors, electric, and telecommunications rooms, elevator lobbies, and elevator machine rooms.

e. Duct type smoke detectors with remote test stations at HVAC units per code, and within five feet of smoke/fire dampers including connections to all smoke/fire dampers.

f. Connections to all Fire Protection devices and Kitchen hood extinguishing system.

g. Connections to audio/visual systems, sound systems, and dimmed lighting controls.

h. Connections to roll-up/folding smoke/fire partitions.

i. 24 VDC magnetic hold open devices at smoke doors.

j. Remote annunciator at main entrance and secondary entrances as directed by Fire Department.

k. Master box and exterior beacon (quantity of beacons per Fire Department.

l. Wiring will be fire alarm MC cable.

m. Monitor Generator.

n. Monitor fire pump (if applicable)

K. Technology per Technology Section.

1. Cable tray will be provided at MDF Room and all IT Closets per IT scope.

2. Duplex receptacles and heavy-duty twist lock receptacles will be provided per IT scope.

3. Standby power will be provided to MDF Room and all IT Closets.

L. Integrated Intrusion, Access Control, CCTV, and Alarm System per Security Section.

M. System Capacities per Enrollment Options:

1. 1,250 Students, 315KSF.
    a. All systems as described above apply except, electric service would be 5,000A.
2. 1,400 Students, 344KSF.
    a. All systems as described above apply except, electric service would be 5,000A.
3. 1,600 Students, 383KSF.
    a. All systems as described above apply.
4. 1,660 Students, 394KSF.
    a. All systems as described above apply.
5. 1,722 Students, 405KSF.
    a. All systems as described above apply.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.1

I. FIRE PROTECTION

A. General:

1. The following systems narrative applies to new building option C.1 and applies to a range of building sizes based on student enrollment.

2. All occupiable and accessible areas of the building will be protected with a complete combination standpipe and wet suppression sprinkler system.

3. Work shall be performed using the “Method “B” Shared Design” process, from a “Fully Engineered” “design” set of documents which outlines the system and requires the Fire Protection Contractor to provide the “installation” set of documents, in conformance with the design criteria as set forth in the bid documents. Works shall be performed in accordance with the Building Code, NFPA, and the Local Authority.

B. System Requirements and Criteria are as follows:

1. Complete combination standpipe and hydraulically calculated, automatic overhead, wet suppression sprinkler systems, providing proper coverage to all areas of the new high school building. Dry sprinkler system for all exterior spaces if any that would be subject to use for storage as a loading dock or for any similar activity.

2. Eight inch dedicated/primary sprinkler water service which shall be extended from the site water main to all devices, equipment and heads. An 8 inch back up water supply is to also be planned from the opposite end of the building. (PIV if required). (Note: All dedicated site water piping, fire hydrants, etc., are required by law to be installed by a licensed Sprinkler Contractor.).

3. Double check type backflow preventor with supervised valves, repair kid, certified test and DEP permit for each of the two building service entries: primary and secondary.

4. Building fire department connections. Two shall be planned at this time based on the overall high school size and site configuration. Each fire department connection shall be located as to ensure access by the fire department and a fire hydrant located within 100 feet of each connection.

5. New water flow tests information will need to be obtained to allow hydraulic calculations, to verify whether or not a fire pump system will be required to support the proposed fire suppression system. Until that can be verified, we recommend that a fire pump system be assumed to be required.

6. Alarm check valves, valves and all piping, hangers, sprinkler heads and accessories. Quantity of alarm check valves anticipated sprinkler zone requirements for each high school building option will need to be established.

7. Based on the overall building area, each major building segment with an area not to exceed 52,000 SF per floor will be fed via a separate alarm check valve/system riser. Each of these risers are to supply a combination fire sandpipe and sprinkler system.

8. The fire standpipe system within a building segment will generally consist of a standpipe riser to be located in each required exit stairway and where otherwise required by code such as at the stage and at remote area of building segments that can't be reached with a 200 foot hose from a required hose valve connection. Each standpipe riser is to supply a hose valve per floor.

9. The sprinkler system within each building segment will start from one of the required fire standpipe risers with a control valve assembly for each floor.

10. Fire standpipe and sprinkler system zoning is to be consistent with the project phasing.

C. Specific Program requirements are as follows:

1. In general, the building will be designed as a light hazard occupancy and therefore a sprinkler spacing not exceed approximately 196 SF for all academic, administration and common area type spaces. Assume 150SF or less due to space configuration.

2. Shop type areas as the follow spaces: Automotive, Automotive/Body, Metal Fabrication, Plumbing, Electrical, Carpentry, Electrical, HVACR, Robotics and Automation will need to be designed as ordinary hazard group 2 and therefore sprinkler spacing not to exceed 120 SF. Assume 100 SF due to space configuration and irregularities. The more stringent requirements are to also apply to the following building spaces: kitchen, mechanical and utility rooms, storage rooms and similar spaces.

D. Specific requirements for this option:

1. Since this option is to include entirely new construction, it is anticipated that the project phasing should not affect the existing fire protection system except for possibly ensuring that fire protection water supply must be maintained for the existing high school building until it can be demolished.

2. This option will require a standpipe system, not knowing the exact site configuration and accessibility to the building structure.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.1

I. PLUMBING

A. General:

1. The following systems narrative applies to new building option C.1 and applies to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. B. 25.

2. All work shall be performed in strict accordance with the State Building Code, the State Plumbing and Fuel Gas Codes, the plumbing inspector and all Local Codes and Ordinances.

B. System Requirements and Criteria are as Follows:

1. Six inch primary domestic water service to 10 feet-0 inch outside building wall for the new high school building. Four inch back up domestic water service to come in at the opposite end of the building. Three inch domestic water service for the Amenities Building. In the absence of water flow test data and based on the proposed site configuration, a domestic booster pump system is to be planned at this time.

2. A new natural gas service is being coordinated to be brought to the site. For the new high school, a new natural gas system is to be provided for the new Science Rooms, for the new heating plant, for the new Culinary classrooms and Restaurant and for the new domestic hot water heating plant with work beginning at the gas company meter. Each of the major gas system components such as Science Room gas outlets shall each be supplied with a dedicated gas system to be fed via a gas meter that shall also be monitored via the building automation system.

3. Internal storm water roof drainage systems from all flat roof areas, consisting of roof drains and all rainwater piping and accessories to points 10 feet outside of the building walls. It is to be assumed at this time that most building roof areas will need to be provided with a secondary roof drainage system. At this time, it is to be assumed that only a few isolated building roof segments may not require a secondary roof drainage system. This will need to be verified based on input and coordination with the Architect.

4. Complete sanitary, waste and vent system connecting to all fixtures and inlet connections and running to points 10 feet outside of the building walls.

5. Dedicated tempered water system including master mixing valve and dedicated tempered water circulation system to supply all emergency shower and eyewash units with a non-stagnant system for the science classrooms. A system will need to be planned for the vocational tech areas.

6. Dedicated special waste piping system serving Science Rooms and related areas susceptible to receive non-conventional waste and this system is to consist of:

a. Central pH adjustment and monitoring system.

7. Reduced pressure backflow preventers on hot and cold water supply to the Science Classrooms. This dedicated system is to also include a circulation system with an integral hot water maintenance system.

8. Dedicated "grease waste" piping system from the Kitchen area and from the Culinary area and restaurant to 10 feet outside building wall, for continuation by Site/Civil from the site grease tank/interceptor. One central grease trap for the kitchen and separate for Culinary since these spaces are located apart. Refer to the Kitchen and Culinary areas for the extent of the plumbing work required to support the intended equipment. Provide allowance for two interior grease interceptors to support kitchen and restaurant. Provide allowance also for floor drains to support the intended equipment.

9. Domestic hot water shall be set up to be generated by gas fired hot water systems for the high school. Each set up shall have a mixing valve, all accessories and devices and a building pumped recirculation loop. Each Major building area will be supplied by a separate hot water system:

    a. Plumbing fixtures that are located too far away from the hot water systems described above will need to be supplied by separate point-of-use water heaters wherever feasible.

10. Complete interior sanitary, waste, vent, gas, cold water, 120°F hot water, 140°F hot water and two recirculation piping systems.

11. Main water meter with monitoring via building automation system. A sub-meter for each major system including the following: Kitchen, domestic hot water system.

12. Plumbing fixtures and trim, all new, commercial grade and high efficiency types for an anticipated approximately 40 percent water saving: 1.28/1.1 GPF dual flush water closets, 1/8 GPF urinals, 0.35 GPM lavatories, 1.5 GPM showers, 1.5 GPM Kitchen faucets, etc.

13. Freezeproof wall hydrants around the perimeter of all construction.

14. Drains, hose bibbs, valves, fittings, hangers and all miscellaneous pipeline accessories, including seismic support requirements.

15. Cleaning and testing of all fixtures, equipment and piping systems.

16. Disinfection of all domestic water piping systems.

17. Waste outlets to accept HVAC condensate and sprinkler waste discharges.

18. Insulation of all domestic water piping, roof drain bodies, storm water piping, water cooler drain piping and all exposed piping at handicapped fixtures.

19. All floor drains shall be provided with automatic trap primers.

20. Include allowance for floor drainage and hose bibbs in all mechanical type spaces and large toilet rooms (with two or more fixtures).

21. It is to be assumed that the following shops will be required to be provided, at a minimum, with a compressed air system to serve all required equipment and outlets, handwashing sink, a service sink, and all other required plumbing connections: Carpentry, Electrical, Robotics, and Automation, Metal Fabrication, Automobile, Auto Body, Plumbing, and

HVAC/R. Some of these shops might be able to be supported from a single system. This will need to be verified.

22. It is to be assumed that according to current state elevator code, elevator pits will be required to include a drainage system. The system is to consist of a pit floor drain to discharge via gravity and is to be extended to the building sanitary system. At this time, we are proceeding under the assumption that each drain will discharge via an oil separator prior to the connection into the sanitary system

23. The Auto Body and the Automotive Shops will need to be provided with a dedicated floor drainage system that will need to be extended to a gas/oil separator system to be located outside the building.

24. A dedicated tempered water system shall also be planned to serve each of the emergency shower/eyewash unit required in the various shops noted above.

25. To satisfy the variation of this option, it is anticipated a single gas fired hot water system will be able to supply the building except as noted below under item f). The system shall consist of (2) gas fired storage type condensing type water heaters:

    a. 1250 students: 300 gallons and 800 MBH each.

    b. 1450 students: 300 gallons and 1000 MBH each.

    c. 1600 students: 400 gallons and 1200 MBH each.

    d. 1660 students: 400 gallons and 1200 MBH each.

    e. 1722 students: 400 gallons and 1,500 MBH each.

    f. Remote isolated type spaces will be supplied each by a small electric type storage unit as manufactured by A.O. Smith DSE series. This requirement also applies to the Amenities Building.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.1

I. HEATING, VENTILATING, AND AIR CONDITIONING

A. General:

1. The following systems narrative applies to new building option C.1 and apply to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. Q. System Capacities for Enrollment Options.

2. Systems are based on all electric heating and cooling for a large portion of the facility based on air-cooled variable refrigerant flow (VRF) systems or air-source hydronic heat pump systems.

3. A hot water boiler system is provided for pre-heating of outside air in rooftop air handling units, as well as heating at entrance vestibules, stairways, exit doors, loading dock, and utility spaces.

4. Air conditioning systems are all air-cooled.

B. Hot Water Heating System:

1. Provide three gas-fired condensing hot water boilers equal to Veissmann Vitocrosal Model 300.

2. Provide a pre-engineered Category 4 AL29-4C stainless steel vent system for each boiler. Provide direct combustion air to each boiler from an exterior louver.

3. Each boiler shall be provided with a constant volume primary boiler water circulation pump.

4. New boiler system shall include manufacturer’s boiler hot water reset controls and sequencing system.

C. Air-Source Hydronic Heat Pump Systems:

1. Units shall provide chilled water to serve zone sensible cooling fan terminal units and hot water to provide ventilation air reheating at the zone VAV terminal units.

2. Provide air-source modular or packaged hydronic heat pumps equal to Aermec, Technical Systems, or Multistack. Systems shall include primary hot water circulation pump package.

3. Units shall be capable of providing continuous heating down to -4 deg. F for preheating of rooftop unit ventilation air.

4. Units shall be capable of providing simultaneous heating and cooling.

D. Air-Source VRF Heat Pump Systems:

1. Units shall be variable refrigerant flow (FRF) air-source DX heat pump units serving all rooftop air handling units.

2. Multiple system modules shall be provided to meet capacity.

3. Units shall be capable of providing continuous heating down to -4 deg. F.

4. Units shall be capable of providing a changeover between heating and cooling as needed.

E. Pump Packages:

1. Provide three variable flow hot water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

2. Provide three variable flow primary chilled water pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

3. Provide three variable flow chilled water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

F. Piping:

1. The following piping distributions shall be provided;

a. Hot water secondary distribution from boiler system in main mechanical room to all rooftop air handling units and all heating terminals including cabinet unit heaters, unit heaters, radiant floors, and panel radiators.

b. Chilled water primary distribution from roof-mounted air-source hydronic heat pumps to main mechanical room.

c. Chilled water secondary piping distribution for air-source heat pump chilled water distribution from main mechanical room to chilled water coils in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/ changeover valve.

d. Hot water primary distribution from packaged primary pumps in roof-mounted air-source hydronic heat pumps to main mechanical room.

e. Hot water secondary piping distribution for air-source heat pump heating distribution from main mechanical room to heating coil in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/changeover valve for supplemental heat.

2. All main distribution piping 2-1/2” and larger shall be Schedule 40 carbon steel with welded joints or mechanical couplings equal to Victaulic. Piping 2” and less shall be Type L copper with mechanical coupling joints equal to Pro-Press.

3. Provide fiberglass pipe insulation with all service jacket on all piping to meet the MA energy code. Generally 1-1/2" thickness required.

G. Classrooms:

1. Classrooms and support spaces shall be served by rooftop dedicated outside air ventilation supply air systems. Units shall be 100% outside air with total energy recovery wheels, MERV 8 and MERV 14 filters, and recirculation dampers. Cooling and primary heating shall be provided with a DX coil and remote VRF (variable refrigerant flow) heat pump condensing units. A hot water preheat coil shall be provided for preheating of outside air under low ambient temperature conditions. Supply and exhaust fans shall be variable speed with variable frequency drives.

2. Outside ventilation air shall be delivered to each classroom by connection to the primary VAV air inlet of the sensible cooling fan terminal unit.

3. Exhaust air shall be from a ceiling exhaust grille controlled by a VAV exhaust terminal.

4. Ventilation supply air to each classroom shall be controlled by a space carbon dioxide sensor.

H. Administration Area:

1. Provide a new variable refrigerant flow (VRF) heating and cooling system with ducted ceiling concealed fan coil units serving each zone. Locate heat recovery condensing unit on the roof and provide refrigerant piping distribution including branch selector boxes to serve each fan coil unit.

2. Provide a roof mounted energy recovery ventilator for ventilation air to all administration spaces. Provide constant volume supply ductwork distribution connected to the fan coil unit return air duct. Exhaust air shall be connected to ceiling diffusers in each space.

3. Library shall be provided with a separate VRF system and energy recovery ventilator.

I. Cafeteria/Kitchen:

1. Cafeteria shall be provided with a variable air volume rooftop air handling unit with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

2. Main kitchen and food trades kitchen air handling units shall be 100% makeup air units with recirculation capability interlocked with kitchen hood exhaust operation. Units shall have a DX cooling coil and hot water heating coil and remote VRF condensing units. Provide with mixing dampers, filters, and supply and return fans with variable frequency drives.

3. Provide kitchen hood exhaust fans for main kitchen and food trades kitchen. Fans shall be variable speed and interlocked with kitchen hood variable exhaust flow control system.

J. Auditorium & Stage:

1. Provide separate single-zone variable air volume rooftop air handling units with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

K. Shops:

1. Trade shops shall each be provided with an indoor heating and ventilating unit. All units shall have hot water heating coil, economizer mixing damper section, MERV 8 and MERV 13 filters, and variable speed supply fan with VFD.

2. H&V unit outside air shall be interlocked with exhaust system operation wherever possible.

3. Systems shall serve the following trade shops:

a. STEM Area

b. Electrical Shop

c. Maintenance Shop

d. HVAC Shop

e. Metal Fabrication Shop

f. Plumbing Shop

g. Carpentry Shop

h. Office Tech Area

i. Auto Body Shop

j. Auto Technology Shop

L. Concessions Building:

1. Provide energy recovery ventilator for Women's and Men's Rooms and concession space exhaust air and ventilation air. Unit shall be ducted for exhaust and outside air with connections to exterior louvers. Provide electric heating coil in the supply air for tempering.

2. Provide electric space heating units in each space: Women's, Men's, Concession, and Janitor's Closet.

M. Ductwork:

1. Ductwork systems serving spaces for ventilation, air conditioning, or heating shall be provided for the following:

a. Classroom dedicated outside air systems with central supply and exhaust distribution to each zone.

b. Rooftop air handling units serving dedicated areas with supply and return ductwork.

c. Supply and exhaust systems for energy recovery ventilators.

d. Local zone supply air ductwork for sensible cooling fan terminal units.

e. Local zone supply and return air ductwork for VRF fan coil units.

f. Local supply and return air ductwork distribution for trade shops.

2. All concealed supply ductwork shall be insulated with 2-inch duct wrap, R-6 minimum.

N. Specialty Exhaust Systems:

1. Provide separate dedicated exhaust systems including ductwork and exhaust fans to serve the following listed uses;

a. Laser cutter

b. 3D Printers

c. CNC machines

d. Art kilns with hoods and dedicated makeup air system

e. Dark room sink with hood.

f. Woodshop with outside dust collector

g. Vehicle exhaust

h. Paint spray booths with dedicated makeup air system

i. Welding booths

j. Welding benches

k. Science fume hoods.

O. Ductless Split heat pump Systems:

1. Provide separate dedicated ductless split cooling and heating systems including indoor fan coil unit and roof-mounted heat pump condensing unit to serve the following listed uses;

a. MDF room

b. IDF rooms

c. Elevator machine rooms

P. Automatic Temperature Controls:

1. Automatic temperature controls for building shall be direct digital DDC control building automation system (BAS) with web access interface. System shall be open protocol BACnet.

2. Manufacturer's controls for air-source heat pumps and boilers shall be integrated with the BAS via BACnet interface.

3. All VRF and ductless split system manufacturer's controls shall be integrated with the BAS through a BACnet interface.

4. All air handling units shall be provided with a DDC controller by the automatic temperature controls (ATC) sub-contractor. All field devices for unit operation shall be provided by the ATC sub-contractor.

5. Unitary controllers shall be provided for all terminal cooling and heating equipment including fan coil units, unit heaters, fin-tube radiation, fans, etc.

Q. System Capacities for Enrollment Options:

1. 1,250 Students.

a. Gas-Fired Hot Water Boilers: (4) 1,800 MBH with 160 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 80 ton, 200 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 220 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 300 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 300 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 14,500 CFM, (2) 30 ton VRF each.

2) Technology: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 12,000 CFM, (2) 20 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 20 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,500 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 8,000 CFM

2) Automotive Technology: 15,000 CFM

3) Carpentry: 12,000 CFM

4) Electrical Technology: 14,600 CFM

5) HVAC Technology: 11,000 CFM

6) Metal Fabrication: 8,800 CFM

7) Plumbing & Pipefitting: 9,800 CFM

2. 1,400 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,000 MBH with 180 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 90 ton, 220 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 240 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 330 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 330 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 330 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

2) Technology: (2) 17,300 CFM, (2) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 13,000 CFM, (1) 20 ton & (1) 24 ton VRF

2) Cafeteria: 9,000 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 24 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,700 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 16,000 CFM

2) Automotive Technology: 17,000 CFM

3) Carpentry: 14,700 CFM

4) Electrical Technology: 13,400 CFM

5) HVAC Technology: 10,700 CFM

6) Metal Fabrication: 12,200 CFM

7) Plumbing & Pipefitting: 13,400 CFM

3. 1,600 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 100 ton, 240 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 360 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 360 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 17,600 CFM, (2) 36 ton VRF each.

2) Technology: (2) 19,600 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 15,600 CFM, (2) 27 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,000 CFM

2) Automotive Technology: 19,500 CFM

3) Carpentry: 15,500 CFM

4) Electrical Technology: 18,900 CFM

5) HVAC Technology: 14,250 CFM

6) Metal Fabrication: 11,200 CFM

7) Plumbing & Pipefitting: 12,700 CFM

4. 1,660 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 105 ton, 250 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 380 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 380 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,000 CFM, (2) 36 ton VRF each.

2) Technology: (2) 20,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,000 CFM, (2) 27 ton VRF

2) Cafeteria: 8,300 CFM, 27 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,700 CFM

2) Automotive Technology: 19,800 CFM

3) Carpentry: 16,200 CFM

4) Electrical Technology: 19,600 CFM

5) HVAC Technology: 14,400 CFM

6) Metal Fabrication: 11,600 CFM

7) Plumbing & Pipefitting: 13,000 CFM

5. 1,722 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 110 ton, 260 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 400 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 400 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,400 CFM, (1) 36 & (1) 40 ton VRF each.

2) Technology: (2) 21,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,600 CFM, (1) 27 ton & (1) 30 ton VRF

2) Cafeteria: 8,600 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 11,000 CFM

2) Automotive Technology: 20,600 CFM

3) Carpentry: 16,900 CFM

4) Electrical Technology: 20,200 CFM

5) HVAC Technology: 15,000 CFM

6) Metal Fabrication: 12,000 CFM

7) Plumbing & Pipefitting: 13,500 CFM

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.1

I. ELECTRICAL

A. General:

1. The following systems narrative applies to new building option C.1 and apply to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. M. System Capacities for Enrollment Options.

B. Main Electric Service:

1. Primary service will be provided from utility company primary services via an underground ductbank and manhole system to a new utility company pad mounted transformer.

2. Secondary service from the new pad mounted transformers will be underground to a main switchboard at 480/277V, 3-phase, 4-wire. Switchboard will be located in a main electric room.

C. New Normal Distribution System:

1. Main switchboard will be provided with surge protection (SPD) and ground fault protection on main and feeder devices.

   a. Switchboard will be double ended, rated 6,000A at 480/277V 3phase 4wire.

   b. Customer metering

   c. Separate free-standing section for fire pump feed

   d. PV breaker

   e. Remote shut off located in Administration area per fire dept.

   f. Include 25’L x 5’W x 5’D waterproof vault below switchboard for cable entry into bottom of switchboard.

2. 480/277V 3phase 4wire distribution will be provided to the following:

   a. 480/277V lighting panelboards located in electric closets within each building area on each floor.

   b. Transformers located in electric closets within each ground floor electric closet in each building to serve 208/120V distribution panels, distribution panels will serve 208/120 3phase 4wire panelboards within electric closets in each building, each floor.

   c. 480/277V 3phase panelboard, step down transformer 480/277V to 208/120V 3phase 4wire, 208/120V 3phase 4wire panelboard at each Shop. Shop

panelboards will be contactor controlled with remote push buttons within each Shop for emergency shutdown.

d. Transformer to serve Kitchen panelboard.

e. Transformer to serve Auditorium theatrical dimming system.

f. Distribution 480/277V 3phase 4wire distribution panel and panelboards located in each building to serve mechanical equipment.

g. Independent feeds from switchboard to large rooftop mechanical equipment.

h. Major mechanical throughout the building and located the roof.

i. Feeds to life safety and standby automatic transfer switches.

j. Distribution to Athletic field building. Distribution will be sized to serve building loads and athletic field lighting.

3. Surge protection will be provided in all 120/208V panelboards.

4. Distribution/panelboards and infrastructure to support PV system.

5. Underground distribution below building, include excavation for conduit routing, conduits stacked and supported by plastic spacers similar to concrete ductbanks outside of building footprint, concrete not required below building.

D. Emergency Distribution System:

1. Natural gas/Diesel (fuel source to be determined) generator.

2. Generator will be rated at 600kW, 480/277V 3phase 4wire, housed in a sound attenuated, ground mounted enclosure at the exterior of the building (with an integral base mounted fuel tank if diesel). Generator will be mounted on an elevated concrete platform for survivability.

3. Include integral 50% load bank and associated load bank breaker.

4. Include separate fire pump, life safety and standby power breakers.

5. Remote shut off located in Administration area per fire dept.

6. Separate automatic transfer switches shall be provided for Life Safety and Standby (non-life safety) loads.

7. Generator will power the following:

a. Emergency egress lighting and exit lighting in corridors, assembly areas, and stair-wells.

b. Fire pump (if applicable).

c. Kitchen walk-in coolers and freezers.

d. Fire alarm system

e. Telephone system.

f. Security system.

g. IT MDF head-end equipment room and remote IT closets.

h. Cooling equipment associated MDF Room and IT closets.

i. Boilers and associated circulator pumps and controls.

j. Additional lighting in Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

k. HVAC ventilation equipment only (no air-conditioning) associated with the Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

l. Receptacles in Administration office area, Gymnasium and Cafeteria.

m. Elevator(s)

8. Life safety emergency panels will be located in two-hour rated electric closets. Emergency feeders not run underground or within two-hour vertical shafts will be two-hour MI type conductors.

9. Standby (non-emergency) loads will be located in separate closets.

10. A portable generator connection will be provided to meet National Electric Code Article 700 requirements to have a portable generator available while servicing the building generator.

E. Sustainable Design Intent LEED 4.0:

1. Sustainable Design Intent compliance will include:

a. Advanced measurement and verification of air conditioning, fans, lighting, and receptacle power via electronic sub-meters equal to E-Mon, D-Mon Class 2000 3-phase kWh and demand meters. Measurement and verification metering will be monitored by the Building Management System (BMS).

b. Plug and process load reductions through the use of vacancy/occupancy sensor controls for local convenience outlets in classrooms, offices, library and resource rooms. Open areas such as Media Center, and Kitchen will be equipped with relay panels controlled via the lighting control system, to reduce loads on a time schedule basis.

c. 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.

d. Empty conduit provisions will be provided for future green vehicles charger stations based on two percent of the available parking.

e. Empty conduits and space provisions will be provided for photovoltaic (PV) installations. Include conduits and space provisions for inverters at a minimum of three locations on Level 3 and/or Level 4 electric closets.

F. Lighting:

1. Luminaires will be dimmable LED. All luminaires will be suitable for respective utility rebate incentives.

2. Building mounted exterior lighting around the building perimeter, entry canopies, entry drives, parking areas, and walkways will be full cutoff LED type. All exterior lighting will be controlled via the building low voltage lighting control system.

3. Athletic field lighting will be provided.

G. Lighting Controls:

1. A low voltage lighting control system will be provided for all common areas including corridors, Cafeteria, Media Center, Gymnasium, exterior building and site lighting. Occupancy sensors and local system overrides will be provided at all locations.

2. Manual low voltage override switches to override the time of day lighting control schedules shall be provided. Override switches will permit extension of lighting control program as well as ON-OFF override for exiting the facility.

3. Lighting program for time of day schedules shall permit all lighting, including exterior to be turned off during non-occupied hours, reducing sky glow and light trespass. Activation of either fire alarm or intrusion detection system shall override the lighting program.

4. Vacancy and occupancy sensors will control lighting in all enclosed spaces including classrooms, offices, and utility type spaces. In addition, all spaces will be provided with local low voltage dimmable switching.

5. Daylight harvesting will be employed in all Cafeteria, Gymnasium, Media Center, perimeter classrooms, offices, and other spaces with substantial daylight utilizing daylight sensors in each space.

H. Auditorium:

1. A professional theatrical lighting system will be provided. (see theatrical lighting/dimming)

I. General Power:

1. Safety type duplex receptacles will be provided throughout the building in quantities to suit space programming.

2. Plug load reduction will be achieved by vacancy/occupancy sensors in classrooms, offices, and staff spaces, and circuits routed via relay panels, controlled via lighting control system time schedule for open areas such as Commons/Café, Kitchen and culinary areas.

3. Shops, duplex receptacles, heavy duty receptacles (20A, 30A, 40A 50A 120V and/or 208V 1phase), and/or direct connections with service disconnect switches will be provided at all shops to serve shop equipment in each respective shop.

4. Branch circuitry form building power and/or infrastructure from utility source to support Electrical Vehicle charging stations.

5. Connection will be provided at all mechanical equipment.

6. Connections will be provided all plumbing and fire protection equipment.

7. Connections will be provided at all motorized overhead doors, grates and partitions.

J. Fire Alarm System:

1. An automatic, fully supervised, analog addressable, voice evacuation system will be provided.

a. Manual pull stations (with tamperproof covers if applicable), at points of egress, and other locations as required to meet code.

b. Audible/visual units in corridors, classrooms, and throughout the building to meet code.

c. Visual only units in conference rooms, meeting rooms and small toilets.

d. Smoke detectors in corridors, electric, and telecommunications rooms, elevator lobbies, and elevator machine rooms.

e. Duct type smoke detectors with remote test stations at HVAC units per code, and within five feet of smoke/fire dampers including connections to all smoke/fire dampers.

f. Connections to all Fire Protection devices and Kitchen hood extinguishing system.

g. Connections to audio/visual systems, sound systems, and dimmed lighting controls.

h. Connections to roll-up/folding smoke/fire partitions.

i. 24 VDC magnetic hold open devices at smoke doors.

j. Remote annunciator at main entrance and secondary entrances as directed by Fire Department.

k. Master box and exterior beacon (quantity of beacons per Fire Department.

l. Wiring will be fire alarm MC cable.

m. Monitor Generator.

n. Monitor fire pump (if applicable)

K. Technology per Technology Section.

1. Cable tray will be provided at MDF Room and all IT Closets per IT scope.

2. Duplex receptacles and heavy-duty twist lock receptacles will be provided per IT scope.

3. Standby power will be provided to MDF Room and all IT Closets.

L. Integrated Intrusion, Access Control, CCTV, and Alarm System per Security Section.

M. System Capacities per Enrollment Options:

1. 1,250 Students, 315KSF.
    a. All systems as described above apply except, electric service would be 5,000A.
2. 1,400 Students, 344KSF.
    a. All systems as described above apply except, electric service would be 5,000A.
3. 1,600 Students, 383KSF.
    a. All systems as described above apply.
4. 1,660 Students, 394KSF.
    a. All systems as described above apply.
5. 1,722 Students, 405KSF.
    a. All systems as described above apply.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.2

I. FIRE PROTECTION

A. General:

1. The following systems narrative applies to new building option C.2 and applies to a range of building sizes based on student enrollment.

2. All occupiable and accessible areas of the building will be protected with a complete combination standpipe and wet suppression sprinkler system.

3. Work shall be performed using the “Method “B” Shared Design” process, from a “Fully Engineered” “design” set of documents which outlines the system and requires the Fire Protection Contractor to provide the “installation” set of documents, in conformance with the design criteria as set forth in the bid documents. Works shall be performed in accordance with the Building Code, NFPA, and the Local Authority.

B. System Requirements and Criteria are as follows:

1. Complete combination standpipe and hydraulically calculated, automatic overhead, wet suppression sprinkler systems, providing proper coverage to all areas of the new high school building. Dry sprinkler system for all exterior spaces if any that would be subject to use for storage as a loading dock or for any similar activity.

2. Eight inch dedicated/primary sprinkler water service which shall be extended from the site water main to all devices, equipment and heads. An 8 inch back up water supply is to also be planned from the opposite end of the building. (PIV if required). (Note: All dedicated site water piping, fire hydrants, etc., are required by law to be installed by a licensed Sprinkler Contractor.).

3. Double check type backflow preventor with supervised valves, repair kid, certified test and DEP permit for each of the two building service entries: primary and secondary.

4. Building fire department connections. Two shall be planned at this time based on the overall high school size and site configuration. Each fire department connection shall be located as to ensure access by the fire department and a fire hydrant located within 100 feet of each connection.

5. New water flow tests information will need to be obtained to allow hydraulic calculations, to verify whether or not a fire pump system will be required to support the proposed fire suppression system. Until that can be verified, we recommend that a fire pump system be assumed to be required.

6. Alarm check valves, valves and all piping, hangers, sprinkler heads and accessories. Quantity of alarm check valves anticipated sprinkler zone requirements for each high school building option will need to be established.

7. Based on the overall building area, each major building segment with an area not to exceed 52,000 SF per floor will be fed via a separate alarm check valve/system riser. Each of these risers are to supply a combination fire sandpipe and sprinkler system.

8. The fire standpipe system within a building segment will generally consist of a standpipe riser to be located in each required exit stairway and where otherwise required by code such as at the stage and at remote area of building segments that can't be reached with a 200 foot hose from a required hose valve connection. Each standpipe riser is to supply a hose valve per floor.

9. The sprinkler system within each building segment will start from one of the required fire standpipe risers with a control valve assembly for each floor.

10. Fire standpipe and sprinkler system zoning is to be consistent with the project phasing.

C. Specific Program requirements are as follows:

1. In general, the building will be designed as a light hazard occupancy and therefore a sprinkler spacing not exceed approximately 196 SF for all academic, administration and common area type spaces. Assume 150SF or less due to space configuration.

2. Shop type areas as the follow spaces: Automotive, Automotive/Body, Metal Fabrication, Plumbing, Electrical, Carpentry, Electrical, HVACR, Robotics and Automation will need to be designed as ordinary hazard group 2 and therefore sprinkler spacing not to exceed 120 SF. Assume 100 SF due to space configuration and irregularities. The more stringent requirements are to also apply to the following building spaces: kitchen, mechanical and utility rooms, storage rooms and similar spaces.

D. Specific requirements for this option:

1. Since this option is to include entirely new construction, it is anticipated that the project phasing should not affect the existing fire protection system except for possibly ensuring that fire protection water supply must be maintained for the existing high school building until it can be demolished.

2. This option will require a standpipe system, not knowing the exact site configuration and accessibility to the building structure.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.2

I. PLUMBING

A. General:

1. The following systems narrative applies to new building option C.2 and applies to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. B. 25.

2. All work shall be performed in strict accordance with the State Building Code, the State Plumbing and Fuel Gas Codes, the plumbing inspector and all Local Codes and Ordinances.

B. System Requirements and Criteria are as Follows:

1. Six inch primary domestic water service to 10 feet-0 inch outside building wall for the new high school building. Four inch back up domestic water service to come in at the opposite end of the building. Three inch domestic water service for the Amenities Building. In the absence of water flow test data and based on the proposed site configuration, a domestic booster pump system is to be planned at this time.

2. A new natural gas service is being coordinated to be brought to the site. For the new high school, a new natural gas system is to be provided for the new Science Rooms, for the new heating plant, for the new Culinary classrooms and Restaurant and for the new domestic hot water heating plant with work beginning at the gas company meter. Each of the major gas system components such as Science Room gas outlets shall each be supplied with a dedicated gas system to be fed via a gas meter that shall also be monitored via the building automation system.

3. Internal storm water roof drainage systems from all flat roof areas, consisting of roof drains and all rainwater piping and accessories to points 10 feet outside of the building walls. It is to be assumed at this time that most building roof areas will need to be provided with a secondary roof drainage system. At this time, it is to be assumed that only a few isolated building roof segments may not require a secondary roof drainage system. This will need to be verified based on input and coordination with the Architect.

4. Complete sanitary, waste and vent system connecting to all fixtures and inlet connections and running to points 10 feet outside of the building walls.

5. Dedicated tempered water system including master mixing valve and dedicated tempered water circulation system to supply all emergency shower and eyewash units with a non-stagnant system for the science classrooms. A system will need to be planned for the vocational tech areas.

6. Dedicated special waste piping system serving Science Rooms and related areas susceptible to receive non-conventional waste and this system is to consist of:

a. Central pH adjustment and monitoring system.

7. Reduced pressure backflow preventers on hot and cold water supply to the Science Classrooms. This dedicated system is to also include a circulation system with an integral hot water maintenance system.

8. Dedicated "grease waste" piping system from the Kitchen area and from the Culinary area and restaurant to 10 feet outside building wall, for continuation by Site/Civil from the site grease tank/interceptor. One central grease trap for the kitchen and separate for Culinary since these spaces are located apart. Refer to the Kitchen and Culinary areas for the extent of the plumbing work required to support the intended equipment. Provide allowance for two interior grease interceptors to support kitchen and restaurant. Provide allowance also for floor drains to support the intended equipment.

9. Domestic hot water shall be set up to be generated by gas fired hot water systems for the high school. Each set up shall have a mixing valve, all accessories and devices and a building pumped recirculation loop. Each Major building area will be supplied by a separate hot water system:

    a. Plumbing fixtures that are located too far away from the hot water systems described above will need to be supplied by separate point-of-use water heaters wherever feasible.

10. Complete interior sanitary, waste, vent, gas, cold water, 120°F hot water, 140°F hot water and two recirculation piping systems.

11. Main water meter with monitoring via building automation system. A sub-meter for each major system including the following: Kitchen, domestic hot water system.

12. Plumbing fixtures and trim, all new, commercial grade and high efficiency types for an anticipated approximately 40 percent water saving: 1.28/1.1 GPF dual flush water closets, 1/8 GPF urinals, 0.35 GPM lavatories, 1.5 GPM showers, 1.5 GPM Kitchen faucets, etc.

13. Freezeproof wall hydrants around the perimeter of all construction.

14. Drains, hose bibbs, valves, fittings, hangers and all miscellaneous pipeline accessories, including seismic support requirements.

15. Cleaning and testing of all fixtures, equipment and piping systems.

16. Disinfection of all domestic water piping systems.

17. Waste outlets to accept HVAC condensate and sprinkler waste discharges.

18. Insulation of all domestic water piping, roof drain bodies, storm water piping, water cooler drain piping and all exposed piping at handicapped fixtures.

19. All floor drains shall be provided with automatic trap primers.

20. Include allowance for floor drainage and hose bibbs in all mechanical type spaces and large toilet rooms (with two or more fixtures).

21. It is to be assumed that the following shops will be required to be provided, at a minimum, with a compressed air system to serve all required equipment and

outlets, handwashing sink, a service sink, and all other required plumbing connections: Carpentry, Electrical, Robotics, and Automation, Metal Fabrication, Automobile, Auto Body, Plumbing, and HVAC/R. Some of these shops might be able to be supported from a single system. This will need to be verified.

22. It is to be assumed that according to current state elevator code, elevator pits will be required to include a drainage system. The system is to consist of a pit floor drain to discharge via gravity and is to be extended to the building sanitary system. At this time, we are proceeding under the assumption that each drain will discharge via an oil separator prior to the connection into the sanitary system

23. The Auto Body and the Automotive Shops will need to be provided with a dedicated floor drainage system that will need to be extended to a gas/oil separator system to be located outside the building.

24. A dedicated tempered water system shall also be planned to serve each of the emergency shower/eyewash unit required in the various shops noted above.

25. To satisfy the variation of this option, it is anticipated a single gas fired hot water system will be able to supply the building except as noted below under item f). The system shall consist of (2) gas fired storage type condensing type water heaters:

    a. 1250 students: 300 gallons and 800 MBH each.

    b. 1450 students: 300 gallons and 1000 MBH each

    c. 1600 students: 400 gallons and 1200 MBH each

    d. 1660 students: 400 gallons and 1200 MBH each.

    e. 1722 students: 400 gallons and 1,500 MBH each

    f. Remote isolated type spaces will be supplied each by a small electric type storage unit as manufactured by A.O. Smith DSE series. This requirement also applies to the Amenities Building

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.2

I. HEATING, VENTILATING, AND AIR CONDITIONING

A. General:

1. The following systems narrative applies to new building option C.2 and apply to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. Q. System Capacities for Enrollment Options.

2. Systems are based on all electric heating and cooling for a large portion of the facility based on air-cooled variable refrigerant flow (VRF) systems or air-source hydronic heat pump systems.

3. A hot water boiler system is provided for pre-heating of outside air in rooftop air handling units, as well as heating at entrance vestibules, stairways, exit doors, loading dock, and utility spaces.

4. Air conditioning systems are all air-cooled.

B. Hot Water Heating System:

1. Provide three gas-fired condensing hot water boilers equal to Veissmann Vitocrosal Model 300.

2. Provide a pre-engineered Category 4 AL29-4C stainless steel vent system for each boiler. Provide direct combustion air to each boiler from an exterior louver.

3. Each boiler shall be provided with a constant volume primary boiler water circulation pump.

4. New boiler system shall include manufacturer’s boiler hot water reset controls and sequencing system.

C. Air-Source Hydronic Heat Pump Systems:

1. Units shall provide chilled water to serve zone sensible cooling fan terminal units and hot water to provide ventilation air reheating at the zone VAV terminal units.

2. Provide air-source modular or packaged hydronic heat pumps equal to Aermec, Technical Systems, or Multistack. Systems shall include primary hot water circulation pump package.

3. Units shall be capable of providing continuous heating down to -4 deg. F for preheating of rooftop unit ventilation air.

4. Units shall be capable of providing simultaneous heating and cooling.

D. Air-Source VRF Heat Pump Systems:

1. Units shall be variable refrigerant flow (FRF) air-source DX heat pump units serving all rooftop air handling units.

2. Multiple system modules shall be provided to meet capacity.

3. Units shall be capable of providing continuous heating down to -4 deg. F.

4. Units shall be capable of providing a changeover between heating and cooling as needed.

E. Pump Packages:

1. Provide three variable flow hot water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

2. Provide three variable flow primary chilled water pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

3. Provide three variable flow chilled water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

F. Piping:

1. The following piping distributions shall be provided;

a. Hot water secondary distribution from boiler system in main mechanical room to all rooftop air handling units and all heating terminals including cabinet unit heaters, unit heaters, radiant floors, and panel radiators.

b. Chilled water primary distribution from roof-mounted air-source hydronic heat pumps to main mechanical room.

c. Chilled water secondary piping distribution for air-source heat pump chilled water distribution from main mechanical room to chilled water coils in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/ changeover valve.

d. Hot water primary distribution from packaged primary pumps in roof-mounted air-source hydronic heat pumps to main mechanical room.

e. Hot water secondary piping distribution for air-source heat pump heating distribution from main mechanical room to heating coil in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/changeover valve for supplemental heat.

2. All main distribution piping 2-1/2” and larger shall be Schedule 40 carbon steel with welded joints or mechanical couplings equal to Victaulic. Piping 2” and less shall be Type L copper with mechanical coupling joints equal to Pro-Press.

3. Provide fiberglass pipe insulation with all service jacket on all piping to meet the MA energy code. Generally 1-1/2" thickness required.

G. Classrooms:

1. Classrooms and support spaces shall be served by rooftop dedicated outside air ventilation supply air systems. Units shall be 100% outside air with total energy recovery wheels, MERV 8 and MERV 14 filters, and recirculation dampers. Cooling and primary heating shall be provided with a DX coil and remote VRF (variable refrigerant flow) heat pump condensing units. A hot water preheat coil shall be provided for preheating of outside air under low ambient temperature conditions. Supply and exhaust fans shall be variable speed with variable frequency drives.

2. Outside ventilation air shall be delivered to each classroom by connection to the primary VAV air inlet of the sensible cooling fan terminal unit.

3. Exhaust air shall be from a ceiling exhaust grille controlled by a VAV exhaust terminal.

4. Ventilation supply air to each classroom shall be controlled by a space carbon dioxide sensor.

H. Administration Area:

1. Provide a new variable refrigerant flow (VRF) heating and cooling system with ducted ceiling concealed fan coil units serving each zone. Locate heat recovery condensing unit on the roof and provide refrigerant piping distribution including branch selector boxes to serve each fan coil unit.

2. Provide a roof mounted energy recovery ventilator for ventilation air to all administration spaces. Provide constant volume supply ductwork distribution connected to the fan coil unit return air duct. Exhaust air shall be connected to ceiling diffusers in each space.

3. Library shall be provided with a separate VRF system and energy recovery ventilator.

I. Cafeteria/Kitchen:

1. Cafeteria shall be provided with a variable air volume rooftop air handling unit with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

2. Main kitchen and food trades kitchen air handling units shall be 100% makeup air units with recirculation capability interlocked with kitchen hood exhaust operation. Units shall have a DX cooling coil and hot water heating coil and remote VRF condensing units. Provide with mixing dampers, filters, and supply and return fans with variable frequency drives.

3. Provide kitchen hood exhaust fans for main kitchen and food trades kitchen. Fans shall be variable speed and interlocked with kitchen hood variable exhaust flow control system.

J. Auditorium & Stage:

1. Provide separate single-zone variable air volume rooftop air handling units with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

K. Shops:

1. Trade shops shall each be provided with an indoor heating and ventilating unit. All units shall have hot water heating coil, economizer mixing damper section, MERV 8 and MERV 13 filters, and variable speed supply fan with VFD.

2. H&V unit outside air shall be interlocked with exhaust system operation wherever possible.

3. Systems shall serve the following trade shops:

a. STEM Area

b. Electrical Shop

c. Maintenance Shop

d. HVAC Shop

e. Metal Fabrication Shop

f. Plumbing Shop

g. Carpentry Shop

h. Office Tech Area

i. Auto Body Shop

j. Auto Technology Shop

L. Concessions Building:

1. Provide energy recovery ventilator for Women's and Men's Rooms and concession space exhaust air and ventilation air. Unit shall be ducted for exhaust and outside air with connections to exterior louvers. Provide electric heating coil in the supply air for tempering.

2. Provide electric space heating units in each space: Women's, Men's, Concession, and Janitor's Closet.

M. Ductwork:

1. Ductwork systems serving spaces for ventilation, air conditioning, or heating shall be provided for the following:

a. Classroom dedicated outside air systems with central supply and exhaust distribution to each zone.

b. Rooftop air handling units serving dedicated areas with supply and return ductwork.

c. Supply and exhaust systems for energy recovery ventilators.

d. Local zone supply air ductwork for sensible cooling fan terminal units.

e. Local zone supply and return air ductwork for VRF fan coil units.

f. Local supply and return air ductwork distribution for trade shops.

2. All concealed supply ductwork shall be insulated with 2-inch duct wrap, R-6 minimum.

N. Specialty Exhaust Systems:

1. Provide separate dedicated exhaust systems including ductwork and exhaust fans to serve the following listed uses;

a. Laser cutter

b. 3D Printers

c. CNC machines

d. Art kilns with hoods and dedicated makeup air system

e. Dark room sink with hood.

f. Woodshop with outside dust collector

g. Vehicle exhaust

h. Paint spray booths with dedicated makeup air system

i. Welding booths

j. Welding benches

k. Science fume hoods.

O. Ductless Split heat pump Systems:

1. Provide separate dedicated ductless split cooling and heating systems including indoor fan coil unit and roof-mounted heat pump condensing unit to serve the following listed uses;

a. MDF room

b. IDF rooms

c. Elevator machine rooms

P. Automatic Temperature Controls:

1. Automatic temperature controls for building shall be direct digital DDC control building automation system (BAS) with web access interface. System shall be open protocol BACnet.

2. Manufacturer's controls for air-source heat pumps and boilers shall be integrated with the BAS via BACnet interface.

3. All VRF and ductless split system manufacturer's controls shall be integrated with the BAS through a BACnet interface.

4. All air handling units shall be provided with a DDC controller by the automatic temperature controls (ATC) sub-contractor. All field devices for unit operation shall be provided by the ATC sub-contractor.

5. Unitary controllers shall be provided for all terminal cooling and heating equipment including fan coil units, unit heaters, fin-tube radiation, fans, etc.

Q. System Capacities for Enrollment Options:

1. 1,250 Students.

a. Gas-Fired Hot Water Boilers: (4) 1,800 MBH with 160 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 80 ton, 200 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 220 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 300 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 300 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 14,500 CFM, (2) 30 ton VRF each.

2) Technology: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 12,000 CFM, (2) 20 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 20 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,500 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 8,000 CFM

2) Automotive Technology: 15,000 CFM

3) Carpentry: 12,000 CFM

4) Electrical Technology: 14,600 CFM

5) HVAC Technology: 11,000 CFM

6) Metal Fabrication: 8,800 CFM

7) Plumbing & Pipefitting: 9,800 CFM

2. 1,400 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,000 MBH with 180 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 90 ton, 220 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 240 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 330 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 330 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 330 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

2) Technology: (2) 17,300 CFM, (2) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 13,000 CFM, (1) 20 ton & (1) 24 ton VRF

2) Cafeteria: 9,000 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 24 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,700 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 16,000 CFM

2) Automotive Technology: 17,000 CFM

3) Carpentry: 14,700 CFM

4) Electrical Technology: 13,400 CFM

5) HVAC Technology: 10,700 CFM

6) Metal Fabrication: 12,200 CFM

7) Plumbing & Pipefitting: 13,400 CFM

3. 1,600 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 100 ton, 240 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 360 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 360 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 17,600 CFM, (2) 36 ton VRF each.

2) Technology: (2) 19,600 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 15,600 CFM, (2) 27 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,000 CFM

2) Automotive Technology: 19,500 CFM

3) Carpentry: 15,500 CFM

4) Electrical Technology: 18,900 CFM

5) HVAC Technology: 14,250 CFM

6) Metal Fabrication: 11,200 CFM

7) Plumbing & Pipefitting: 12,700 CFM

4. 1,660 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 105 ton, 250 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 380 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 380 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,000 CFM, (2) 36 ton VRF each.

2) Technology: (2) 20,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,000 CFM, (2) 27 ton VRF

2) Cafeteria: 8,300 CFM, 27 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,700 CFM

2) Automotive Technology: 19,800 CFM

3) Carpentry: 16,200 CFM

4) Electrical Technology: 19,600 CFM

5) HVAC Technology: 14,400 CFM

6) Metal Fabrication: 11,600 CFM

7) Plumbing & Pipefitting: 13,000 CFM

5. 1,722 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 110 ton, 260 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 400 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 400 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,400 CFM, (1) 36 & (1) 40 ton VRF each.

2) Technology: (2) 21,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,600 CFM, (1) 27 ton & (1) 30 ton VRF

2) Cafeteria: 8,600 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 11,000 CFM

2) Automotive Technology: 20,600 CFM

3) Carpentry: 16,900 CFM

4) Electrical Technology: 20,200 CFM

5) HVAC Technology: 15,000 CFM

6) Metal Fabrication: 12,000 CFM

7) Plumbing & Pipefitting: 13,500 CFM

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.2

I. ELECTRICAL

A. General:

1. The following systems narrative applies to new building option C.2 and apply to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. M. System Capacities for Enrollment Options.

B. Main Electric Service:

1. Primary service will be provided from utility company primary services via an underground ductbank and manhole system to a new utility company pad mounted transformer.

2. Secondary service from the new pad mounted transformers will be underground to a main switchboard at 480/277V, 3-phase, 4-wire. Switchboard will be located in a main electric room.

C. New Normal Distribution System:

1. Main switchboard will be provided with surge protection (SPD) and ground fault protection on main and feeder devices.

   a. Switchboard will be double ended, rated 6,000A at 480/277V 3phase 4wire.

   b. Customer metering

   c. Separate free-standing section for fire pump feed

   d. PV breaker

   e. Remote shut off located in Administration area per fire dept.

   f. Include 25’L x 5’W x 5’D waterproof vault below switchboard for cable entry into bottom of switchboard.

2. 480/277V 3phase 4wire distribution will be provided to the following:

   a. 480/277V lighting panelboards located in electric closets within each building area on each floor.

   b. Transformers located in electric closets within each ground floor electric closet in each building to serve 208/120V distribution panels, distribution panels will serve 208/120 3phase 4wire panelboards within electric closets in each building, each floor.

   c. 480/277V 3phase panelboard, step down transformer 480/277V to 208/120V 3phase 4wire, 208/120V 3phase 4wire panelboard at each Shop. Shop panel-boards will be contactor controlled with remote push buttons within each Shop for emergency shutdown.

d. Transformer to serve Kitchen panelboard.

e. Transformer to serve Auditorium theatrical dimming system.

f. Distribution 480/277V 3phase 4wire distribution panel and panelboards located in each building to serve mechanical equipment.

g. Independent feeds from switchboard to large rooftop mechanical equipment.

h. Major mechanical throughout the building and located the roof.

i. Feeds to life safety and standby automatic transfer switches.

j. Distribution to Athletic field building. Distribution will be sized to serve building loads and athletic field lighting.

3. Surge protection will be provided in all 120/208V panelboards.

4. Distribution/panelboards and infrastructure to support PV system.

5. Underground distribution below building, include excavation for conduit routing, conduits stacked and supported by plastic spacers similar to concrete ductbanks outside of building footprint, concrete not required below building.

D. Emergency Distribution System:

1. Natural gas/Diesel (fuel source to be determined) generator.

2. Generator will be rated at 600kW, 480/277V 3phase 4wire, housed in a sound attenuated, ground mounted enclosure at the exterior of the building (with an integral base mounted fuel tank if diesel). Generator will be mounted on an elevated concrete platform for survivability.

3. Include integral 50% load bank and associated load bank breaker.

4. Include separate fire pump, life safety and standby power breakers.

5. Remote shut off located in Administration area per fire dept.

6. Separate automatic transfer switches shall be provided for Life Safety and Standby (non-life safety) loads.

7. Generator will power the following:

a. Emergency egress lighting and exit lighting in corridors, assembly areas, and stair-wells.

b. Fire pump (if applicable).

c. Kitchen walk-in coolers and freezers.

d. Fire alarm system

e. Telephone system.

f. Security system.

g. IT MDF head-end equipment room and remote IT closets.

h. Cooling equipment associated MDF Room and IT closets.

i. Boilers and associated circulator pumps and controls.

j. Additional lighting in Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

k. HVAC ventilation equipment only (no air-conditioning) associated with the Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

l. Receptacles in Administration office area, Gymnasium and Cafeteria.

m. Elevator(s)

8. Life safety emergency panels will be located in two-hour rated electric closets. Emergency feeders not run underground or within two-hour vertical shafts will be two-hour MI type conductors.

9. Standby (non-emergency) loads will be located in separate closets.

10. A portable generator connection will be provided to meet National Electric Code Article 700 requirements to have a portable generator available while servicing the building generator.

E. Sustainable Design Intent LEED 4.0:

1. Sustainable Design Intent compliance will include:

a. Advanced measurement and verification of air conditioning, fans, lighting, and receptacle power via electronic sub-meters equal to E-Mon, D-Mon Class 2000 3-phase kWh and demand meters. Measurement and verification metering will be monitored by the Building Management System (BMS).

b. Plug and process load reductions through the use of vacancy/occupancy sensor controls for local convenience outlets in classrooms, offices, library and resource rooms. Open areas such as Media Center, and Kitchen will be equipped with relay panels controlled via the lighting control system, to reduce loads on a time schedule basis.

c. 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.

d. Empty conduit provisions will be provided for future green vehicles charger stations based on two percent of the available parking.

e. Empty conduits and space provisions will be provided for photovoltaic (PV) installations. Include conduits and space provisions for inverters at a minimum of three locations on Level 3 and/or Level 4 electric closets.

F. Lighting:

1. Luminaires will be dimmable LED. All luminaires will be suitable for respective utility rebate incentives.

2. Building mounted exterior lighting around the building perimeter, entry canopies, entry drives, parking areas, and walkways will be full cutoff LED type. All exterior lighting will be controlled via the building low voltage lighting control system.

3. Athletic field lighting will be provided.

G. Lighting Controls:

1. A low voltage lighting control system will be provided for all common areas including corridors, Cafeteria, Media Center, Gymnasium, exterior building and site lighting. Occupancy sensors and local system overrides will be provided at all locations.

2. Manual low voltage override switches to override the time of day lighting control schedules shall be provided. Override switches will permit extension of lighting control program as well as ON-OFF override for exiting the facility.

3. Lighting program for time of day schedules shall permit all lighting, including exterior to be turned off during non-occupied hours, reducing sky glow and light trespass. Activation of either fire alarm or intrusion detection system shall override the lighting program.

4. Vacancy and occupancy sensors will control lighting in all enclosed spaces including classrooms, offices, and utility type spaces. In addition, all spaces will be provided with local low voltage dimmable switching.

5. Daylight harvesting will be employed in all Cafeteria, Gymnasium, Media Center, perimeter classrooms, offices, and other spaces with substantial daylight utilizing daylight sensors in each space.

H. Auditorium:

1. A professional theatrical lighting system will be provided. (see theatrical lighting/dimming)

I. General Power:

1. Safety type duplex receptacles will be provided throughout the building in quantities to suit space programming.

2. Plug load reduction will be achieved by vacancy/occupancy sensors in classrooms, offices, and staff spaces, and circuits routed via relay panels, controlled via lighting control system time schedule for open areas such as Commons/Café, Kitchen and culinary areas.

3. Shops, duplex receptacles, heavy duty receptacles (20A, 30A, 40A 50A 120V and/or 208V 1phase), and/or direct connections with service disconnect switches will be provided at all shops to serve shop equipment in each respective shop.

4. Branch circuitry form building power and/or infrastructure from utility source to support Electrical Vehicle charging stations.

5. Connection will be provided at all mechanical equipment.

6. Connections will be provided all plumbing and fire protection equipment.

7. Connections will be provided at all motorized overhead doors, grates and partitions.

J. Fire Alarm System:

1. An automatic, fully supervised, analog addressable, voice evacuation system will be provided.

a. Manual pull stations (with tamperproof covers if applicable), at points of egress, and other locations as required to meet code.

b. Audible/visual units in corridors, classrooms, and throughout the building to meet code.

c. Visual only units in conference rooms, meeting rooms and small toilets.

d. Smoke detectors in corridors, electric, and telecommunications rooms, elevator lobbies, and elevator machine rooms.

e. Duct type smoke detectors with remote test stations at HVAC units per code, and within five feet of smoke/fire dampers including connections to all smoke/fire dampers.

f. Connections to all Fire Protection devices and Kitchen hood extinguishing system.

g. Connections to audio/visual systems, sound systems, and dimmed lighting controls.

h. Connections to roll-up/folding smoke/fire partitions.

i. 24 VDC magnetic hold open devices at smoke doors.

j. Remote annunciator at main entrance and secondary entrances as directed by Fire Department.

k. Master box and exterior beacon (quantity of beacons per Fire Department.

l. Wiring will be fire alarm MC cable.

m. Monitor Generator.

n. Monitor fire pump (if applicable)

K. Technology per Technology Section.

1. Cable tray will be provided at MDF Room and all IT Closets per IT scope.

2. Duplex receptacles and heavy-duty twist lock receptacles will be provided per IT scope.

3. Standby power will be provided to MDF Room and all IT Closets.

L. Integrated Intrusion, Access Control, CCTV, and Alarm System per Security Section.

M. System Capacities per Enrollment Options:

1. 1,250 Students, 315KSF.

a. All systems as described above apply except, electric service would be 5,000A.

2. 1,400 Students, 344KSF.

   a. All systems as described above apply except, electric service would be 5,000A.

3. 1,600 Students, 383KSF.

   a. All systems as described above apply.

4. 1,660 Students, 394KSF.

   a. All systems as described above apply.

5. 1,722 Students, 405KSF.

   a. All systems as described above apply.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.3

I. FIRE PROTECTION

A. General:

1. The following systems narrative applies to new building option C.3 and applies to a range of building sizes based on student enrollment.

2. All occupiable and accessible areas of the building will be protected with a complete combination standpipe and wet suppression sprinkler system.

3. Work shall be performed using the “Method “B” Shared Design” process, from a “Fully Engineered” “design” set of documents which outlines the system and requires the Fire Protection Contractor to provide the “installation” set of documents, in conformance with the design criteria as set forth in the bid documents. Works shall be performed in accordance with the Building Code, NFPA, and the Local Authority.

B. System Requirements and Criteria are as follows:

1. Complete combination standpipe and hydraulically calculated, automatic overhead, wet suppression sprinkler systems, providing proper coverage to all areas of the new high school building. Dry sprinkler system for all exterior spaces if any that would be subject to use for storage as a loading dock or for any similar activity.

2. Eight inch dedicated/primary sprinkler water service which shall be extended from the site water main to all devices, equipment and heads. An 8 inch back up water supply is to also be planned from the opposite end of the building. (PIV if required). (Note: All dedicated site water piping, fire hydrants, etc., are required by law to be installed by a licensed Sprinkler Contractor.).

3. Double check type backflow preventor with supervised valves, repair kid, certified test and DEP permit for each of the two building service entries: primary and secondary.

4. Building fire department connections. Two shall be planned at this time based on the overall high school size and site configuration. Each fire department connection shall be located as to ensure access by the fire department and a fire hydrant located within 100 feet of each connection.

5. New water flow tests information will need to be obtained to allow hydraulic calculations, to verify whether or not a fire pump system will be required to support the proposed fire suppression system. Until that can be verified, we recommend that a fire pump system be assumed to be required.

6. Alarm check valves, valves and all piping, hangers, sprinkler heads and accessories. Quantity of alarm check valves anticipated sprinkler zone requirements for each high school building option will need to be established.

7. Based on the overall building area, each major building segment with an area not to exceed 52,000 SF per floor will be fed via a separate alarm check valve/system riser. Each of these risers are to supply a combination fire sandpipe and sprinkler system.

8. The fire standpipe system within a building segment will generally consist of a standpipe riser to be located in each required exit stairway and where otherwise required by code such as at the stage and at remote area of building segments that can't be reached with a 200 foot hose from a required hose valve connection. Each standpipe riser is to supply a hose valve per floor.

9. The sprinkler system within each building segment will start from one of the required fire standpipe risers with a control valve assembly for each floor.

10. Fire standpipe and sprinkler system zoning is to be consistent with the project phasing.

C. Specific Program requirements are as follows:

1. In general, the building will be designed as a light hazard occupancy and therefore a sprinkler spacing not exceed approximately 196 SF for all academic, administration and common area type spaces. Assume 150SF or less due to space configuration.

2. Shop type areas as the follow spaces: Automotive, Automotive/Body, Metal Fabrication, Plumbing, Electrical, Carpentry, Electrical, HVACR, Robotics and Automation will need to be designed as ordinary hazard group 2 and therefore sprinkler spacing not to exceed 120 SF. Assume 100 SF due to space configuration and irregularities. The more stringent requirements are to also apply to the following building spaces: kitchen, mechanical and utility rooms, storage rooms and similar spaces.

D. Specific requirements for this option:

1. Since this option is to include entirely new construction, it is anticipated that the project phasing should not affect the existing fire protection system except for possibly ensuring that fire protection water supply must be maintained for the existing high school building until it can be demolished.

2. This option will require a standpipe system, not knowing the exact site configuration and accessibility to the building structure.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.3

I. PLUMBING

A. General:

1. The following systems narrative applies to new building option C.3 and applies to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. B. 25.

2. All work shall be performed in strict accordance with the State Building Code, the State Plumbing and Fuel Gas Codes, the plumbing inspector and all Local Codes and Ordinances.

B. System Requirements and Criteria are as Follows:

1. Six inch primary domestic water service to 10 feet-0 inch outside building wall for the new high school building. Four inch back up domestic water service to come in at the opposite end of the building. Three inch domestic water service for the Amenities Building. In the absence of water flow test data and based on the proposed site configuration, a domestic booster pump system is to be planned at this time.

2. A new natural gas service is being coordinated to be brought to the site. For the new high school, a new natural gas system is to be provided for the new Science Rooms, for the new heating plant, for the new Culinary classrooms and Restaurant and for the new domestic hot water heating plant with work beginning at the gas company meter. Each of the major gas system components such as Science Room gas outlets shall each be supplied with a dedicated gas system to be fed via a gas meter that shall also be monitored via the building automation system.

3. Internal storm water roof drainage systems from all flat roof areas, consisting of roof drains and all rainwater piping and accessories to points 10 feet outside of the building walls. It is to be assumed at this time that most building roof areas will need to be provided with a secondary roof drainage system. At this time, it is to be assumed that only a few isolated building roof segments may not require a secondary roof drainage system. This will need to be verified based on input and coordination with the Architect.

4. Complete sanitary, waste and vent system connecting to all fixtures and inlet connections and running to points 10 feet outside of the building walls.

5. Dedicated tempered water system including master mixing valve and dedicated tempered water circulation system to supply all emergency shower and eyewash units with a non-stagnant system for the science classrooms. A system will need to be planned for the vocational tech areas.

6. Dedicated special waste piping system serving Science Rooms and related areas susceptible to receive non-conventional waste and this system is to consist of:

a. Central pH adjustment and monitoring system.

7. Reduced pressure backflow preventers on hot and cold water supply to the Science Classrooms. This dedicated system is to also include a circulation system with an integral hot water maintenance system.

8. Dedicated "grease waste" piping system from the Kitchen area and from the Culinary area and restaurant to 10 feet outside building wall, for continuation by Site/Civil from the site grease tank/interceptor. One central grease trap for the kitchen and separate for Culinary since these spaces are located apart. Refer to the Kitchen and Culinary areas for the extent of the plumbing work required to support the intended equipment. Provide allowance for two interior grease interceptors to support kitchen and restaurant. Provide allowance also for floor drains to support the intended equipment.

9. Domestic hot water shall be set up to be generated by gas fired hot water systems for the high school. Each set up shall have a mixing valve, all accessories and devices and a building pumped recirculation loop. Each Major building area will be supplied by a separate hot water system:

    a. Plumbing fixtures that are located too far away from the hot water systems described above will need to be supplied by separate point-of-use water heaters wherever feasible.

10. Complete interior sanitary, waste, vent, gas, cold water, 120°F hot water, 140°F hot water and two recirculation piping systems.

11. Main water meter with monitoring via building automation system. A sub-meter for each major system including the following: Kitchen, domestic hot water system.

12. Plumbing fixtures and trim, all new, commercial grade and high efficiency types for an anticipated approximately 40 percent water saving: 1.28/1.1 GPF dual flush water closets, 1/8 GPF urinals, 0.35 GPM lavatories, 1.5 GPM showers, 1.5 GPM Kitchen faucets, etc.

13. Freezeproof wall hydrants around the perimeter of all construction.

14. Drains, hose bibbs, valves, fittings, hangers and all miscellaneous pipeline accessories, including seismic support requirements.

15. Cleaning and testing of all fixtures, equipment and piping systems.

16. Disinfection of all domestic water piping systems.

17. Waste outlets to accept HVAC condensate and sprinkler waste discharges.

18. Insulation of all domestic water piping, roof drain bodies, storm water piping, water cooler drain piping and all exposed piping at handicapped fixtures.

19. All floor drains shall be provided with automatic trap primers.

20. Include allowance for floor drainage and hose bibbs in all mechanical type spaces and large toilet rooms (with two or more fixtures).

21. It is to be assumed that the following shops will be required to be provided, at a minimum, with a compressed air system to serve all required equipment and

outlets, handwashing sink, a service sink, and all other required plumbing connections: Carpentry, Electrical, Robotics, and Automation, Metal Fabrication, Automobile, Auto Body, Plumbing, and HVAC/R. Some of these shops might be able to be supported from a single system. This will need to be verified.

22. It is to be assumed that according to current state elevator code, elevator pits will be required to include a drainage system. The system is to consist of a pit floor drain to discharge via gravity and is to be extended to the building sanitary system. At this time, we are proceeding under the assumption that each drain will discharge via an oil separator prior to the connection into the sanitary system

23. The Auto Body and the Automotive Shops will need to be provided with a dedicated floor drainage system that will need to be extended to a gas/oil separator system to be located outside the building.

24. A dedicated tempered water system shall also be planned to serve each of the emergency shower/eyewash unit required in the various shops noted above.

25. To satisfy the variation of this option, it is anticipated a single gas fired hot water system will be able to supply the building except as noted below under item f). The system shall consist of (2) gas fired storage type condensing type water heaters:

    a. 1250 students: 300 gallons and 800 MBH each.

    b. 1450 students: 300 gallons and 1000 MBH each

    c. 1600 students: 400 gallons and 1200 MBH each

    d. 1660 students: 400 gallons and 1200 MBH each.

    e. 1722 students: 400 gallons and 1,500 MBH each

    f. Remote isolated type spaces will be supplied each by a small electric type storage unit as manufactured by A.O. Smith DSE series. This requirement also applies to the Amenities Building.

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.3

I. HEATING, VENTILATING, AND AIR CONDITIONING

A. General:

1. The following systems narrative applies to new building option C.3 and apply to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. R. System Capacities for Enrollment Options.

2. Systems are based on all electric heating and cooling for a large portion of the facility based on air-cooled variable refrigerant flow (VRF) systems or air-source hydronic heat pump systems.

3. A hot water boiler system is provided for pre-heating of outside air in rooftop air handling units, as well as heating at entrance vestibules, stairways, exit doors, loading dock, and utility spaces.

4. Air conditioning systems are all air-cooled.

B. Hot Water Heating System:

1. Provide three gas-fired condensing hot water boilers equal to Veissmann Vitocrosal Model 300.

2. Provide a pre-engineered Category 4 AL29-4C stainless steel vent system for each boiler. Provide direct combustion air to each boiler from an exterior louver.

3. Each boiler shall be provided with a constant volume primary boiler water circulation pump.

4. New boiler system shall include manufacturer’s boiler hot water reset controls and sequencing system.

C. Air-Source Hydronic Heat Pump Systems:

1. Units shall provide chilled water to serve zone sensible cooling fan terminal units and hot water to provide ventilation air reheating at the zone VAV terminal units.

2. Provide air-source modular or packaged hydronic heat pumps equal to Aermec, Technical Systems, or Multistack. Systems shall include primary hot water circulation pump package.

3. Units shall be capable of providing continuous heating down to -4 deg. F for preheating of rooftop unit ventilation air.

4. Units shall be capable of providing simultaneous heating and cooling.

D. Air-Source VRF Heat Pump Systems:

1. Units shall be variable refrigerant flow (FRF) air-source DX heat pump units serving all rooftop air handling units.

2. Multiple system modules shall be provided to meet capacity.

3. Units shall be capable of providing continuous heating down to -4 deg. F.

4. Units shall be capable of providing a changeover between heating and cooling as needed.

E. Pump Packages:

1. Provide three variable flow hot water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

2. Provide three variable flow primary chilled water pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

3. Provide three variable flow chilled water secondary distribution pumps, each with a variable frequency drive, mounted on a factory assembled packaged pump skid. Units shall be equal to Grundfos. Each pump shall be sized for 50% capacity with one pump as a stand-by.

F. Piping:

1. The following piping distributions shall be provided;

a. Hot water secondary distribution from boiler system in main mechanical room to all rooftop air handling units and all heating terminals including cabinet unit heaters, unit heaters, radiant floors, and panel radiators.

b. Chilled water primary distribution from roof-mounted air-source hydronic heat pumps to main mechanical room.

c. Chilled water secondary piping distribution for air-source heat pump chilled water distribution from main mechanical room to chilled water coils in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/ changeover valve.

d. Hot water primary distribution from packaged primary pumps in roof-mounted air-source hydronic heat pumps to main mechanical room.

e. Hot water secondary piping distribution for air-source heat pump heating distribution from main mechanical room to heating coil in zone sensible cooling fan powered terminal units. System shall include interconnection with the boiler hot water secondary distribution system including three-way mixing/changeover valve for supplemental heat.

2. All main distribution piping 2-1/2” and larger shall be Schedule 40 carbon steel with welded joints or mechanical couplings equal to Victaulic. Piping 2” and less shall be Type L copper with mechanical coupling joints equal to Pro-Press.

3. Provide fiberglass pipe insulation with all service jacket on all piping to meet the MA energy code. Generally 1-1/2" thickness required.

G. Classrooms:

1. Classrooms and support spaces shall be served by rooftop dedicated outside air ventilation supply air systems. Units shall be 100% outside air with total energy recovery wheels, MERV 8 and MERV 14 filters, and recirculation dampers. Cooling and primary heating shall be provided with a DX coil and remote VRF (variable refrigerant flow) heat pump condensing units. A hot water preheat coil shall be provided for preheating of outside air under low ambient temperature conditions. Supply and exhaust fans shall be variable speed with variable frequency drives.

2. Outside ventilation air shall be delivered to each classroom by connection to the primary VAV air inlet of the sensible cooling fan terminal unit.

3. Exhaust air shall be from a ceiling exhaust grille controlled by a VAV exhaust terminal.

4. Ventilation supply air to each classroom shall be controlled by a space carbon dioxide sensor.

H. Administration Area:

1. Provide a new variable refrigerant flow (VRF) heating and cooling system with ducted ceiling concealed fan coil units serving each zone. Locate heat recovery condensing unit on the roof and provide refrigerant piping distribution including branch selector boxes to serve each fan coil unit.

2. Provide a roof mounted energy recovery ventilator for ventilation air to all administration spaces. Provide constant volume supply ductwork distribution connected to the fan coil unit return air duct. Exhaust air shall be connected to ceiling diffusers in each space.

3. Library shall be provided with a separate VRF system and energy recovery ventilator.

I. Cafeteria/Kitchen:

1. Cafeteria shall be provided with a variable air volume rooftop air handling unit with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

2. Main kitchen and food trades kitchen air handling units shall be 100% makeup air units with recirculation capability interlocked with kitchen hood exhaust operation. Units shall have a DX cooling coil and hot water heating coil and remote VRF condensing units. Provide with mixing dampers, filters, and supply and return fans with variable frequency drives.

3. Provide kitchen hood exhaust fans for main kitchen and food trades kitchen. Fans shall be variable speed and interlocked with kitchen hood variable exhaust flow control system.

J. Auditorium & Stage:

1. Provide separate single-zone variable air volume rooftop air handling units with DX cooling coil, remote VRF condensing units, hot water heating coil, economizer damper section, MERV 8 and MERV 14 filters and supply and return fans with variable frequency drives.

K. Shops:

1. Trade shops shall each be provided with an indoor heating and ventilating unit. All units shall have hot water heating coil, economizer mixing damper section, MERV 8 and MERV 13 filters, and variable speed supply fan with VFD.

2. H&V unit outside air shall be interlocked with exhaust system operation wherever possible.

3. Systems shall serve the following trade shops:

a. STEM Area

b. Electrical Shop

c. Maintenance Shop

d. HVAC Shop

e. Metal Fabrication Shop

f. Plumbing Shop

g. Carpentry Shop

h. Office Tech Area

i. Auto Body Shop

j. Auto Technology Shop

L. Concessions Building:

1. Provide energy recovery ventilator for Women's and Men's Rooms and concession space exhaust air and ventilation air. Unit shall be ducted for exhaust and outside air with connections to exterior louvers. Provide electric heating coil in the supply air for tempering.

2. Provide electric space heating units in each space: Women's, Men's, Concession, and Janitor's Closet.

M. Satellite Building:

1. Provide ducted energy recovery ventilator for Women's and Men's Team Rooms, toilet rooms and coach offices for exhaust air and ventilation air to each space. Unit shall be ducted for exhaust and outside air with connections to exterior louvers. Provide electric heating coil in the supply air duct for tempering.

2. Provide electric space heating units in each space: team rooms, toilet rooms, coach offices, garage space, maintenance office and elevator vestibules.

3. Provide ductless split heat pump system for elevator machine room.

N. Ductwork:

1. Ductwork systems serving spaces for ventilation, air conditioning, or heating shall be provided for the following:

    a. Classroom dedicated outside air systems with central supply and exhaust distribution to each zone.

    b. Rooftop air handling units serving dedicated areas with supply and return ductwork.

    c. Supply and exhaust systems for energy recovery ventilators.

    d. Local zone supply air ductwork for sensible cooling fan terminal units.

    e. Local zone supply and return air ductwork for VRF fan coil units.

    f. Local supply and return air ductwork distribution for trade shops.

2. All concealed supply ductwork shall be insulated with 2-inch duct wrap, R-6 minimum.

O. Specialty Exhaust Systems:

1. Provide separate dedicated exhaust systems including ductwork and exhaust fans to serve the following listed uses;

    a. Laser cutter

    b. 3D Printers

    c. CNC machines

    d. Art kilns with hoods and dedicated makeup air system

    e. Dark room sink with hood.

    f. Woodshop with outside dust collector

    g. Vehicle exhaust

    h. Paint spray booths with dedicated makeup air system

    i. Welding booths

    j. Welding benches

    k. Science fume hoods.

P. Ductless Split heat pump Systems:

1. Provide separate dedicated ductless split cooling and heating systems including indoor fan coil unit and roof-mounted heat pump condensing unit to serve the following listed uses;

    a. MDF room

b. IDF rooms

c. Elevator machine rooms

Q. Automatic Temperature Controls:

1. Automatic temperature controls for building shall be direct digital DDC control building automation system (BAS) with web access interface. System shall be open protocol BACnet.

2. Manufacturer's controls for air-source heat pumps and boilers shall be integrated with the BAS via BACnet interface.

3. All VRF and ductless split system manufacturer's controls shall be integrated with the BAS through a BACnet interface.

4. All air handling units shall be provided with a DDC controller by the automatic temperature controls (ATC) sub-contractor. All field devices for unit operation shall be provided by the ATC sub-contractor.

5. Unitary controllers shall be provided for all terminal cooling and heating equipment including fan coil units, unit heaters, fin-tube radiation, fans, etc.

R. System Capacities for Enrollment Options:

1. 1,250 Students.

a. Gas-Fired Hot Water Boilers: (4) 1,800 MBH with 160 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 80 ton, 200 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 220 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 300 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 300 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 14,500 CFM, (2) 30 ton VRF each.

2) Technology: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 12,000 CFM, (2) 20 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 20 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,500 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 8,000 CFM

2) Automotive Technology: 15,000 CFM

3) Carpentry: 12,000 CFM

4) Electrical Technology: 14,600 CFM

5) HVAC Technology: 11,000 CFM

6) Metal Fabrication: 8,800 CFM

7) Plumbing & Pipefitting: 9,800 CFM

2. 1,400 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,000 MBH with 180 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 90 ton, 220 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 240 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 330 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 330 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 330 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 16,000 CFM, (1) 30 ton & (1) 36 ton VRF each.

2) Technology: (2) 17,300 CFM, (2) 36 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 13,000 CFM, (1) 20 ton & (1) 24 ton VRF

2) Cafeteria: 9,000 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: 40 tons

2) Media: 24 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,000 CFM

2) Media: 1,700 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 16,000 CFM

2) Automotive Technology: 17,000 CFM

3) Carpentry: 14,700 CFM

4) Electrical Technology: 13,400 CFM

5) HVAC Technology: 10,700 CFM

6) Metal Fabrication: 12,200 CFM

7) Plumbing & Pipefitting: 13,400 CFM

3. 1,600 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 100 ton, 240 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 360 GPM, 10 HP ea.

3) Air-source heat pump secondary chilled water: (3) 360 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 17,600 CFM, (2) 36 ton VRF each.

2) Technology: (2) 19,600 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 15,600 CFM, (2) 27 ton VRF

2) Cafeteria: 8,000 CFM, 24 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,000 CFM

2) Automotive Technology: 19,500 CFM

3) Carpentry: 15,500 CFM

4) Electrical Technology: 18,900 CFM

5) HVAC Technology: 14,250 CFM

6) Metal Fabrication: 11,200 CFM

7) Plumbing & Pipefitting: 12,700 CFM

4. 1,660 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 105 ton, 250 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 380 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 380 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,000 CFM, (2) 36 ton VRF each.

2) Technology: (2) 20,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,000 CFM, (2) 27 ton VRF

2) Cafeteria: 8,300 CFM, 27 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 10,700 CFM

2) Automotive Technology: 19,800 CFM

3) Carpentry: 16,200 CFM

4) Electrical Technology: 19,600 CFM

5) HVAC Technology: 14,400 CFM

6) Metal Fabrication: 11,600 CFM

7) Plumbing & Pipefitting: 13,000 CFM

5. 1,722 Students.

a. Gas-Fired Hot Water Boilers: (4) 2,250 MBH with 200 GPM circulation pumps.

b. Air-Cooled Hydronic Heat Pumps: (3) 110 ton, 260 GPM chilled water ea.

c. Pump Packages:

1) Boiler secondary hot water: (3) 270 GPM, 10 HP ea.

2) Air-source heat pump primary chilled water: (3) 400 GPM, 15 HP ea.

3) Air-source heat pump secondary chilled water: (3) 400 GPM, 15 HP ea.

4) Air-source heat pump secondary hot water: (3) 300 GPM, 10 HP ea.

d. Dedicated Outside Air Heat Recovery Units:

1) Academic/Special Ed: (2) 18,400 CFM, (1) 36 & (1) 40 ton VRF each.

2) Technology: (2) 21,000 CFM, (2) 40 ton VRF each.

e. Single Zone Rooftop Air Handling Units:

1) Auditorium: 10,000 CFM, 36 ton VRF

2) Stage: 2,500 CFM, 8 ton VRF

3) Gymnasium: 18,000 CFM, (2) 30 ton VRF

f. Multiple Zone Rooftop VAV Air Handling Units:

1) PE/Locker: 16,600 CFM, (1) 27 ton & (1) 30 ton VRF

2) Cafeteria: 8,600 CFM, 30 ton VRF

g. Air-Cooled VRF Systems:

1) Admin/Guidance/Medical: (1) 20 ton & (1) 24 ton

2) Media: 27 tons

h. Energy Recovery Ventilators:

1) Admin/Guidance/Medical: 3,200 CFM

2) Media: 2,000 CFM

i. Vocational Shops (H&V):

1) Automotive Collision Repair: 11,000 CFM

2) Automotive Technology: 20,600 CFM

3) Carpentry: 16,900 CFM

4) Electrical Technology: 20,200 CFM

5) HVAC Technology: 15,000 CFM

6) Metal Fabrication: 12,000 CFM

7) Plumbing & Pipefitting: 13,500 CFM

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL SCHOOL

PREFERRED SCHEMATIC REPORT - OPTION C.3

I. ELECTRICAL

A. General:

1. The following systems narrative applies to new building option C.3 and apply to a range of building sizes based on student enrollment. System capacities for the various enrollments are listed under Para. M. System Capacities for Enrollment Options.

B. Main Electric Service:

1. Primary service will be provided from utility company primary services via an underground ductbank and manhole system to a new utility company pad mounted transformer.

2. Secondary service from the new pad mounted transformers will be underground to a main switchboard at 480/277V, 3-phase, 4-wire. Switchboard will be located in a main electric room.

C. New Normal Distribution System:

1. Main switchboard will be provided with surge protection (SPD) and ground fault protection on main and feeder devices.

   a. Switchboard will be double ended, rated 6,000A at 480/277V 3phase 4wire.

   b. Customer metering

   c. Separate free-standing section for fire pump feed

   d. PV breaker

   e. Remote shut off located in Administration area per fire dept.

   f. Include 25’L x 5’W x 5’D waterproof vault below switchboard for cable entry into bottom of switchboard.

2. 480/277V 3phase 4wire distribution will be provided to the following:

   a. 480/277V lighting panelboards located in electric closets within each building area on each floor.

   b. Transformers located in electric closets within each ground floor electric closet in each building to serve 208/120V distribution panels, distribution panels will serve 208/120 3phase 4wire panelboards within electric closets in each building, each floor.

   c. 480/277V 3phase panelboard, step down transformer 480/277V to 208/120V 3phase 4wire, 208/120V 3phase 4wire panelboard at each Shop. Shop panel-boards will be contactor controlled with remote push buttons within each Shop for emergency shutdown.

d. Transformer to serve Kitchen panelboard.

e. Transformer to serve Auditorium theatrical dimming system.

f. Distribution 480/277V 3phase 4wire distribution panel and panelboards located in each building to serve mechanical equipment.

g. Independent feeds from switchboard to large rooftop mechanical equipment.

h. Major mechanical throughout the building and located the roof.

i. Feeds to life safety and standby automatic transfer switches.

j. Distribution to Athletic field building. Distribution will be sized to serve building loads and athletic field lighting.

3. Surge protection will be provided in all 120/208V panelboards.

4. Distribution/panelboards and infrastructure to support PV system.

5. Underground distribution below building, include excavation for conduit routing, conduits stacked and supported by plastic spacers similar to concrete ductbanks outside of building footprint, concrete not required below building.

D. Emergency Distribution System:

1. Natural gas/Diesel (fuel source to be determined) generator.

2. Generator will be rated at 600kW, 480/277V 3phase 4wire, housed in a sound attenuated, ground mounted enclosure at the exterior of the building (with an integral base mounted fuel tank if diesel). Generator will be mounted on an elevated concrete platform for survivability.

3. Include integral 50% load bank and associated load bank breaker.

4. Include separate fire pump, life safety and standby power breakers.

5. Remote shut off located in Administration area per fire dept.

6. Separate automatic transfer switches shall be provided for Life Safety and Standby (non-life safety) loads.

7. Generator will power the following:

a. Emergency egress lighting and exit lighting in corridors, assembly areas, and stair-wells.

b. Fire pump (if applicable).

c. Kitchen walk-in coolers and freezers.

d. Fire alarm system

e. Telephone system.

f. Security system.

g. IT MDF head-end equipment room and remote IT closets.

h. Cooling equipment associated MDF Room and IT closets.

i. Boilers and associated circulator pumps and controls.

j. Additional lighting in Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

k. HVAC ventilation equipment only (no air-conditioning) associated with the Gymnasium, Cafeteria, Kitchen, and associated toilets and corridors.

l. Receptacles in Administration office area, Gymnasium and Cafeteria.

m. Elevator(s)

8. Life safety emergency panels will be located in two-hour rated electric closets. Emergency feeders not run underground or within two-hour vertical shafts will be two-hour MI type conductors.

9. Standby (non-emergency) loads will be located in separate closets.

10. A portable generator connection will be provided to meet National Electric Code Article 700 requirements to have a portable generator available while servicing the building generator.

E. Sustainable Design Intent LEED 4.0:

1. Sustainable Design Intent compliance will include:

a. Advanced measurement and verification of air conditioning, fans, lighting, and receptacle power via electronic sub-meters equal to E-Mon, D-Mon Class 2000 3-phase kWh and demand meters. Measurement and verification metering will be monitored by the Building Management System (BMS).

b. Plug and process load reductions through the use of vacancy/occupancy sensor controls for local convenience outlets in classrooms, offices, library and resource rooms. Open areas such as Media Center, and Kitchen will be equipped with relay panels controlled via the lighting control system, to reduce loads on a time schedule basis.

c. 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.

d. Empty conduit provisions will be provided for future green vehicles charger stations based on two percent of the available parking.

e. Empty conduits and space provisions will be provided for photovoltaic (PV) installations. Include conduits and space provisions for inverters at a minimum of three locations on Level 3 and/or Level 4 electric closets.

F. Lighting:

1. Luminaires will be dimmable LED. All luminaires will be suitable for respective utility rebate incentives.

2. Building mounted exterior lighting around the building perimeter, entry canopies, entry drives, parking areas, and walkways will be full cutoff LED type. All exterior lighting will be controlled via the building low voltage lighting control system.

3. Athletic field lighting will be provided.

G. Lighting Controls:

1. A low voltage lighting control system will be provided for all common areas including corridors, Cafeteria, Media Center, Gymnasium, exterior building and site lighting. Occupancy sensors and local system overrides will be provided at all locations.

2. Manual low voltage override switches to override the time of day lighting control schedules shall be provided. Override switches will permit extension of lighting control program as well as ON-OFF override for exiting the facility.

3. Lighting program for time of day schedules shall permit all lighting, including exterior to be turned off during non-occupied hours, reducing sky glow and light trespass. Activation of either fire alarm or intrusion detection system shall override the lighting program.

4. Vacancy and occupancy sensors will control lighting in all enclosed spaces including classrooms, offices, and utility type spaces. In addition, all spaces will be provided with local low voltage dimmable switching.

5. Daylight harvesting will be employed in all Cafeteria, Gymnasium, Media Center, perimeter classrooms, offices, and other spaces with substantial daylight utilizing daylight sensors in each space.

H. Auditorium:

1. A professional theatrical lighting system will be provided. (see theatrical lighting/dimming)

I. General Power:

1. Safety type duplex receptacles will be provided throughout the building in quantities to suit space programming.

2. Plug load reduction will be achieved by vacancy/occupancy sensors in classrooms, offices, and staff spaces, and circuits routed via relay panels, controlled via lighting control system time schedule for open areas such as Commons/Café, Kitchen and culinary areas.

3. Shops, duplex receptacles, heavy duty receptacles (20A, 30A, 40A 50A 120V and/or 208V 1phase), and/or direct connections with service disconnect switches will be provided at all shops to serve shop equipment in each respective shop.

4. Branch circuitry form building power and/or infrastructure from utility source to support Electrical Vehicle charging stations.

5. Connection will be provided at all mechanical equipment.

6. Connections will be provided all plumbing and fire protection equipment.

7. Connections will be provided at all motorized overhead doors, grates and partitions.

J. Fire Alarm System:

1. An automatic, fully supervised, analog addressable, voice evacuation system will be provided.

a. Manual pull stations (with tamperproof covers if applicable), at points of egress, and other locations as required to meet code.

b. Audible/visual units in corridors, classrooms, and throughout the building to meet code.

c. Visual only units in conference rooms, meeting rooms and small toilets.

d. Smoke detectors in corridors, electric, and telecommunications rooms, elevator lobbies, and elevator machine rooms.

e. Duct type smoke detectors with remote test stations at HVAC units per code, and within five feet of smoke/fire dampers including connections to all smoke/fire dampers.

f. Connections to all Fire Protection devices and Kitchen hood extinguishing system.

g. Connections to audio/visual systems, sound systems, and dimmed lighting controls.

h. Connections to roll-up/folding smoke/fire partitions.

i. 24 VDC magnetic hold open devices at smoke doors.

j. Remote annunciator at main entrance and secondary entrances as directed by Fire Department.

k. Master box and exterior beacon (quantity of beacons per Fire Department.

l. Wiring will be fire alarm MC cable.

m. Monitor Generator.

n. Monitor fire pump (if applicable)

K. Technology per Technology Section.

1. Cable tray will be provided at MDF Room and all IT Closets per IT scope.

2. Duplex receptacles and heavy-duty twist lock receptacles will be provided per IT scope.

3. Standby power will be provided to MDF Room and all IT Closets.

L. Integrated Intrusion, Access Control, CCTV, and Alarm System per Security Section.

M. System Capacities per Enrollment Options:

1. 1,250 Students, 315KSF.

a. All systems as described above apply except, electric service would be 5,000A.

2. 1,400 Students, 344KSF.

   a. All systems as described above apply except, electric service would be 5,000A.

3. 1,600 Students, 383KSF.

   a. All systems as described above apply.

4. 1,660 Students, 394KSF.

   a. All systems as described above apply.

5. 1,722 Students, 405KSF.

   a. All systems as described above apply.