Appendix J: Rowan CHSS Draft MEP Basis of Design
Added as part of 12/11/25 RFP addendum; Appendix J And Appendix I are to be used to inform opinion of cost in proposal submission

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MEP Basis of Design

Schematic Design Submission

PREPARED FOR:

Rowan University
Edelman College Of Communications, Humanities and Social Sciences

BY:

Syska Hennessy Group, Inc.

PROJECT NO:

25-009830

DATE:

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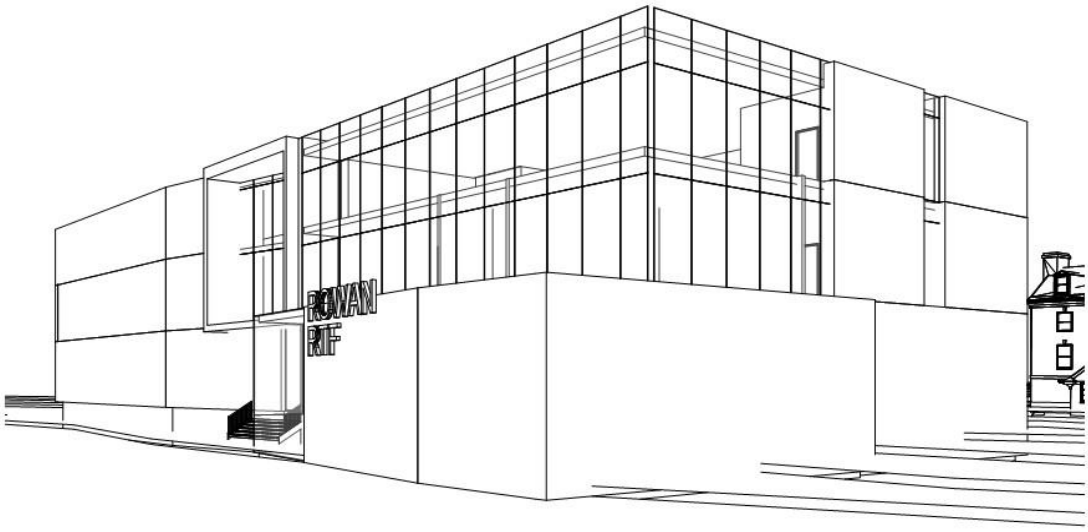

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D20 - PLUMBING

A. Building Design Criteria

1. Site Conditions:

    a. Location: Rowan University
    b. Occupied Area: Three story building; 54,000 gsf total.

2. Codes and Standards: The systems described herein will be designed to conform to the following applicable codes and standards, and authorities having jurisdiction. In all cases where differences between codes are found, the more stringent code shall apply. The code or standard with the more stringent requirements will be followed:

    a. 2021 International Building Code
    b. 2021 International Mechanical Code
    c. 2021 International Fuel Gas Code
    d. 2021 International Fire Code
    e. 2021 International Energy Conservation Code; Sub-Code ASHRAE 90.1 2019
    f. 2021 National Standard Plumbing Code New Jersey Edition
    g. Americans with Disabilities Act (ADA).
    h. AGA-American Gas Association
    i. ANSI: American National Standards Institute
    j. ASME: American Society of Mechanical Engineers
    k. ASTM: American Society of Testing and Materials
    l. AWS: American Welding Society
    m. NFPA: National Fire Protection Association Code
    n. NFPA 13, Installation of Sprinkler Systems
    o. NFPA 14, Standpipe and Hose Systems
    p. NFPA 20, Stationary Pumps for Fire Protection
    q. NFPA 54, National Fuel Gas Code
    r. NFPA 101, Life Safety Code
    s. UL: Underwriters Laboratories
    t. All other Local and State codes and Owner standards will be adhered to where applicable and available.

D2020 – Domestic Water Distribution

1. Sustainability (water conservation):

    a. Provide low flow plumbing fixtures – with electronic, sensor type faucets and flush valves
        i. Water Closets (1.28 GPF)
            i. Battery Powered Flushometer
        ii. Urinals (0.25 GPF).

i. Battery Powered Flushometer
iii. Lavatories (0.5 GPM).
i. Battery Powered Faucet

b. Acceptable manufacturers for plumbing fixtures:
i. American Standard
ii. Kohler
iii. Sloan
iv. Zurn
v. Toto

c. Acceptable manufacturers for Flushometer and faucets
i. Sloan
ii. Chicago Faucets
iii. Powers

d. 105° F hot water will be supplied to all fixtures at the outlet of each mixing valve unless otherwise noted on drawings.
e. Appropriate insulation will be provided on all water piping systems.

2. Domestic Cold-Water System

a. One (1) new domestic water service with meter and reduced pressure principle Back Flow Preventers (RPZ) will be provided from existing site main and connected to a distribution water main and distributed to all new plumbing fixtures and equipment. System will be designed with a maximum velocity of 6 fps at design flow conditions. It is anticipated that a domestic water booster pump will be required. This is based off of low-pressure readings from pressure gauges on existing fire services in adjacent buildings. A recent flow test would be required to verify that this information is accurate. If required, a duplex domestic water booster pump will be located in the building's domestic water service room.

3. Domestic Hot Water System

a. **Hot Water System Option #1**: Two (2) High efficiency electric type water heaters. Each water heater will be sized for 100% demand. The second water heater will allow for 100% redundancy for the system. Water heaters will be sized to generate 120ºF water.
b. **Hot Water System Option #2**: Two (2) High efficiency condensing gas fired semi-instantaneous water heaters. Each water heater will be sized for 100% demand. The second water heater will allow for 100% redundancy for the system. Water heaters will be sized to generate 120ºF water. This option is only feasible if other gas fired equipment is installed for this building.
c. **Hot Water System Option #3**: Two (2) Hybrid electric heat pump water heaters. Each water heater will be sized for 100% demand. The second water heater will allow for 100% redundancy for the system. Water heaters will be sized to generate 120ºF water. This option is only feasible if other gas fired equipment is installed for this building.

d. **Hot water System Option #4**: Provide additional point of use water heaters for remote domestic water demand. This will reduce the running of domestic hot water and hot water return piping runs as well as reducing the size of the water heaters.
e. Hot water return system shall be provided with duplex circulating pumps to maintain temperature. Generally, hot water return piping will be dropped into fixture chases and routed as close to fixtures to avoid "dead leg" piping in system. Hot and Hot Water return at 120°F will be distributed throughout the piping system to all plumbing fixtures.
f. Products and materials:
    i. High Efficiency Electric Domestic Water Heater:
        i. Acceptable Manufacturers
            a) Bradford White
            b) A.O. Smith
    ii. High Efficiency Condensing Gas Fired Domestic Water Heater:
        i. Acceptable Manufacturers
            a) PVI
            b) Lochinvar
            c) Bradford White
            d) A.O. Smith
    iii. Instantaneous Water Heaters:
        i. Acceptable Manufacturers
            a) Rinnai
            b) Bradford White
            c) A.O. Smith
            d) Rheem

4. Domestic Water piping:

    a. Brass pipe with threaded cast brass fittings or Type 'L" copper tubing above grade with wrought copper or cast bronze fittings with 95-5 soldered joints. Any water piping below the slab will be type "K" copper. PEX piping will be allowed for trap primer piping underground, below slab.
    b. Pipe Sizing Criteria
        i. Design Velocity-6fps
        ii. Maximum Velocity-8fps
        iii. Maximum Friction Loss-3 psi/100 ft.
        iv. Minimum pressure at most remote flush valve-35psig.
        v. Minimum Pipe size - 1/2 inch
        vi. Provide 110°F hot water to domestic fixtures.
        vii. Provide 120°F hot water to lab sinks and kitchen sinks.

D2030 – Sanitary Drainage

1. Building Sanitary and Waste and Vent System
    a. A new sanitary lateral system will need to be installed from the new building to the existing site sanitary system.
    b. All fixtures above grade (where practical) will be routed by gravity to sewer connections.

c. All fixtures below grade and where fixtures above grade cannot be routed to sewer by gravity shall be routed underground to a sewage ejector.
d. Venting shall be in place to protect liquid trap seals of fixtures.
e. Venting pipe shall be sloped back to sanitary connections so that any buildup of moisture or condensation cannot create a trap.
f. New floor drains will be provided in Mechanical rooms, public toilet rooms and all other areas requiring floor drains by code or equipment. Floor drains and sprinkler standpipe drains will be provided with trap primers.
g. The elevator sump pumps will be provided at the bottom of the elevator pits and will be routed to discharge either at grade or an open drain with approved means of backflow prevention. The elevator sump pumps will be with oil sensing controls.
h. Piping and fittings for sanitary drainage and vent piping:
    i. Service weight cast iron hub and spigot soil pipe and drainage fittings, or galvanized steel pipe with galvanized threaded cast iron drainage fittings, with galvanized threaded malleable iron vent fittings or cast-iron no-hub with 24-gauge, 304 stainless steel couplings with Neoprene gaskets same as Husky 4000, rated for 15 psi and requiring a minimum of 100 inch/lbs. of torque. Below grade to use hub & spigot extra heavy-duty weight and above grade to use no hub service weight.
    ii. No Hub cast iron pipe 5 inches and larger shall be anchored at each side of coupling (or no hub clamp) and at five (5) feet intervals.
    iii. Exposed waste piping at plumbing fixtures shall be chrome plated.
i. Pipe Sizing Criteria for Gravity System
    i. Minimum design velocity-2fps
        a) Minimum pipe slopes:
        b) 2 inch and smaller: ¼ inch per foot.
        c) 3 inches and larger: 1/4 inch per foot
    ii. Minimum pipe sizes (waste and vent)
        a) Above grade: 1 ½ inches
        b) Below grade: 2 inches
    iii. Pipe Sizing Criteria for elevator pit sump pump discharge
        a) Design Velocity-5fps
        b) Maximum Velocity-8fps
j. Acceptable Manufacturers
    i. Piping:
        a) Anvil International
        a) Star Pipe Products; Starr Fittings Div.
        b) Ward Manufacturing Inc.
    ii. Couplings:
        a) Husky 4000
        b) Clamp All, Hi Torq 25

D2040 – Rain Water Drainage

1. Storm Water Drainage System
    a. Storm water for the roof areas will be drained by gravity through internal leaders, house drains and storm sewers. The storm sewers will be connected to the sanitary sewers at the building exits with house traps and fresh air intakes and connected to the city sewers.

b. Secondary roof drains will be provided on all roofs. Discharge piping from the secondary roof drains will be discharged at grade.

2. Storm Water Piping
   a. Service weight cast iron hub and spigot soil pipe and drainage fittings for below grade with hangers from the floor slab and cast iron no-hub with 24 gauge, 304 stainless steel couplings with neoprene gaskets same as Husky 4000, rated for 15 psi and requiring a minimum of 100 inch/lbs. of torque for above ground.
   b. No Hub cast iron pipe 5 inches and larger shall be anchored at each side of coupling (or no hub clamp) and at five (5) feet intervals.
   c. Acceptable Manufacturers
      i. Piping:
         1. Anvil International
         2. Star Pipe Products; Starr Fittings Div.
         3. Ward Manufacturing Inc.
      ii. Couplings:
         1. Husky 4000
         2. Clamp All, Hi Torq 25

D2090 – Other Plumbing Systems

1. Natural Gas
   a. A new natural gas service will be brought to the building. Natural gas will be provided by South Jersey Gas. A delivery pressure of 2.0 psi will be requested from the utility. Gas regulators will be installed near each piece of equipment to reduce the gas pressure from 2.0 psi to match the gas pressure required for each piece of equipment.
   b. Gas piping:
      i. For gas pipe sizes 3 inch and smaller: standard weight steel pipe with standard weight 150 lbs. w.o.g. Malleable iron, threaded fittings.
      ii. For gas pipe sizes 4 inch and larger: standard weight steel pipe with welded fittings.
2. Insulation
   a. All piping, components, and equipment subject to sweating, heat loss or freezing (hot and cold water) will be insulated with appropriate thickness of fiberglass and fire-retardant jacket in accordance with the State Energy Code and the Owner's standards.
      i. Insulation Schedule

Service	Installation Material	Thickness
Cold Water	Fiberglass	1"
Hot Water	Fiberglass	1"
Hot Recirculation	Fiberglass	1"
Protected Water	Fiberglass	1"
Hot Protected Water	Fiberglass	1"

ii. Insulation will be covered with an all-service jacket equal to Owens Corning Co. Fiberglass 25 ASJ vapor barrier jacketing. Fitting and valve covers will be premolded PVC covers with fiberglass insert.

3. Seismic Restraints
   a. Piping and equipment will be provided with adequate restraints consistent with Code requirements.

D30 - HVAC

B. Building Design Criteria

1. Site Conditions:

   a. Location: Rowan University
   b. Occupied Area: Three story building; 54,000 gsf total.

2. Codes and Standards: The systems described herein will be designed to conform to the following applicable codes and standards, and authorities having jurisdiction. In all cases where differences between codes are found, the more stringent code shall apply. The code or standard with the more stringent requirements will be followed:

   a. 2021 International Building Code
   b. 2021 International Mechanical Code
   c. 2021 International Energy Conservation Code; Sub-Code ASHRAE 90.1 2019
   d. AABC: Associated Air Balance Council
   e. AMCA: Air Movement and Control Association
   f. ANSI: American National Standards Institute
   g. ARI: American Refrigeration Institute
   h. ASHRAE: American Society of Heating, Refrigeration & Air Conditioning Engineers
   i. Handbook and Standards
   j. ASME: American Society of Mechanical Engineers
   k. ASTM: American Society of Testing and Materials
   l. AWS: American Welding Society
   m. MCAA: Mechanical Contractors Association of America
   n. NEBB: National Environmental Balancing Bureau (NEBB)
   o. NFPA: National Fire Protection Association Code
   p. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association
   q. UL: Underwriters Laboratories

3. Design Philosophy

   a. Flexibility: The ductwork distribution systems on each floor will match to the greatest extent possible to the smoke compartments if any. This will both minimize the quantity of fire/smoke dampers and enable future renovations to take place with minimum impact on adjacent suites.

b. Serviceability: All major water side mechanical equipment will be consolidated on the penthouse of the roof of building A. All major air side equipment will be consolidated on the roof of building A with service vestibule. Valves and dampers will be located throughout the building with maintenance in mind and servable from an 8-foot ladder.
c. Indoor Air Quality: All fresh air intakes will be located at the roof, to avoid any opportunity for the ingestion of contaminant and to exceed the minimum requirements from the Department of Homeland Defense.
d. Sustainability: The mechanical systems will be "right sized" and made-up of premium efficiency components and provided with air side economizer. Variable air-volume air system design will be implemented in all spaces to save energy. Variable frequency drives on fans and pumps will be provided to save energy at reduced demand times. Heat recovery chiller and heat recovery coil will be utilized to save energy.
e. Redundancy/Resiliency: Chiller/heaters, associated pumps, heat exchangers and associated pumps, etc. will be headered together within respective mechanical rooms. The coupling will provide reliability if any one system fails. Cooling towers, Chiller/heaters, and associated pumps will be provided with N+1 redundancy. Air handling units will be designed to allow for a minimum of one fan failure while still maintaining 100% airflow.

D3010 - Environmental Criteria

1. Outdoor Design Conditions (ASHRAE, McGuire AFB, climate zone 4A)

Annual Cooling Conditions	
SUMMER (0.4%)	WINTER (99.6%)
92.9° F DB/75.7° F WB	10.5° F DB
Annual Dehumidification Conditions	
SUMMER (0.4%)	WINTER (99.6%)
76.6° F DB/77.3° F WB	10.5° F DB

2. Internal Load Criteria

a. Internal heat gain from equipment will be updated once actual equipment is selected. Internal heat gain from lighting, electric powered or other heat generating equipment and from people occupying the spaces for design (Peak Load) calculations and sizing of equipment are based on the following:

3. People

a. Sensible: 250 BTUH per person
b. Latent: 215 BTUH per person

4. Lighting

    a. Classrooms: 1.0 Watts/ s.f.
    b. Public Spaces: 1.0 Watts/ s.f.

5. Equipment

    a. Classrooms: 1.0 Watts/ s.f.
    b. Office/Public Space: 1.0 Watts/ s.f.

6. Building Envelope Criteria (Zone 4A)

    a. Architect to provide overall U-value of existing exterior wall, roof and fenestration.
    b. Heating/Cooling (Assumptions)
        i. Exterior wall overall U-value 0.060 BTU/Hr- sq ft- degree
        ii. Roof/ceiling overall U value 0.032 BTU/Hr- sq ft- degree
        iii. Vertical glazing overall U-value 0.25 BTU/Hr- sq ft- degree and 0.22 SHGC.

7. Indoor Design Conditions

    a. Summer: 75°F DB/ 50% RH
    b. Winter: 70°F DB

8. Ventilation Requirements

    a. Office Space:
        i. Outside air: 5 CFM/Person+0.06 CFM/SF (Based on 2021 IMC)
    b. Computer Science Space:
        i. Outside air: 10 CFM/Person+0.12 CFM/SF (Based on 2021 IMC)
    c. Classroom/Lecture halls Space:
        i. Outside air: 7.5 CFM/Person+0.06 CFM/SF (Based on 2021 IMC)
    d. Toilet Rooms will be exhausted with a minimum of 70 CFM/fixture as per 2018 IMC.

9. Pressurization

    a. Classroom areas/office spaces in buildings shall be at positive air pressure in respect to corridors and exterior to building.

10. Air System Filtration Design Condition

    a. At a minimum all roof top air handling units will incorporate air filtration media. Filter average efficiency shall be (MERV-8) for a pre-filter and (MERV-11) for final filter.

    b. All filters will be the "Dry Disposable Type."

c. The efficiency of all filters will be the average atmospheric dust spot test efficiency based on ASHRAE Standard 52.1 – 1992 and MERV-A (minimum efficiency value) efficiency according to standard 52.2 – 2007 including appendix.

11. Noise Criteria Design Conditions

a. The mechanical systems shall be designed to conform to the Design Guidelines Criteria for HVAC-Related Background Sound listed in 2019 ASHRAE Handbook Application. Information will be updated once sound consultant reviews and makes further recommendations.

Area Designation	Recommended Room Criteria NC/RC
Corridor/Support Space	40
Open Plan Offices	40
Classrooms	30
Conference Room	30
Teleconference Room	25
Recording Room	25

12. Preliminary Loads (Approximated)

a. Space Cooling and Heating Loads

Occupancy Classification	Occupied Area (SF)	Cooling Loads		Heating & Process Loads	
		SF/TON	TONS	BTU/SF	MBTU
CHSS	54,000	250	216	40	2127

b. Preliminary A/C system selection is based on the above criteria. The following table lists the preliminary selection of A/C systems.

PRELIMINARY AHU SIZING			
Unit No.	Area (S.F.)	CFM/SF	Proposed CFM
AHU-1	27,000	1.48	40,000
AHU-2	27,000	1.48	40,000

D3020 - Heating Systems

1. General

    a. In general, the building heating system shall consist of air-cooled heat pumps, variable primary hot water pumps, pre-heat coils in air handling unit, heating coils in air terminal units.
    b. The heating plant shall be arranged in parallel in an N+1 arrangement for redundancy in the event of equipment failure and/or periodic maintenance.
    c. Heating/Reheating water generated by the heat pumps will be distributed by a variable speed pumping system to heating/reheating coils, unit heater, fan coil units etc. located throughout the building.

2. Design Criteria:

    a. Total Output Heat Pumps Capacity: 4160 MBTU
    b. Hot Water Supply Temperature: 130 Deg. F.
    c. Hot Water Return Temperature: 110 Deg. F.

3. Heat Pumps:
    a. Total Quantity: 8 (N+1); Multiple redundant heat pumps due to sizing for cooling
    b. Air cooled
    c. Capacity: 520 MBTU Each.
    d. All electric

4. Hot Water Pumping System (pre-heat, Re-Heat Coils, Unit heaters, FCU etc)

    a. Variable Primary System
    b. Total two (2) pumps (N+1) one pump is stand-by.
    c. End Suction Pumps 265 gpm @ 65 ft.hd.
    d. 480v Variable Speed Drives
    e. Closed loop chemical treatment via Chemical shot feeder(s).

5. Products and Materials

    a. Hot Water Piping
        i. Hot-water heating piping, aboveground, NPS 2 and smaller shall be any of the following:
            a) Copper tubing and soldered joints.
        ii. Hot-water heating piping, aboveground, NPS 2-1/2 and larger shall be any of the following:

a) Steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

b. Insulation
   i. Hot Water: 2-inch molded fiberglass.

c. Separately Coupled, Base-Mounted, End-Suction Centrifugal Pumps:
   i. Casing: Radially split, cast iron. Integral mount on volute to support the casing and attached piping.
   ii. Impeller: Cast bronze.
   iii. Pump Shaft: Carbon steel.
   iv. Seal: Mechanical.
   v. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing.
   vi. Shaft Coupling: Drop-out type molded rubber insert and interlocking spider with EPDM coupling sleeve for variable-speed applications.
   vii. Coupling Guard: Dual rated; steel; removable; attached to mounting frame.
   viii. Mounting Frame: Welded-steel frame and cross members.
   ix. Acceptable Manufacturers
      a) Grundfos/Paco
      b) Bell & Gossett
      c) Armstrong

d. Modular Air-cooled Heat Pumps:
   i. All electric
   ii. Four pipe designs for simultaneous heating cooling operation.
   iii. Acceptable Manufacturers
      a) York - YMAE
      b) Carrier

D3030 – Cooling Systems

1. General

   a. In general, the cooling system shall consist of (9) nine air cooled heat pumps, variable primary chilled water and condenser water pumps, and chilled water coil in air handling units.
   b. Chiller water plant shall be arranged in parallel in an N+1 arrangement for redundancy.
   c. All heat pumps are capable of producing chilled water and hot water.

2. Design Criteria

    a. Installed Chiller Capacity: 253 Tons include redundant chiller
    b. Chilled water supply temperature: 44°F
    c. Chilled water return temperature: 54°F

3. Heat Pumps

    a. Electric Centrifugal Chillers:
        i. Total Quantity: 8 (N+1)
        ii. Total Tons: 221 Tons; 31 Tons each
        iii. Operating Voltage: 480V
        iv. Refrigerant: R-454B
        v. Variable speed motors and Drive

4. Chilled Water Pumping System

    a. Variable primary system
    b. Two (2) pumps, one pump is stand-by
    c. End Suction pumps 530 gpm @ 65 ft. hd
    d. 480V variable speed drives
    e. Closed loop chemical treatment via chemical shot feeder.

5. Chilled Water Piping

    a. Chilled-water piping, aboveground, NPS 2 and smaller shall be any of the following:
        i. Copper tubing and soldered joints.
    b. Chilled-water piping, aboveground, NPS 2-1/2 and larger shall be any of the following:
        i. Steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
    c. Insulation
        i. Chilled Water: 2-inch molded fiberglass.

D3040 - Air Distribution Systems

1. Air Handling Units

    a. The building supply air side system will include two (2) AHUs located on the roof level penthouse.
    b. Units shall be double wall, 2” insulated with thermal break minimum.
    c. The configuration of AHU will contain the following sections:
        i. Units shall be 20% outside air with variable air volume.

ii. Outside air intake plenum, Economizer section, mixing air plenum, return fans, air blender, pre filters, reheat coil, cooling coil, UVGI grid, supply fans, and final filters and multiple access sections.
iii. Units shall be configured with multiple supply and return fans of the plenum fan type. The minimum quantity of fans shall be six (6) supply fans and four (4) return fans. Each fan to be provided with isolation damper to allow removal without affecting the rest of the system.
iv. Cooling coils and Filters shall be sized for maximum face velocity of 450 fpm.
v. Ultraviolet Germicidal Irradiation (UVGI): This system is being proposed for two reasons: first they save money by reducing HVAC energy costs and eliminating the need for costly coil cleaning programs; second for their ability to kill both surface and airborne microorganisms and prevent the spread of infectious diseases caused by viruses and bacteria.
vi. All air handling units shall have VFDs on supply and return fans.
vii. Airflow measuring stations will be provided for minimum outside air and each supply and return fans.
viii. Units will be provided with Internal Spring with inertia bases for vibration isolation.
ix. Units will be provided with enthalpy-based economizer section.
x. Units will be provided with full-width service vestibule.
xi. Acceptable Manufacturers:
    a) York
    b) Carrier
    c) Trane
    d) Haakon
    e) TMI

2. Distribution System Descriptions

a. In general, the distribution system will be of the variable air volume type for most spaces.
b. Medium pressure supply air ductwork connected to office AHU system runs in duct shafts and branch ductwork to the inlet of each air terminal unit serving each zone on each floor. Low pressure supply ductwork downstream of each air terminal unit ducted to supply air outlets/registers.
c. Return air will utilize the plenum above the ceiling.
d. Medium pressure supply air ductwork connected to lab AHU system runs in duct shafts and branch ductwork to the inlet of each air terminal unit serving each zone on each floor. Low pressure supply ductwork downstream of each air terminal unit ducted to supply air outlets/registers and diffusers.
e. Terminal Air Units shall be of the Variable Air Volume with minimum settings or Constant Air Volume.
    i. Each Terminal Air Unit shall have fiber free insulation, provided with Mylar film.
    ii. Each Terminal Box shall be provided with hot water, coil and pressure independent control valve will be provided on the incoming hot water piping.
    iii. Each Terminal Box shall be provided with a sound attenuator
f. The air terminal boxes will be zoned appropriately per program requirements. The following is a general guide for zoning.

i. Maximum of (3) three offices per air terminal unit.
ii. Maximum of 1000 square feet per air terminal unit.
iii. Corner spaces shall be provided with separate air terminal units.
iv. Conference rooms, classrooms, sound studios shall be provided with separate air terminal units.
v. Must maintain individual, thermal controllability for at least 50% of building occupants

g. Hot water recessed cabinet unit heaters will be provided at vestibule or spaces which have perimeter walls exposed to the outdoors.

3. General Exhaust Fans

a. General/Toilet Exhaust fan will be provided for Toilet Rooms, janitor's closet and similar spaces. Fan to be located on the roof.

D3050 – Terminal and Packaged units

1. Electrical Closet

a. At a minimum, Electrical closet will be ventilated by exhaust fans.

2. Electrical/ UPS/ Transformer Rooms

a. Fan coil unit (FCU) with chilled water coil shall be provided for the main service electrical/UPS rooms.
b. FCU shall be provided with cooling coil and filtration.
c. Pressure independent control valves shall be provided on the leaving chilled water piping.
d. Any and all piping shall be provided with drip pans with leak detectors.
e. Leak detectors shall be provided in the drain pan of FCU.
f. Refer to Electrical narratives for list of electrical rooms with transformers and power conditioner.

3. Data Rooms (IDF & MDF)

a. Each Data Rooms shall be conditioned with fan coil units.
b. Fan coil units shall be provided with chilled water coil, reheat coil, and filtration.
c. Pressure independent control valves shall be provided on the leaving chilled water coils.
d. Each data room shall be provided with 100% redundant units.
e. Any and all piping shall be provided with drip pans with leak detectors.
f. Leak detectors shall be provided.

4. Elevator shaft and Elevator equipment Rooms

a. Elevator shafts and elevator equipment rooms shall be provided with fan coil units.

b. Fan coil units shall be provided with chilled water coil, reheat coil, and filtration.
c. Pressure independent control valves shall be provided on the leaving chilled water coils.
d. Any and all piping shall be provided with drip pans with leak detectors.
e. Leak detectors shall be provided.

5. Mechanical/Plumbing Rooms

a. Mechanical rooms will be ventilated by exhaust/supply fans.
b. Four pipe fan coil unit served by central chilled water and heating hot water shall be installed in the Mechanical/Plumbing rooms.
c. FCU shall be provided with 2" thick MERV-8 filters.
d. Pressure independent control valves shall be provided on the leaving chilled and hot water piping.
e. Leak detectors shall be provided in the drain pan of FCU.

D3060 – Building Management System (BMS)

1. The new BMS shall be a modern fully integrated control and monitoring system incorporating Direct Digital Control (DDC) as a peer-to-peer modular distributed control system.

2. The BMS shall monitor and control HVAC equipment to meet code.

3. The system will be based on communication and interoperability requirements for open, non-proprietary systems using the BACnet IP protocol in compliance with ASHRAE SSPC/135 and ASHRAE 90.1.

4. The BMS shall be a "turnkey" system including all required computer software, hardware, controllers, sensors, transmission equipment, servers, system workstations, local DDC panels, conduit, wire, installation, engineering, database and set-up, supervision, commissioning, acceptance testing, training, and warranty service.

5. BMS Connectivity
   a. The BMS shall reside on the campus converged IT/OT network, on a dedicated vLAN for the BMS.

   b. The BMS shall be a fully IP base system and not utilize any gateways and/or serial connection in order to be functional

   c. Any 3rd party equipment that shall be controlled or monitored by the BMS, shall communicate with the BMS via BACnet IP. In cases where BACnet IP is not available, Modbus TCP/IP shall be utilized.

   d. Network equipment including cabling (i.e. fiberoptic or category cabling), ethernet switches, pathways, outlets, shall be provided by the cabling/telecom contractor. The

BMS contractor shall coordinate data drop location required for BMS components, including but not limited to workstations, DDCPs, IoT sensors, etc with the cabling/telecom contractor.

e. The cabling/telecom contractor shall provide a surface mounted 4-port data outlet mounted within the DDC panels or in a compact locked panel which is conjoined to the DDC panel (panels provided by BMS Contractor). The conjoined panels shall be keyed alike to the DDC panel.

6. Direct Digital Control Panels

   a. DDCPs shall include standalone, modular controllers that are BTL-listed as a BACnet Building Controller that supports BACnet IP.

   b. The I/O modules shall include status LEDs on the I/O modules to allow users to confirm the status of the input/outputs at the panel.

   c. The controller enclosure in dry locations shall be NEMA 12 steel enclosure. NEMA 3R or NEMA 4 enclosures shall be used for outdoor applications.

7. The BMS shall be BACnet SC (Secure Connect) ready, with a secure, encrypted communication datalink layer for the cyber secure transporting of all BACnet messages (sent and received).

8. The BMS shall be a secure encrypted system that is recognized by ASHRAE/ANSI BACnet/SC system. The system shall include four access levels:

   a. Monitor (viewpoints/statuses but make no changes.
   b. Operator (view and change points)
   c. Technician (temporarily override points)
   d. Programmer (complete, unfettered access)

9. The BMS software application shall reside in the client's virtual environment.

10. BMS Historical Trending and Runtime Requirements
    a. The BMS shall be capable of providing owner defined, hourly, daily, and monthly historical trend reports for facility operations and maintenance.
    b. A variety of historical data collection utilities shall be provided to automatically sample, store, and display system data including extended sample period trends, control loop performance trends, and data storage and archiving.
    c. DDC controllers shall automatically accumulate and store runtime hours for binary input and output points.
    d. The operator shall have the capability to define a warning limit for runtime totalization including user-specific messages that shall be generated when the limit is reached.
    e. The BMS shall automatically sample, calculate, and store consumption totals on a daily, weekly, or monthly basis for user selected analog and binary pulse input type points. Totalization shall provide calculations and storage of accumulations including KWH, gallonage, KBTU's, tons, etc.

11. BMS Graphic User Interface (GUI)

    a. BMS Graphic User Interface (GUI) software shall include 3-D real-time values, displays of one-line color graphics and tables that shall be augmented using scaled floorplans to indicate equipment, service locations and system data.
    b. The GUI shall employ browser-like functionality to facilitate operator navigation for quick-viewing of, and access to, the hierarchical structure of databases.
    c. The GUI floorplans shall be set up as "color heat maps" to indicate critical and non-critical space zones showing a color code indicating the condition of the space.
    d. Graphics shall incorporate hardwired and integrated points communicated via multiple sources including 3rdparty interfaces.

12. Miscellaneous Control and Monitoring Systems:
    a. Chilled Water Plant
    b. Hot Water Plant
    c. Miscellaneous Exhaust Systems.
    d. Variable Frequency Drives (VFD) integrated with BMS via BACnet MSTP protocol.
    e. FCU for critical rooms monitoring and control
    f. VAV/CAV boxes / terminal boxes
    g. Indoor Air Quality (IAQ).
    h. Elevator sump pumps monitoring via BMS (high level, pump status).
    i. Miscellaneous electrical alarms.
    j. Refrigerant leak detection panel.
    k. System interfaced with HVAC/Fire alarm.

D3090 – Other HVAC Systems and Equipment

1. Integrated Automation Facility Controls (Smart Building)

    a. As part of the Rowan's Smart Campus Master Plan, this project shall leverage smart building enabling technology to drive experiential learning for the 21-century students and workforce. The CHSS building shall pursue a data-driven approach, integrating and harnessing all building-generated data to drive desired outcomes, improve experiences, and ensure flexibility in space utilization.
    b. Applicable to CHSS project, the day one use cases that have been pre-selected by Rowan stakeholders are categorized based on the following outcomes:
        i. Student Experience Satisfaction
            a) Use Case: Indoor Air Quality Tracking
            b) Use Case: Room / Space Reservation

        ii. Smart Space Optimization
            a) Use Case: Real-Time Building Occupancy
            b) Use Case: Smart Restroom Management & Optimized Cleaning

iii. Smart Energy Management
   a) Use Case: Integrated Classroom Schedule (Pre-Conditioning)

iv. Efficient & Predictable Operations
   a) Use Case: Fault Detection & Diagnostics

c. Refer to appendix – "A" for additional details for each use case.

2. Energy Conservation and Potential Sustainable Design Features

a. The Engineered systems will be designed to meet ASHRAE 90.1 – 2019, Additional energy conservation and sustainability features considered are as follows:

i. Dry bulb or enthalpy-controlled economizer cycle for air conditioning systems, to take advantage of "cool" outside air to provide space cooling without or with reduced usage of refrigeration system.
ii. Use of variable air volume type air conditioning systems for areas, which do not require constant humidity or maintained-pressure relationships with adjacent areas. Variable speed motor drives for VAV system if it is economical and feasible, supply and returns fans. VAV systems will incorporate air measuring stations to accurately control supply and return fan performance.
iii. Larger temperature differential (supply – return temperature) for water systems. Primarily, this will involve application of chilled water equipment with temperature differential of 12 degrees F.
iv. Use of variable speed pumping for all hydronic systems; hot water reheat.
v. LED Lighting to reduce heat load and cooling demand.
vi. Minimum Outdoor Air Measurement.
vii. CO2 based, demand-controlled ventilation (DCV).
viii. Wall-mounted, combination Temperature/CO2 sensor in each of the affected occupied spaces.

   a) Conference Rooms
   b) classrooms
   c) Open Office Areas
   d) Lounges
   e) Lobby's
   f) AV studio's

ix. Each sensor output is then sent to a signal transducer that will read all the sensors and pass through one signal that represents the sensor with the highest reading to the air handler
x. As a result, ventilation rates will be controlled to ensure the most critical space is always adequately ventilated
xi. Advanced Control Applications

a) Optimal Start: starts HVAC equipment only as early as required to bring the building setpoints to comfort levels for occupancy
b) Optimal Stop: Determines the earliest possible time to initiate setback temperatures before unoccupied periods while still maintaining occupant comfort
c) Demand Limiting or Load Shedding: Monitors electric meters and current draw on high-demand equipment, then relaxes setpoints to immediately reduce demand. This technique can, for example, prevent a chiller from further loading, but can also globally change HVAC setpoints throughout the building to shed electric load to avoid peak utility charges

xii. Air handling systems shall operate with 100% outdoor air at the completion of construction activities. Operation at 100% outside air would continue until enough time has passed to lower emitted contamination concentrations to near background levels. (Approximately 2 weeks.)

D40 – FIRE PROTECTION

Building Design Criteria

1. Site Conditions:

    a. Location: Rowan University
    b. Occupied Area: Three story building; 54,000 gsf total.

2. Codes and Standards: The systems described herein will be designed to conform to the following applicable codes and standards, and authorities having jurisdiction. In all cases where differences between codes are found, the more stringent code shall apply. The code or standard with the more stringent requirements will be followed:

    a. 2021 International Building Code
    b. 2021 International Fire Code
    c. 2021 National Standard Plumbing Code New Jersey Edition
    d. ANSI: American National Standards Institute
    e. ASME: American Society of Mechanical Engineers
    f. ASTM: American Society of Testing and Materials
    g. NFPA 13, Installation of Sprinkler Systems
    h. NFPA 14, Standpipe and Hose Systems
    i. NFPA 20, Stationary Pumps for Fire Protection
    j. NFPA 101, Life Safety Code
    k. UL: Underwriters Laboratories
    l. FM Global Owner's Underwriter
    m. All other Local and State codes and Owner standards will be adhered to where applicable and available.

D4010 – Fire Suppression Systems

1. Fire Protection System
    a. The building will be equipped with a complete wet piping sprinkler system. One (1) new water service will be provided to the building. A water meter and double detector check valve assembly will be supplied in the water service room. One (1) Siamese connection will be provided on the exterior of the building.
    b. Upright sprinkler heads will be provided areas without ceilings. Design to be based on NFPA 13 and local code requirements.
    c. Provide drains at the low points of the sprinkler floor level systems, at base of risers and at other required locations for complete drainage of systems. Refer to specification section 213910 2.9 for Drains and test pipes.
    d. Piping shall be concealed above ceilings and within walls except for non-public equipment rooms and areas without ceilings.
    e. Sprinkler heads shall be spaced for symmetry with ceiling features. This will require additional heads that shall be provided in base bid. Basis of head location shall be:

f. Locate in center of ceiling tiles or as indicated otherwise.
g. Contractor shall be responsible for producing valid hydrant flow test and calculations.
h. The system will be hydraulically calculated to provide a minimum pressure of 7 psi at the furthest head.

2. Standpipes (If required)
   a. Per section 905.3.1 of the New Jersey edition of the International Building Code, Standpipes will be required if the floor level of the highest story is located more than 30' above the lowest level of fire department vehicle access.
      i. Class 1 standpipes and provided in each stairwell.
      ii. For standpipes supplying water to the sprinkler system, the following will be required.
         i. Zone control valve with tamper switch
         ii. Flow switch
         iii. Inspectors test
      iii. Standpipes will be in each stairwell with one (1) 2 ½ inch fire department hose valve located at each floor.

3. Fire Pump (If required)
   a. During a site visit on November 5th, 2025, water pressure was observed to be 47psi static. This is relatively low and could cause the need to provide a fire pump.
   b. If standpipes are required, a fire pump would be required to support the requirement of 65 PSI at the highest outlet (2-1/2" fire department hose valve)
      i. A fire pump will be located in a dedicated fire pump room to serve the combined sprinkler / standpipe systems throughout the building.
      ii. Soft start fire pump controller will be specified to reduce the voltage required at startup.

4. Pre-Action Single our Double Interlock (Owners Preference)
   a. A Pre-Action system can be provided the data and visualization space, VR classrooms and VR Room pods.
      i. Pre-Action cabinet would be located in a mechanical space located near the area where the Pre-Action system is being installed.
      ii. Dedicated smoke/heat detection will be installed to tie into the Pre-Action panel.
   b. Acceptable Manufacturers for dry and pre-action valve assemblies:
      i. Victaulic.
      ii. Reliable Automatic Sprinkler Co.
      iii. Viking Corp.
      iv. Tyco.

5. Dry sprinkler system (If required)
   a. Dry-pipe sprinkler systems will be provided for any unheated locations. The dry valves will be located near the area of operation.

6. Sprinkler Design.

a. Light Hazard (Office Space, Seating Area, and Conference Rooms) - Density 0.10 GPM/SQ. FT. over most hydraulically remote area 1500 SQ. FT. with maximum coverage per sprinkler 225 SQ. FT. Maximum area limitation 52,000 SQ. FT.
b. Ordinary Hazard (Mechanical and Electrical Equipment Rooms; storage spaces, etc.) - Density 0.15 GPM/SQ. FT. over most hydraulically remote area 1500 SQ. FT. with maximum coverage per sprinkler 130 SQ. FT. Maximum area limitation 52,000 SQ. FT.

7. Materials
   a. Standard-Pressure, Wet-Type Piping, NPS 4 and Smaller:
      i. Standard-weight, black-steel pipe with threaded ends and uncoated, gray-iron fittings.
      ii. Standard-weight, black-steel pipe with cut- or roll-grooved ends; and uncoated, grooved-end fittings and couplings.
      iii. Standard-weight, galvanized-steel pipe with cut-grooved ends; and galvanized, grooved-end fittings and couplings.
   b. Standard-Pressure, Wet-Type Piping, 5" to 8":
      i. Standard-weight, black-steel pipe with threaded ends and uncoated, gray-iron fittings.
      ii. Standard-weight, black-steel pipe with cut- or roll-grooved ends; and uncoated, grooved-end fittings and couplings.
      iii. Standard-weight, galvanized-steel pipe with cut-grooved ends; and galvanized, grooved-end fittings and couplings.
   c. Standard-Pressure, Dry-Type Piping, 4" and Smaller:
      i. Standard-weight, galvanized-steel pipe with threaded ends and galvanized, gray-iron fittings.
      ii. Standard-weight, galvanized-steel pipe with cut-grooved ends; and galvanized, grooved-end fittings and couplings.

8. Sprinkler Heads
   a. The sprinkler heads will be Quick Response Concealed type heads with white cover plates and adjustable inlet in spaces with ceilings and upright or pendent in rooms without ceilings. Branch sprinkler piping shall be located near structural slab or deck. Design to be based on NFPA 13 and local code requirements.

9. Seismic Restraints
   a. Piping and equipment will be provided with adequate restraints consistent with Code requirements.

D50 - ELECTRICAL

A. Building Design Criteria

1. Site Conditions:

    a. Location: Rowan University Glassboro, NJ
    b. Occupied Area: Three story building; 54,000 gsf total.

2. Codes and Standards: The systems described herein will be designed to conform to the following applicable codes and standards, and authorities having jurisdiction. The code or standard with the more stringent requirements will be followed:

    a. 2021 International Building Code, NJ Edition
    b. 2021 International Energy Conservation Code; Sub-Code ASHRAE 90.1 2016
    a. NFPA 70 National Electrical Code (NEC 2020 Edition)
    b. NFPA 72 National Fire Alarm Code (2019)
    c. NFPA 101 Life Safety Code (2021)
    d. NFPA 110 Emergency and Standard Power Systems (2019)
    e. National Electrical Manufacturers Association (NEMA)
    f. Underwriters Laboratories (UL)
    g. Occupational Safety and Health Act (OSHA)
    h. Illuminating Engineering Society of North America (IESNA)
    i. Americans with Disabilities Act (ADA)
    j. American National Standards Institute (ANSI)
    k. Institute of Electrical & Electronics Engineers (IEEE)
    l. Electrical Testing Laboratories (ETL)
    m. American Society for Testing Materials (ASTM)

D5020 -Normal Electric Service & Distribution

1. The source for utility power for the CHSS Building will be the existing 4.16kV campus loop that presently serves Memorial, Laurel, and Oak Halls. Each building electric service in this area of the campus is fed from a 4.16kV loop allowing the building to be powered from either side of upstream double ended substation #2 located adjacent to the nearby baseball field. The new building will be powered in the same manner with the installation of a new S&C 14.4kV PMH-9 loop switch that will provide a connection to the 4.16kV loop. The load side of the loop switch will extend to a new exterior, pad mounted, oil filled step down transformer that will be dedicated to the new CHSS Building electric service.

2. The proposed point of connection to the 4.16kV loop is an existing electrical manhole located at the northeast side of Memorial Hall not far from Manhole E-23. Refer to attached drawing E-700 for the manhole location and related medium voltage diagram. Final confirmation of the

manhole connection must be provided by Rowan University based on the proposed electrical load (refer to Detail #1 Preliminary Utility Electric Load Estimate) and availability of space in the manhole for the necessary splices to the 4.16kV loop.

Preliminary Utility Electric Load Estimate				
Load Description	**Amperes @ 480V-3Phase**	**Quantity**	**Total Amperes**	**Total kVA**
Air Cooled Heater/Chillers	74	7	518	430
Roof Top AHU	140	2	280	232
Chilled Water Pumps (2 x 20HP, 1 standby)	27	1	27	22
HVAC Controls	20	NA	20	17
Hot Water Pumps (2 x 15HP, 1 standby)	21	1	21	17
Elevators (40HP Est.)	52	2	104	86
Telecom Equipment	50	NA	50	42
AV Equipment (Est.)	50	NA	50	42
Lighting (1VA/SF)	64	NA	64	53
Fire Pump (Est 125 HP)	156	1	156	129
Receptacles (2.5 VA/SF)	159	NA	159	132
Totals			**1,449**	**1,203**

Detail #1: Preliminary Electrical Load Estimate

3. The new pad mounted 1,500 kVA, liquid filled transformer serving the CHSS Building step the voltage down from 4.16kV to building utilization voltage of 480/277V-3 phase 4W. The insulation fluid will be environmentally friendly FR3 biodegradable seed oil.

4. Power will be extended below grade from the exterior 1,500kVA transformer to a new 1,600A 480/277V Main Service Switchboard located in the grade level electrical room.

5. Main Service Switchboard: The main switchboard will include 100% rated, fixed type main and branch circuit breakers with UL 891 listing. The main circuit breaker will have an LSIG electronic adjustable trip function for coordination with feeder circuit brakers. All feeder circuit breakers will have LSI electronic adjustable trip units. The switchboard bus bars shall be hard drawn copper.

6. Power will be distributed through the building from the main service switchboard at 480V to local electrical closets to feed lighting and power panels and step-down transformers for 208/120V panelboards.

7. Each level will require a minimum of two electrical rooms to facilitate space for distribution boards, panelboards, transformers and electrical equipment.

8. Cable riser supports and pull boxes shall be provided in accordance with code requirements.

9. Switchboards & Panelboards:

    a. All switchboards to be circuit breaker type with copper bus.
    b. All panelboards to be bolt-on circuit breaker type, door-in-door construction.
    c. All 480/277V lighting panels to be rated 100A minimum.
    d. All 208/120V receptacle panels will be 84 pole, single section and rated 225A minimum (except for the panels installed in MDF and IDF Rooms).
    e. 208/120V panels installed in MDF and IDF rooms will be 30 pole, single section 100A.
    f. All circuit breakers 100A and above will have electronic trip units.
    g. Acceptable Manufacturers as per specifications.

10. Transformers:

    a. All interior building distribution type transformers will be dry type.
    b. All transformers will meet current 2016 US Department of Energy 10 CFR 431 192 efficiency standards.
    c. All transformer windings will be copper.
    d. Distribution transformers 150 kVA and below- temperature rise will not exceed 115°C over a maximum ambient temperature of 40° C with a 30° C hot-spot rise.
    e. Transformers 225 kVA and above- temperature rise will not exceed 80°C over a maximum ambient temperature of 40° C with a 30° C hot-spot rise.
    f. Step-down transformers with 208/120V secondary windings shall be K-13 rated where required to mitigate the effects of loads that generate high harmonic content.
    g. All transformers 75 Kva and below shall be suspended from the structure to conserve floor space.
    h. All floor mounted transformers will be furnished with steel reinforced, 4” concrete housekeeping pads.
    i. Acceptable Manufacturers as per specifications.

11. Equipment short circuit settings shall be based on computerized short circuit, arc flash study and coordination study to be performed by a third party incensed professional engineer engaged by the electrical contractor for the normal and emergency system. For the estimating purposes only assume the following:

    a. All equipment shall be fully rated; series rating is not acceptable.

b. 480V equipment shall be rated to withstand minimum 65 kAIC, 208V equipment shall be rated to withstand minimum 10kAIC minimum.

12. Fire Pump Electric Service: The fire pump does not require emergency power from an on-site generator. The fire pump will be connected to the 4.16kV loop in accordance with NEC 695.3. A dedicated 4.16kV to 480V- 3 phase step-down transformer will be required to power the fire pump at 480V – 3 phase. The transformer is estimated to be 150kVA based on an estimated 125HP pump motor. The transformer will be pad mounted unit installed on a steel reinforced concrete pad located at the building exterior. Feeders to the building will be installed below grade and routed below the building floor slab to the fire pump controller located in the fire pump room to comply with code requirements for protection of the fire pump feeders.

13. General Wiring Methods and Materials

a. Enclosures:
   i. All interior enclosures will be NEMA 1 rated

   ii. All exterior enclosures will be NEMA 3R rated

b. Wiring:
   i. All wire will be copper.

   ii. Minimum wire size will be No. 12 AWG for power and lighting circuits and No. 14 AWG for control wiring.

   iii. Wire for low voltage (600 volts and below) circuits shall be single conductor stranded copper of not less than 98% conductivity with 600-volt, Type THHN/THWN insulation. Type XHHW may be used for sizes #2AWG and larger.

   iv. Electro-Galvanized Steel Metallic Tubing (EMT) shall comply with UL Standard 797, Federal Specification WW-C-563 and ANSI C 80.3. EMT shall be used for the following:

   a. Interior branch circuits exposed, concealed in hung ceilings and wall partitions, in masonry or concrete.

   b. Interior feeders, exposed or concealed.

   c. Interior motor circuit wiring.

   e. Generally use mechanical dual set-screw type on EMT conduit on interior conduit runs. Use threaded steel compression type within mechanical rooms, kitchens and damp/wet locations.

v. Metal-Clad cable Type "MC" with THHN insulation rated 600 volts & with an insulated grounding conductor shall be permitted for power and lighting branch circuits where concealed above hung ceilings or in walls.

vi. There shall be no shared neutral in multi-circuit raceways. Provide dedicated neutral for each 120V, or 277V circuit. If multi-circuit raceways are planned to be utilized- allow for circuit size derating as required by code.

vii. All wiring will be run concealed within furred walls and above hung ceilings, except as otherwise noted.

viii. Wiring in MER spaces will be run exposed in RGS conduit and mounted at minimum 7'-0" AFF where achievable. Conduit will be permitted to be directly buried in concrete floor, and ceiling slab. Shop/record drawings will be provided for locations.

ix. Wiring in MERs, exterior, and areas exposed to physical damage will be in rigid galvanized steel (RGS) conduit.

x. Below grade conduits shall be run in reinforced concrete duct banks.

xi. Distribution and utilization voltages provided are 480/277V and 208/120V. Equipment requiring voltages other than these will require individual transformers dedicated to that piece of equipment.

xii. HVAC/Utility Equipment: provide a complete system including local safety switches, motor starters, interlocks/safeties, and power and control wiring.

xiii. Motors of 1/3 HP and less will be rated 115 V, single-phase. Motors of 1/2 HP and larger will be rated 460 V, three-phase. Some equipment manufactured may dictate exceptions to these rules.

c. Grounding
   i. Grounding will be specified for all equipment racks and cable trays installed in MDF and IDF Rooms. Grounding will be specified for cable management systems installed throughout the building.
   ii. A reference ground bus will be installed in each MDF and IDF room for grounding equipment in these spaces. A separate equipment ground conductor will be extended back to the main ground bus of the building electric service.
   iii. An equipment grounding conductor will be run in every power raceway.
   iv. A below grade ground loop will be buried around the perimeter of the building with driven ground rods at interval dictated by code.

n. Receptacles
    i. All receptacle cover plates for receptacles shall be labeled such that the panel and circuit number from which they are served is identified.
    ii. Receptacles generally shall be duplex, specification grade, 2 pole, 3 wire grounding type conforming to latest NEMA standards for 20 amp, 125 volt with back and side wiring, ivory; Hubbell #5362 or approved equal.

3. Design Considerations

a. Voltage Drop: All feeders will be sized in order to limit the utilization voltage drop to 2%. All branch circuit conductors will be sized in order to limit the utilization voltage drop to 3%.
b. All service and distribution equipment will be sized for an additional 20% spare capacity.

D5030 -Fire Alarm Systems

A. Site Conditions:
a. Location: Glassboro, New Jersey.
b. Occupied Area: 53,000 square feet.

1. Codes and Standards: The project will be designed in accordance with the following Codes and Standards. Refer to the Project Code Analysis for complete listing.
a. New Jersey Building Sub-Code NJAC 5:23
b. Energy Sub-Code ASHRAE 90.1 2019
c. International Building Code 2021, NJ Edition
d. NFPA 70 National Electrical Code
e. NFPA 72 National Fire Alarm Code
f. National Electrical Manufacturers Association (NEMA)
g. Underwriters' laboratory (UL):
h. UL 864 - Control Units for Fire Protective Signaling Systems
i. UL 228 - Door Holders for Fire Protective Signaling Systems
j. UL 38 - Manually Activated Signaling Boxes
k. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
l. UL 268A - Smoke Detectors for Duct Applications
m. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems
n. UL 464 - Audible Signaling Appliances
o. UL 521 - Heat Detectors for Fire Protective Signaling Systems
p. UL 1481 - Power Supplies for Fire Protective Signaling Systems
q. UL 1638 - Visual Signaling Appliances
r. UL 1971 - Visual Notification Appliances
s. ICC/ANSI A117.1, 2017 Edition
t. Title III (28 CFR Part 36) Americans With Disabilities Act (ADA) – ADOPTED July 1, 1994 (Updated September 15, 2010);
u. ADAAG for Titles I (Employees) and III (Public Accommodation)
v. ASME A17.1-2007/CSA B44-07 (Safety Code for Elevators and Escalators)

w. ANSI S3.41 (American National Standard Audible Emergency Evacuation Signal (2008)

1. The existing Campus fire alarm system is an Edwards EST 3 multiplex addressable system. A new compatible Edwards Fire Alarm Control Panel (FACP) will be installed in the new CHSS Building with a link to the campus system.
2. The fire alarm system shall comply with the requirements of NFPA 72 for Protected Premises Fire Alarm Systems. The fire alarm system shall incorporate an emergency voice/alarm communications system.
3. The fire alarm system shall be programmed with a temporal 3 Notification Signal Sequence of Operations.
4. The fire alarm system shall be an addressable multiplexed microprocessor-controlled Fire Alarm/Life Safety System, which shall be network based with distributed network nodes and amplification.
5. Fire alarm zones shall be limited to 22,500 square feet and shall be consistent with sprinklers, smoke and HVAC zones.
6. A dedicated Class 'A' (Style 7) Fire Alarm System Network Communications Riser shall be provided for redundancy and survivability.
7. Addressable Remote Data Gathering, Amplifier and NAC Panels shall be added as required.
8. The existing smoke detectors located within the second and third floor shell spaces shall be removed.

A. System Components:

1. The Fire Alarm System shall generally consist of the following major components:
    a. New Edwards Fire Alarm Control Panel (FACP) located level 1.
    b. Remote Data Gathering Panel(s) (RDGP)
    c. Remote Amplifier Panel(s)
    d. Remote NAC panels(s)
    e. Dedicated Fire Alarm System Communications Network
    f. Remote annunciator(s).
    g. Addressable Initiating Devices:
        i. Area Smoke Detectors
        ii. Duct Mounted Detectors
        iii. Heat Detectors
        iv. Manual Pull Stations
            a. Addressable Monitor Modules for monitoring of various systems
        v. Addressable Control Modules for control of various systems
    h. Notification Devices
        i. Visual Notification Devices (Strobe Lights)
        ii. Audible Notification Devices (Speakers)
        iii. Combination Notification Devices (Speaker-Strobes)
    i. Fire Alarm System Device - General Installation Guidelines:
        i. Area Smoke Detection at the following locations:
            a. Each elevator lobby
            b. Each elevator machine Room
            c. Each elevator shaft (top)

d. Both sides of rated smoke doors @ smoke/fire barriers for door release
e. Each telephone/communications/LAN closet regardless of size
f. Each electrical Closet, regardless of size
g. All areas open to egress corridor
h. In all egress corridors

j. Duct Mounted Smoke Detectors at the following locations:
   i. All HVAC supply units in excess of 2,000 CFM capacity
   ii. At All floor return duct/entry to return shaft (each shaft/each floor)
   iii. Within 5 feet of smoke dampers, where the duct passes through required smoke barrier and where duct/HVAC system serves multiple smoke zones
   iv. Within 5 feet of each fire smoke damper (FSD)

k. Manual Pull Stations:
   i. At each path of egress on each floor, with 5' of egress
   ii. At additional locations in conformance with 200-foot rule

l. Addressable Interface Monitor/Control Devices:
   i. At each waterflow & tamper device (provided by Fire Protection)
   ii. At sub-systems for alarm/trouble Status
   iii. At Elevator Controllers to initiate Elevator recall
   iv. At required HVAC controllers to initiate direct fan shutdown/restart/purge/exhaust
   v. At fire/smoke and smoke dampers
   vi. At Security Fail-Safe Door Systems & Stairway Re-entry System
   vii. At Building Management System for FAS status/samper control

m. Notification Devices:
   i. Emergency Voice/Alarm Communications Evacuation Speakers:
      a. In all Mechanical & Elevator Machine Rooms
      b. Within 10 feet of each exit on each floor
      c. Spacing to provide a minimum of 15dBa above ambient noise level (per area)
      d. Within stairway every third floor on an individual zone (circuit)
      e. Within each elevator, coordinated with the elevator communication system
      f. Within Elevator Lobbies

n. Visual Indicating Devices (Strobe Lights):
   i. Minimum of two (2) visual zones (circuits) per floor per zone
   ii. In all Mechanical & Elevator Machine Rooms
   iii. Within 10 feet of each exit on each floor
   iv. In all Toilets, Conference Rooms, Copy/File Rooms, Pantry
   v. In all common areas in excess of 1000 square feet
   vi. Within 15 feet of the end of every corridor (ADA/NFPA/ANSI) with 100 feet maximum spacing between appliances (ADA/NFPA/ANSI)
   vii. ADA compliant 75 candela (Minimum) strobes – synchronized.

D5040 -Supplementary components

1. Lighting fixture specifications and lighting level calculations and lighting layouts will be performed by a separate consultant. Lighting will be wired primarily at 277V to local panelboards located at each level.

2. Automatic Lighting Control System for building excluding, mechanical rooms, electrical rooms, electrical and IT closets, and elevator machine rooms.

3. Lighting Control

    a. Lighting control system shall be provided throughout and shall include the following:
        1. Relay-based control via inputs from low-voltage switches, occupancy sensors, and/or programmable schedules.
        2. Occupancy Sensors shall be provided for at least 75% of the connected lighting loads.
        3. Daylight harvesting utilizing dimming-controlled fixtures via inputs from daylight sensors where applicable per code.
        4. Preset dimming controls for conference rooms, multipurpose rooms.
        5. AV interface for scene selectors in conference rooms, multipurpose rooms where applicable.
        6. Shade controls in conference rooms, multipurpose rooms where applicable.
        7. Photocell/time schedule control for exterior lighting.

4. Lighting Control Sequence of Operation

    a. Each room shall have at least one accessible lighting control to independently activate general lighting within the room.
    b. All rooms larger than 500 square feet shall have one or more accessible lighting controls so that general lighting may be reduced by at least one half throughout the room.
    c. Individual controllability for 90% of occupants.
    d. Lighting control systems consisting of but not limited to line voltage wall sensor switches for rooms <300 ft2, larger standalone rooms shall have CAT5E digital room configurations as described below and CAT5E digital networked lighting control panels for time schedule where required.
    e. All switches shall be on/off override control for indicated spaces. Dimming feature as described below.
    f. Daylighting controls shall be installed when the space meets code requirements.
    g. Occupancy/vacancy sensors shall turn lights off after 20 min of vacancy.
    h. Sensor technology shall be of the appropriate type for each space.
    i. Emergency lighting fixtures are supplied with emergency feed from a generator and shall be un-switched night lights.

5. Conference Rm / Private Office / Workrooms

a. Rooms <300 ft2 shall be manual-on / auto-off via a line voltage wall mounted dual-tech sensor switch with 0-10V dimming.
b. Rooms >300 ft2 shall be manual-on / auto-off via a digital on/off/0-10V dimmer switch and dual-tech ceiling/wall sensor with digital room controller. Digital daylighting controls if required.

6. Storage

a. Rooms <300 ft2 shall be manual-on / auto-off via a line voltage wall mounted dual-tech sensor switch.
b. Rooms >300 ft2 shall be manual-on / auto-off via a digital on/off switch and dual-tech ceiling/wall sensor with digital room controller. Digital daylighting controls if required.

7. Toilets / Restrooms

a. Private toilets shall be auto-on / auto-off via a line voltage wall mounted PIR sensor switch.
b. Multi-stall restrooms shall be auto-on / auto-off via a digital ultrasonic ceiling sensor and digital room controller with digital on/off switch for override. Digital daylighting controls if required.

8. Stairwells

a. Lighting fixtures at each landing shall have integral occupancy sensor to dim each fixture by at least 50% when vacant and bring fixtures to full intensity upon loss of utility power.

9. Mechanical / Electrical Rooms

a. These spaces shall have line voltage toggle switches only. No automatic controls are required.

10. Lobby / Corridors

a. 24/7 general use areas – Digital room controller and ceiling sensors shall dim all lighting fixtures by 50% after vacancy. All lighting fixtures shall be brought to full brightness upon occupancy. Override switch control shall be remote mounted.
b. Outpatient treatment areas – Auto-on / auto-off via a digital time schedule with digital occupancy sensors after hour override control. Override switch control shall be remote mounted.

D5060 -Miscellaneous Electrical Systems

1. Surge Protective Devices (SPD's)

a. An SPD device will be designed to protect the Electric Service Switchboard from power surges.
b. SPDs will be installed at all 208/120V panel boards in electrical closets and IDF/MDF rooms to protect sensitive electronic equipment from power surges.

2. Uninterruptable Power Supply System (UPS)

a. A central UPS system is not required for this project. At the discretion of The College, local rack mounted UPS units can be installed in IDF or MDF rooms. Rack mounted UPS units are considered user equipment and not specified by the electrical design team. Power will be provided locally from the IDF or MDF panelboard based on the power requirements provide by the College to the design team.

3. Security, Audio Visual, Telecommunications Systems

a. Power will be provided on the electrical drawings for low voltage systems as defined by the respective design consultants providing design for these systems.
b. Syska's drawings will refer to Security, Audio Visual, Telecommunications Systems drawings and specifications for all conduit systems, wireways, cable trays and junction and pull boxes required for these installations. This information will not be duplicated on Syska's drawings which will avoid conflicts in documentation. All Security, Audio Visual, Telecommunications Systems documents must be shared with electrical contractors during the bidding process prior to construction.

4. Lightning Protection System

a. A UL Master Label and LPI certified lightning protection system will be provided with down conductors tied into the grounding electrode system via the buried perimeter ground ring, building steel, ground rods, etc. The new building will have its own Master Label.

D5090 – Emergency Lighting and Power

1. This project does not require the installation of an emergency generator for support of legally required standby loads.

2. Power for code required emergency lighting will be provided from a centrally located UL 924 battery inverter unit located in the grade level electrical room. The battery inverter unit will provide 90 minutes of battery reserve based on the full load rating of the system. Dedicated emergency egress lighting circuits will be extended to areas described below at 277V.

3. At a minimum, egress emergency lighting will be installed in the following locations in accordance with IBC 1008.3.2 and 1008.3.3:

a. Rooms and spaces that require two or more exits or access to exits.
b. Corridors.

c. Interior exit access stairways and ramps.
d. Interior and exterior exit stairways and ramps.
e. Exit passageways.
f. Vestibules and areas on the level of discharge used for exit discharge.
g. Exterior landings for exit doorways that lead to the exit discharge.
h. Electrical Equipment Rooms.
i. Fire Command Center.
j. Fire pump room.

4. The central battery inverter unit is estimated to be 16.7kW with a 480V single phase input rating. Approximate dimensions: 48”W x 76”H x 25”D. The approximate weight of the system is 3845 pounds including batteries. Battery type will be maintenance free valve regulated lead acid (VRLA) type. A 4” high, steel reinforced concrete maintenance pad will be required to support this equipment.

Appendix A

Real-time Building Occupancy Tracking + Controls

Wired or wireless occupancy sensor

OUTCOME	USER(S)	SPACE(S)
• A reduction in HVAC and cleaning related costs	• Building Operation • IT Services • Safety and Security	• All building zones and high-traffic areas

DESCRIPTION

Real-time occupancy monitoring to improve space planning, safety, and facility utilization

CRITERIA

- As Wi-Fi/BLE presence analytics
- Occupancy sensors
- Scheduling system integration

FUNCTIONALITY

- Live zone-based occupancy data
- Historical usage analytics
- Overcrowding alerts

BENEFITS

- Optimized space usage
- Improved safety compliance
- Support for hybrid learning environments

PRIORITY	PRIORITY
High - ☐ Low - ☐	☆☆☆☆☆

Room / Space Reservation

Integrated Classroom Schedule (Room Conditioning)

OUTCOME	USER(S)	SPACE(S)
Increase In the efficiency in which spaces are utilized and conditioned	• Faculty • Academic Coordinators • Students	• All learning environments and shared spaces

DESCRIPTION

Systemwide classroom scheduling with AV/HVAC presets and occupancy integration

CRITERIA

- Integration with academic calendar
- Room booking by availability and tyle
- Environmental present triggers

FUNCTIONALITY

- Prevent double-bookings
- Prepare room conditions before use
- Sync course changes instantly

BENEFITS

- Better teaching environment readiness
- Efficient use of space
- Reduced conflicts

PRIORITY	PRIORITY
High - ☐ Low - ☐	☆☆☆☆☆

Optimzed Building Cleaning

OUTCOME	USER(S)	SPACE(S)
• Sustainable • Efficient Operation	• Janitorial Team • Facilities Team • Property Manager	• Restrooms • Pantry / Kitchenette • Office spaces

DESCRIPTION

Using data generated by IoT devices to track usage patterns of consumables in real time to optimize cleaning schedule

CRITERIA

Digital tools that enhance the visibility of cleaning activities and streamline planning for optimal results.

FUNCTIONALITY

- Track consumable levels
- Optimize cleaning plans and schedule
- Generate insightful analytics and reports

BENEFITS

- Increased efficiency
- Eliminate waste
- Cost savings
- Safer and cleaner environment for users

PRIORITY	PRIORITY
High - ☐ Low - ☐	☆☆☆☆☆

Indoor Air Quality Tracking

Students' experience satisfaction

OUTCOME	USER(S)	SPACE(S)
• Sustainable	• Sustainability director	• Office space • Conference rooms • Other relevant zones

DESCRIPTION

Tracks and reports real-time air quality indoors as well as outdoors to provide insight into the environmental performance.

CRITERIA

Track, monitor, and report on the building's air quality.

FUNCTIONALITY

- Monitor indoor air quality (IAQ)
  - assist LEED credit "*Enhanced IAQ Management*"
  - assist WELL credit "*A07.2 Manage Window Use*"
- Monitor outdoor air quality for optimal ventilation and filtration, better management of IAQ, automatic notification if air quality exceeds a threshold

BENEFITS

- XXX

PRIORITY	PRIORITY
High - ☐ Low - ☐	☆☆☆☆☆

Fault Detection + Diagnostics

Efficient & predictable campus operations

OUTCOME	USER(S)	SPACE(S)
• A decrease in maintenance costs associated with surprise repairs, and a reduction in down time	• Facilities Management • Campus Engineering Teams	• Mechanical rooms • Electrical panels • HVAC zones • Control systems

DESCRIPTION

FDD systems continuously monitor building systems and automatically detect, diagnose and alert staff of equipment faults and performance deviations.

CRITERIA

- Integration with BMS and HVAC control layers
- Sensor fusion and analytics engine
- Real-time alerting and diagnostics dashboard

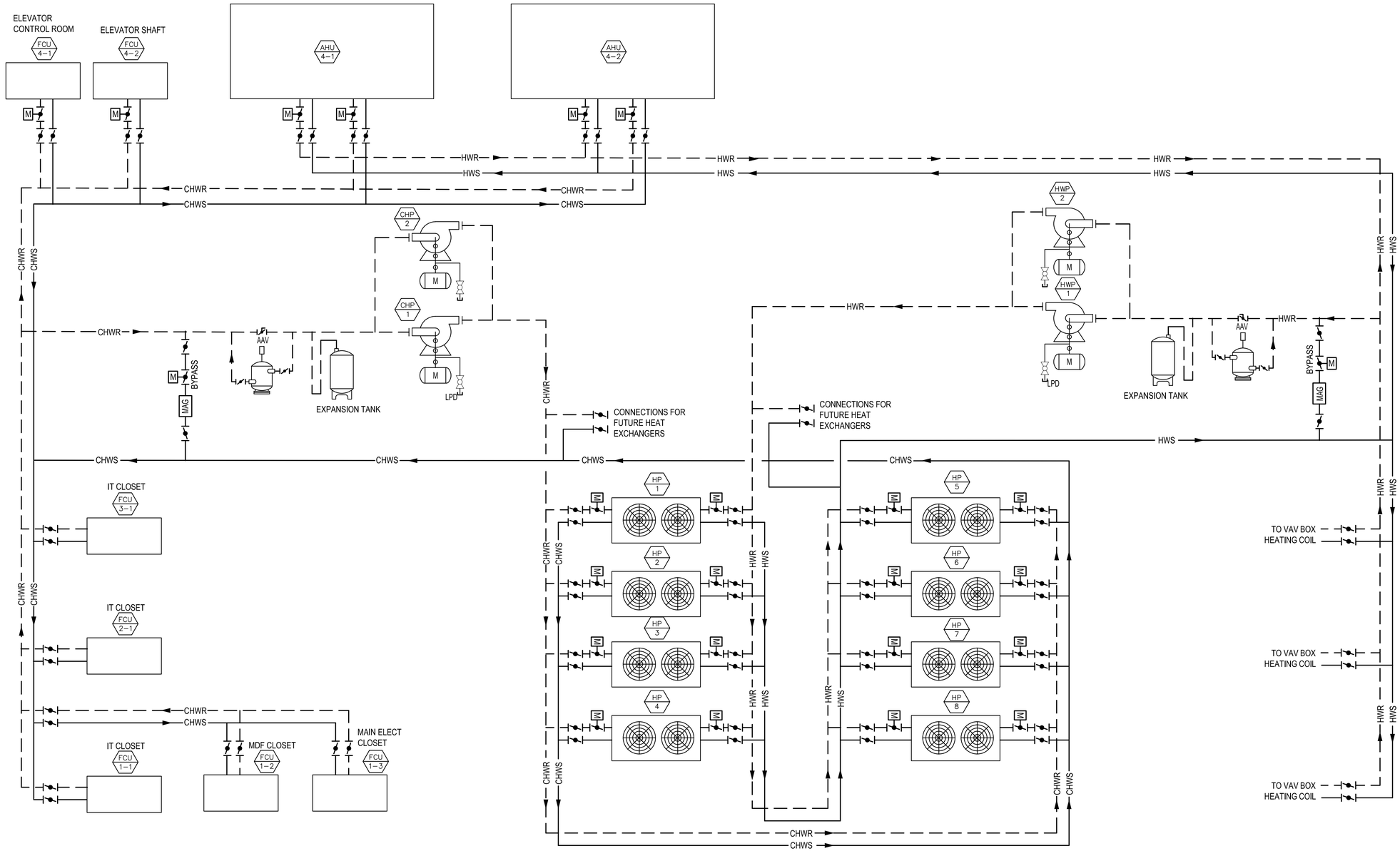
FUNCTIONALITY

- Early detection of mechanical inefficiencies or failures
- Automated classification of fault types
- Guidance on corrective action

BENEFITS

- Reduced downtime and service disruptions
- Increased lifespan of equipment
- Lower maintenance costs through early intervention

PRIORITY	RATING
High - ☐ Low - ☐	☆☆☆☆☆



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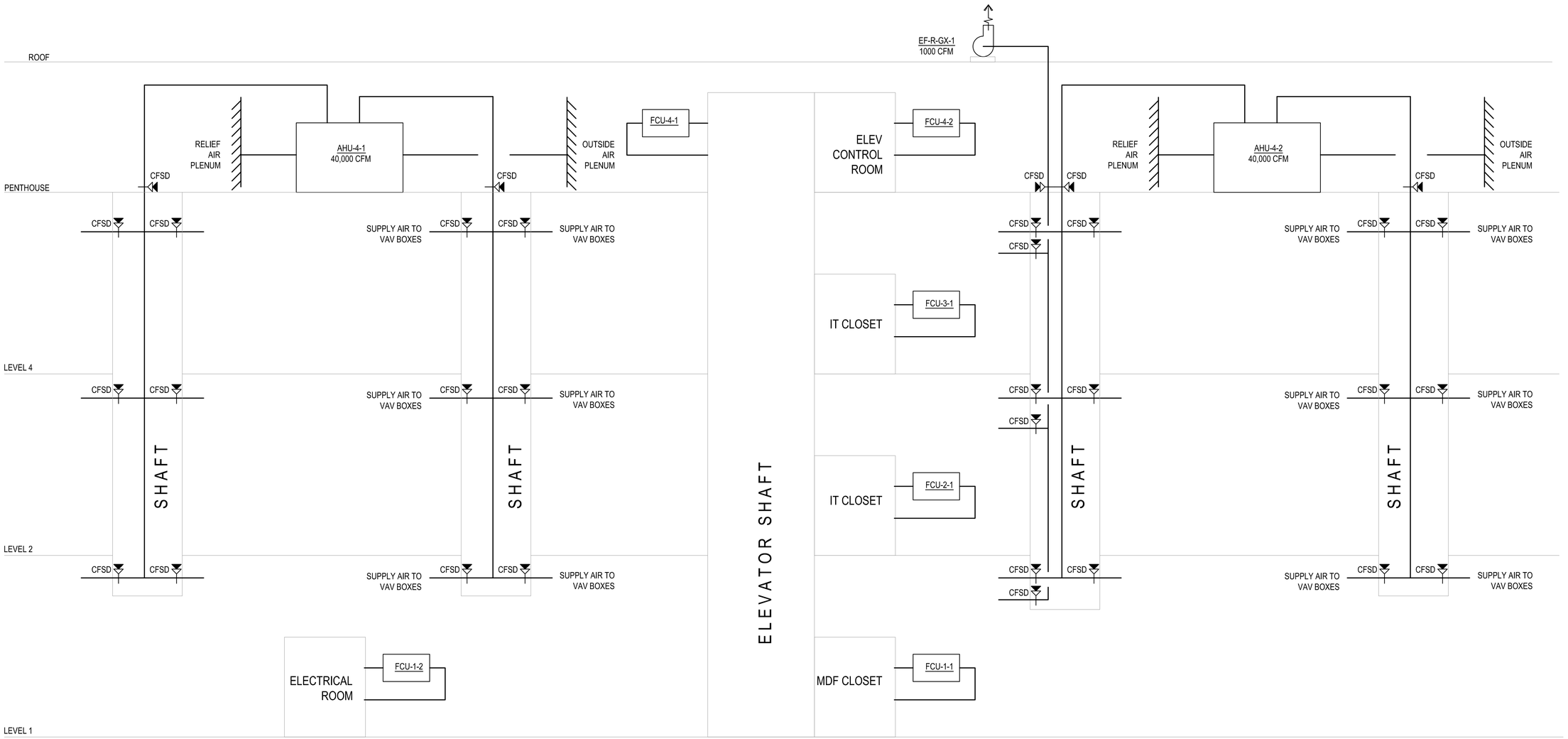
APPROVED BY:	CAD

TITLE:
CHILLED AND HOT WATER FLOW DIAGRAM

NUMBER:
M-700



1 AIR FLOW DIAGRAM
Scale: NTS

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AIRFLOW DIAGRAM

NUMBER:
M-701

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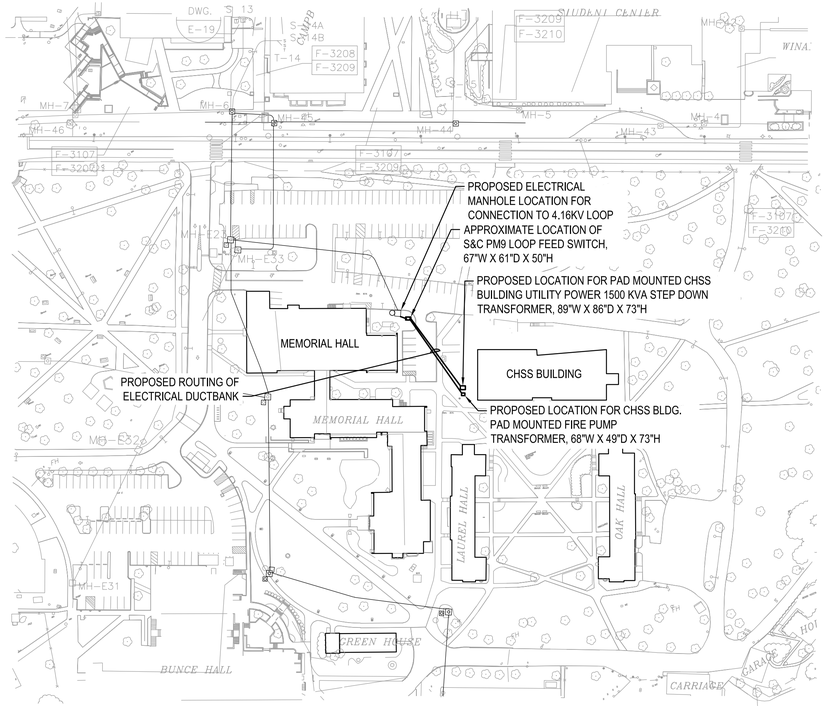

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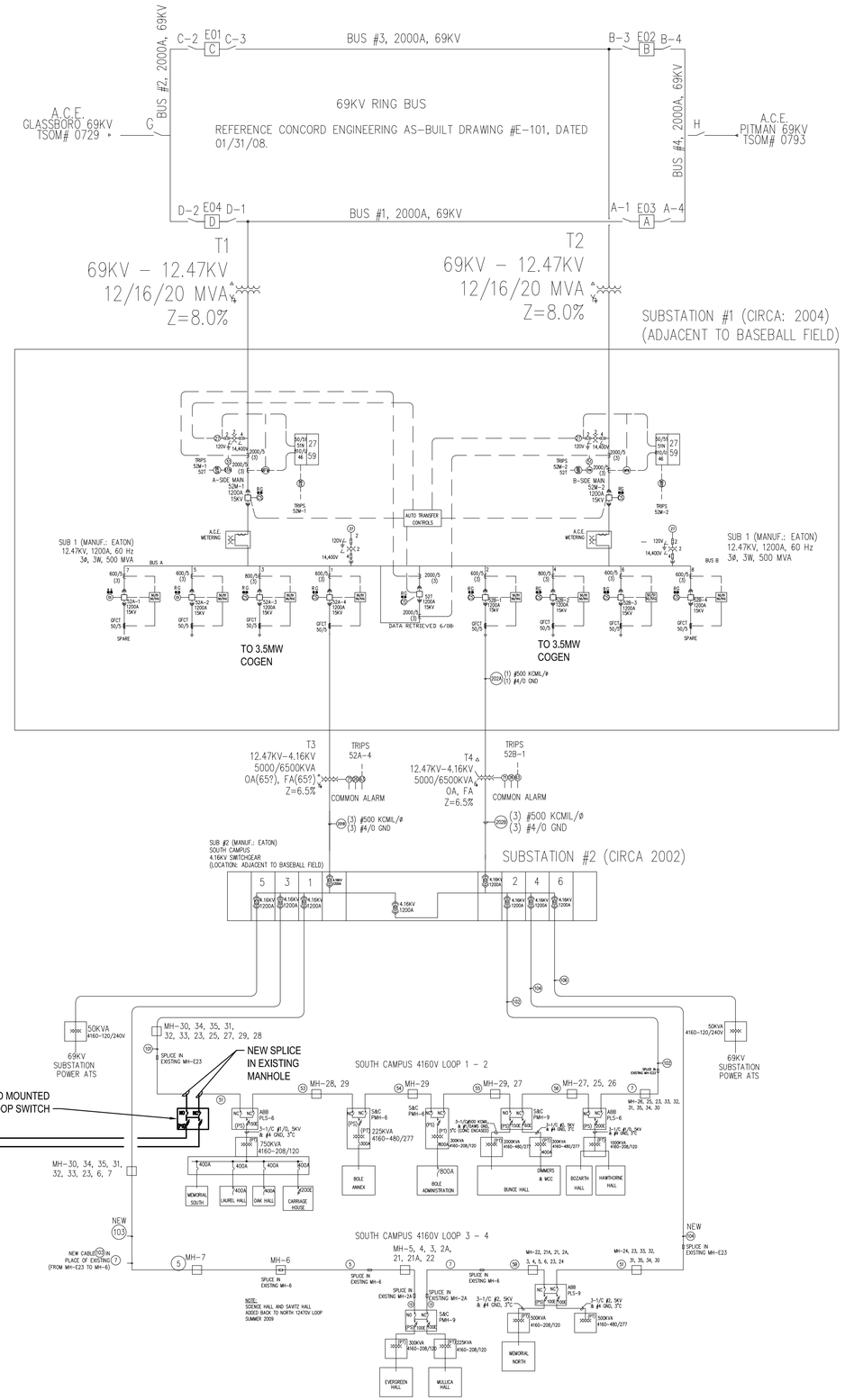

1 MEDIUM VOLTAGE SITE DISTRIBUTION DIAGRAM
Scale: NONE

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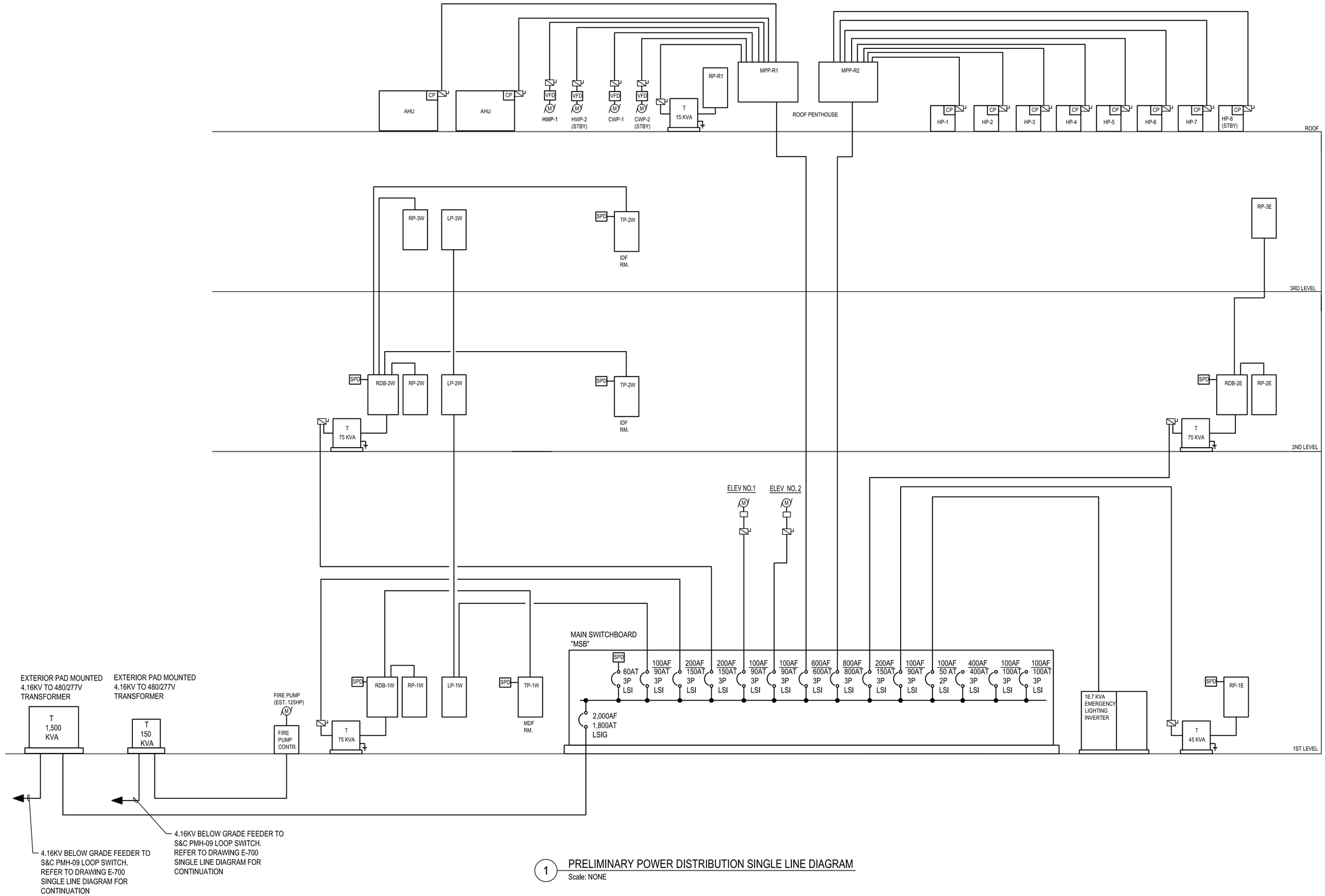
APPROVED BY:	CAD

TITLE:
SITE ELECTRICAL AND MEDIUM VOLTAGE DIAGRAM

NUMBER:
E-700



1 PRELIMINARY POWER DISTRIBUTION SINGLE LINE DIAGRAM
Scale: NONE

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APPROVED BY:	CAD

TITLE:
PRELIMINARY POWER DISTRIBUTION SINGLE LINE DIAGRAM

NUMBER:
E-701