College of Marin
Fusselman Hall Boiler & Controls System Replacement:
100% SD MEP Basis of Design

April 1, 2016

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1.0 Project Description

1.1 General Building Description

The project is the replacement of the boiler plant and the controls systems for the Fusselman Hall building located at the Kentfield Campus of the College of Marin.

The existing boiler, hot water pumps, and other auxiliary equipment will all be removed from the basement boiler room and replaced with new boiler, two hot water pumps, air separator, expansion tank, cold domestic water pressure reducing station for water makeup, gas piping and gas valve train, variable speed drives for each pump, and all valves required to make the system a variable speed primary heating hot water system.

The existing building HVAC controls system will be retrofitted to have a DDC front end that communicates with the campus control system, and all controls equipment in the entire building will be replaced and retrofitted with a new DDC controls system. The existing pneumatic controls systems will be completely removed and replaced with a new DDC controls system including the retrofit of existing control components as required for a complete installation, retrofit existing HVAC equipment to connect with new DDC controls system throughout the building. Deduct Alternates for controls are included in this Basis of Design controls section to reduce the scope of the controls work limit it to the boiler room. These deduct alternates are to be priced as separate scope items.

Size:	First Level 7,500 GSF Second Level 7,300 GSF
Number of Floors:	Two levels
Function:	School classroom/admin
Year Built:	1940

Table 1: Building Description

1.2 Sustainability Goals

The project (components being replaced) will meet and exceed all code requirements including the energy code Title 24-2013. The project successful bidder will pursue and obtain the rebate incentive from PG&E for heating hot water boiler replacement, details are available here - http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/boilers_waterheating_catalog_final.pdf.

1.3 Existing MEP Equipment

The Design/build mechanical and electrical contractors shall test any existing equipment that is planned to be reused and provide a written report describing equipment functionality and suitability for reuse. If existing equipment to be reused needs to be replace or repaired (in part or whole), the design/build contractors shall identify the work required, cost, and any schedule implications of work to be done prior to commencing any work to repair any piece of equipment. If the Design/build contractor starts any work on existing equipment after the assessment period it is understood that the equipment can be reused as is, or that any repair of equipment required for a complete project is included in the original bid.

1.4 Climatic Conditions

1.4.1 Climate Summary

Understanding the local climate is critical toward the design of a sustainable project. The climate summary for Sonoma County, CA, the closest available weather file/city, is shown below in tabular format. Additional climate information, including some of the following charts, is available from ASHRAE publications and the Western Regional Climate Center, wrcc@dri.edu.

For annual hourly weather analysis, the industry standard is to use TMY3 (Typical Meteorological Year 3) data, produced by the National Renewable Energy Laboratory (NREL). The TMY3 data set contains weather data for 1,020 locations across the United States. For this project, the closest TMY3 weather data available is for Santa Rosa in Sonoma County, CA, which is approximately 38 miles north of the project location.

Geographical	
Latitude	38° 30’ N
Longitude	122° 48’ W
Elevation	148 ft.
Climate Summary	
Cooling	
Degree Days (65°F)	375
Extreme	110.9°F
0.4% DB/MCWB	95.3/66.6 °F
1.0% DB/MCWB	91.1/65.9°F
2% DB/MCWB	87.8/64.8°F
Evaporation	
0.4% WB/MCDB	69.2/90.4°F
1% WB/MCDB	67.5/87.8°F
Max – Min Avg. Daily Range	18.3-31.7°F
Heating	
Degree Days (50°F)	347
Extreme	19.6°F
99.6%	29.6°F
99%	31.7°F
Annual Rainfall	44.7”
Snowfall	0”
Sources: ASHRAE 2013 and Western Regional Climate Center	

Table 2: Project Climate Summary

Table 2 and Figure 1 illustrate the extremes, averages, and breakdown of Santa Rosa’s typical annual temperatures and relative humidity range. Figure 1 demonstrates that this climate is ideal for passive strategies like natural ventilation and mixed mode operation as the bulk of bin hours occur at 75F outdoor temperature or below.

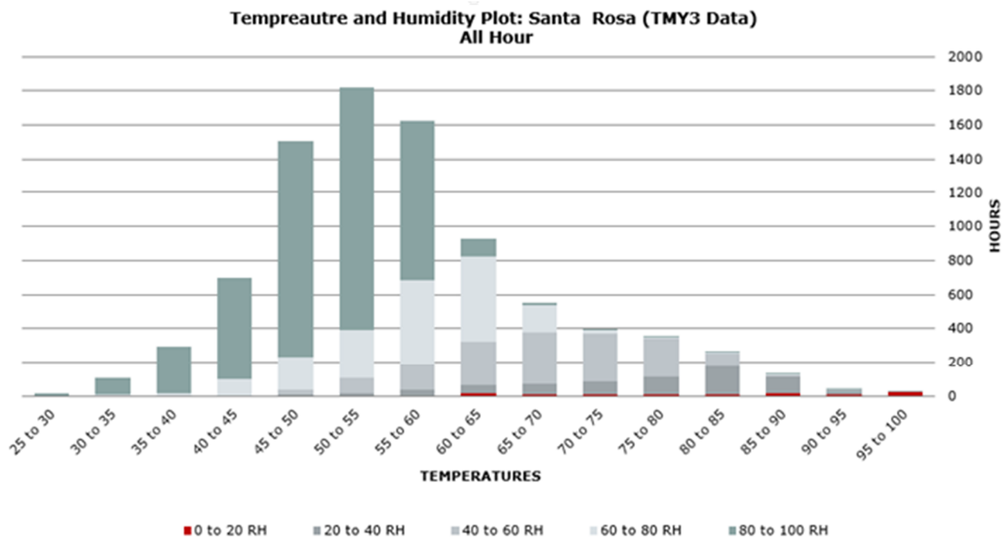


Figure 1: Typical Annual Temperature Profile (Daytime), Santa Rosa, CA

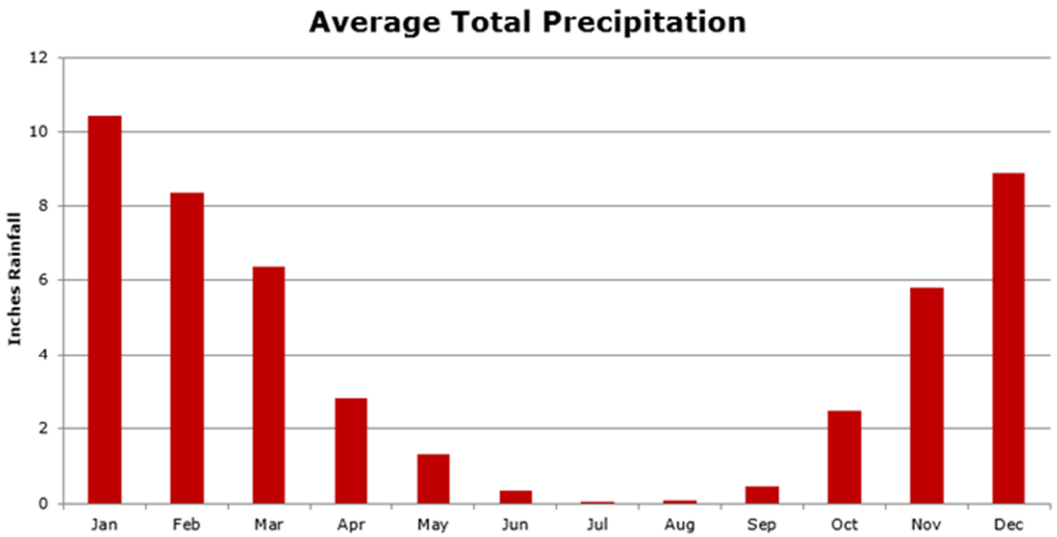


Figure 2: Typical Annual Precipitation Profile, Kentfield, CA

1.5 MEP Basis of Design & Design-Build Requirements

The purpose of this MEP Basis of Design (BOD) document is to establish the minimum design and quality standards for the project. The design/build contractors shall use this BOD in preparing their proposals for the design and construction of the mechanical, and electrical systems for this building.

The Design/build contractors shall visit the project site prior to bidding on this project and shall be familiar with existing conditions. The Design/build contractors shall provide an evaluation report of existing equipment prior to starting any construction as outlined in section 1.3. Provide separate pricing for the evaluation report in your bid.

The selected mechanical and electrical contractors will be entirely responsible for the design, assisting with permitting, building, start-up and testing of all the MEP systems. The design shall be the responsibility of the mechanical, fire protection, electrical, and fire alarm engineers of record who shall be registered professional engineers in the State of California. The MEP contractors shall provide complete and functional systems that meet all of College of Marin's guidelines & requirements. The MEP design/build contractors shall provide a written guarantee for a period of one year from the date of substantial completion that covers the entire MEP system including equipment, materials, and workmanship.

Mechanical Work Included: HVAC/controls, plumbing, and fire protection systems.

Electrical Work Included: Normal and emergency power systems, lighting, fire alarm systems.

Design/Build Proposals: MEP design/build proposals shall include evidence of experience in the design and construction of the MEP systems being proposed - refer to MEP system design description section below. The MEP systems shall be designed in strict accordance with the College of Marin Design Guidelines and to high quality standards to maximize the life of the systems and minimize the maintenance and utility costs.

Design Procedures: Design of all systems shall be according to recognized industry standards, this BOD, and College of Marin Design Guidelines. The design criteria and design of MEP systems provided by the design build contractor including drawings, specifications and calculations shall be reviewed and approved by the owner and owner representatives (College of Marin PM and PAE) at the following critical milestones, 100%DD, 100% CD/Permit.

At the completion of construction the MEP contractors shall furnish the owner with complete as built drawings, training, and OEM Manual information in both electronic and hard-copy formats.

The following drawings are part of this MEP Basis of Design Document, refer to them for additional information regarding equipment location and MEP design information. The drawings are included in Appendix A and are as follows:

- ME1 SYMBOLS LIST – MECHANICAL AND ELECTRICAL
- ME2 EQUIPMENT SCHEDULES
- ME3 FIRST FLOOR OVERALL PLAN AND SCHEDULES
- ME4 ENLARGED BOILER ROOM FLOOR PLAN
- ME5 ENLARGED MECHANICAL ROOM FLOOR PLAN
- ME6 HOT WATER FLOW DIAGRAM
- ME7 CONTROLS DIAGRAM AND DETAILS

1.6 Codes and Standards

MEP systems will be designed in accordance with the following codes:

- 2013 California Building Standards Administrative Code
- 2013 California Building Code
- 2013 California Electrical Code
- 2013 California Mechanical Code
- 2013 California Plumbing Code
- 2013 California Energy Code, Title 24
- 2013 California Fire Code
- 2013 California Green Code, CALGreen
- 2013 California Reference Standards Code
- Division of State Architect (DSA) Interpretations of Regulations (IR's)
- Cal/OSHA laws and regulations – Division of the department of occupational safety and health

MEP systems will be designed in accordance with the following standards:

- College of Marin Design Guidelines.
- PG&E Boiler Rebate Program - http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/boilers_waterheating_catalog_final.pdf.
- ASHRAE Standard 135-2010 – BACnet, A Data Communication Protocol for Building Automation and Control Networks
- AABC – TAB Standards
- SMACNA
    - Fire and Smoke Damper Installation Guide.
    - Guidelines for Seismic Restraints of Mechanical Systems.
    - Standards for Duct Construction.
- NEMA – National Electrical Manufacturer's Association.
- NECA - National Electrical Contractors Association.
- IEEE - Institute of Electrical and Electronic Engineers.
- NFPA 13 – Standard for the Installation of Sprinkler Systems.
- NFPA 101 – Life Safety Code.
- ADA or Uniform Federal Accessibility Standards.

1.7 Equipment Clearances and Accessibility

All MEP equipment on the project shall be located, such that all local, State and National codes, including but not limited to OSHA, CALOSHA, and manufacturer's recommendations for clearances and access for maintenance shall be provided. At each project milestone (100%DD and 100%CD) the Design Build Contractor shall have a page turn meeting with the College of Marin Project Manager and facility staff to provide them an overview of all equipment location and access.

1.8 Economic Incentives

The project will pursue and obtain the maximum rebate amount possible under the PG&E rebate for boiler (for heating hot water) replacement as detailed in the manual available at this website - http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/boilers_waterheating_catalog_final.pdf.

The Design Build contractor shall fill all paperwork and provided all calculations required to satisfy PG&E's rebate requirements, and shall liaison with PG&E representatives to obtain the rebate for the College of Marin.

1.9 Commissioning

The project is assumed not to require commissioning since the areas of work are under the 10,000 square-foot threshold in the CA energy code. However, it is the Design Build Contractor's responsibility to meet with the Authority Having Jurisdiction and determine all project requirements.

1.10 Seismic Design

Anchoring and seismic design of mechanical and electrical systems will be designed (include with every MEP equipment submittal details and calculations stamped and signed) by a California Licensed Structural Engineer. Design shall meet all of DSA's requirements.

Contractor shall provide for all concrete work required on this project. Existing concrete pads in boiler room (for boiler and pumps) may need to be replaced with new to match new equipment footprint, provide as required for a complete project.

1.11 Acoustical Design

The design of MEP systems and infrastructure shall be according to ASHRAE guidelines.

1.12 Testing & Balancing

The project HVAC equipment shall be tested and balanced (TAB) per AABC guidelines. The new boiler, pumps, and other new equipment within boiler room, as well as existing HVAC equipment throughout the building using heating hot water (AHU heating coils located on the first floor, office console units located on second floor, etc.) shall all be tested and balanced so as to balance the entire heating hot water system. Any fan system being replaced or repaired under this project shall also be balanced for air flow. Design/build contractor shall assess existing conditions as outline on section 1.3 and provide within the existing conditions report recommendations on any air dampers, shut-off valves, or control valves that need to be added to the system(s) for proper balancing of air and water HVAC systems.

Design/build contractor shall provide a 90-day period for water and air balancing of HVAC systems, starting from initial TAB work, during which additional TAB work required to adjust HVAC systems shall be provided at no cost to the owner (up to a maximum of three TAB adjustments).

2.0 Mechanical

2.1 HVAC Systems Base Scope

2.1.1 Design Criteria

Outdoor Conditions	Summer (0.4%)	Winter (99.6%)
ASHRAE 2013, Sonoma County	95.3°F DB/66.6°F WB	29.6°F

Table 3: Outdoor Conditions

Indoor Conditions	Summer	Winter
Boiler Room	85°F ±2°F	60°F ±2°F

Table 4: Indoor Temperature Conditions

Hydronic Piping	Summer
Static Pressure Loss	Maximum 2 feet WC per 100 feet
Velocity	Maximum 6 feet per second

Table 5: Pipe Sizing Criteria

2.1.2 Heating Hot Water (HHW) System

The building has an existing heating hot water system that consists of a single boiler, two pumps, and other auxiliary equipment located in the first level boiler room. This system circulates hot water through the building to Air Handling Units (AHU's hot water coils) located in the first level mechanical room to warm up supply air provided by the AHU's which in turn warm and ventilate building spaces. In addition heating hot water is also distributed to Heating and Cooling Consoles located on the second floor offices and associated spaces.

The existing boiler, pumps, and all associated equipment located in the boiler room is to be demolished and replaced with new boiler, pumps, and ancillary equipment that will provide the building with a modern condensing boiler plant and a variable primary heating hot water system. Provide a minimum heating hot water flow control valve at the end of the riser mains to ensure minimum flow to the system is always provided. Refer to the drawings on Appendix A more information on the equipment size, location, and performance requirements.

Boiler system (boiler, pumps, air separator, expansion tank, piping, valves for water and gas, water control valves, VFD's, electrical panel, controls panel) can be provided as a factory assembled system as long as it can be moved into the building using existing doors, corridors, elevators, etc. The boiler system can also be completely assembled in the place (in the boiler room).

The new boiler plant shall have heating hot water piping connected to the heating hot water mains (2 pairs of HHW) within the boiler room. A new domestic cold water make-up PRV assembly and a new gas valve train shall be provided for the boiler system.

The following are acceptable boiler manufacturers: RBI Futera XLF, Hydrotherm KN, Aerco Benchmark (or approved equal).

2.1.3 Air Handling Unit (AHU) System

The existing three Air Handling Units (AHU's) located on the first floor are to remain and be reused. However, the controls of for these AHU's are to be retrofitted or replaced as needed to accommodate the new DDC control system onto the AHU's and connect them the building and campus controls. This includes the replacement of coil control valves for chilled and heating hot water (two-way valves), replacement of damper actuators, fan start/stop/status and speed control, supply air temperature/pressure control, main controllers for the AHU's, and local space thermostats for AHU zone damper control.

2.1.4 Heating and Cooling units on second floor offices

The existing heating and cooling console units located in the second floor are to remain and be reused. However, the controls of for these console units are to be retrofitted or replaced as needed to accommodate the new DDC control system onto the console units and connect them the building and campus controls. This includes the replacement of coil control valves (two-way valves), and any other retrofits required to the console units and local space thermostats.

2.1.5 Exhaust Fan System

Replace the exhaust fan in the boiler room with a new fan (match airflow and static pressure drop) and new control signal (start/stop/status).

2.1.6 Building Controls

Provide a new DDC controls system for all HVAC equipment throughout the building. New controls system shall be BACnet based, compliant with ASHRAE standard 135, open protocol down to the programming level, and shall be compatible to be integrated with the College of Marin campus control network. The following are acceptable controls systems manufacturers: Delta Controls, Schneider Controls, Syserco Controls (or approved equal).

The new controls system shall monitor and control all new and existing HVAC equipment in the building. Provide new hardware and programming as necessary for a complete system. Building DDC control system shall shall be accessible via the World Wide Web, including for monitoring and revising equipment schedules and set points. Controls system shall allow College or Marin Facilities Staff to easily set up trending and logging of any points available in the new controls system.

The new DDC controls system shall be provided with main control panel that will control all new and existing equipment at a DDC level. Existing equipment may need to have equipment controller, coils valves, damper actuators, temperature sensors, pressure sensors/switches, and thermostats replaced to allow for full retrofit of controls required by this project. New valves and damper actuators shall be by Belimo (or approved equal).

It is the responsibility of the contractor to visit the site and understand the entire number, type, and location of HVAC devices to be controlled and integrated into new DDC control system before submitting a bid on this project.

2.1 HVAC System Add and Deduct Alternates

2.1.1 Add Alternate 1

Replace all three existing AHU units located on the first floor mechanical room (match airflow and static pressure drop). Provide new AHU's to be compliant with current energy code Title 24-2013 including full air economizer.

Provide factory installed controls compatible with new DDC building controls system, and single point power connection. New AHU's shall be selected such that airflow velocity through all components (filters, coils) shall be 400 FPM or less. AHU shall have MERV8 pre-filters and MERV 13 final filters.

2.1.2 Add Alternate 2

Replace all existing first floor mechanical room outside air supply and exhaust air fans (match airflow and static pressure drop). Provide new fan to be compliant with current energy code Title 24-2013 including full air economizer.

2.1.3 Deduct Alternate 1

Scale back controls scope replacement so that new controls work shall be done within the first floor boiler room.

Provide a new DDC controls system for all new HVAC equipment within boiler room (Boiler, pump VFD's). New controls system shall have the capability to control all equipment in the building and be ready for future retrofit of controls system for all existing HVAC throughout the building. New DDC controls system shall be BACnet based, compliant with ASHRAE standard 135, open protocol down to the programming level, and shall be compatible to be integrated with the College of Marin campus control network. The following are acceptable controls systems manufacturers: Delta Controls, Schneider Controls, Syserco Controls (or approved equal).

The new controls system shall monitor and control all new HVAC equipment in the first floor boiler room. All existing HVAC equipment outside of the first floor boiler room shall continue to be controlled by existing pneumatic system, existing air compressor, air dryer, pneumatic controls panel located in the boiler room shall remain. New DDC controls system shall connect to and control existing pneumatic system and provide start/stop/status signal. Provide a minimum heating hot water flow control valve at the end of the riser mains to ensure minimum flow to the system is always provided.

Provide new hardware and programming as necessary for a complete system. Building DDC control system shall shall be accessible via the World Wide Web, including for monitoring and revising equipment schedules and set points (for equipment in boiler room only). Controls system shall allow College or Marin Facilities Staff to easily set up trending and logging of any points available in the new controls system.

It is the responsibility of the contractor to visit the site and understand the entire number, type, and location of HVAC devices to be controlled and integrated into new DDC control system before submitting a bid on this project.

2.1.4 Deduct Alternate 2

Provide controls scope described in Deduct Alternate 1 and in addition provide wireless thermostats (sensor) to monitor the temperature of all spaces that currently have a (pneumatic) thermostat. Locate new wireless thermostats adjacent to existing thermostats. Provide new hardware and programming as necessary for a complete system.

3.0 Plumbing Systems

3.1.1 Design Criteria

Domestic Water Piping	
Minimum Pressure	35 PSI at most remote outlet
Maximum Pressure	80 PSI
Static Pressure Loss	Maximum 6 psi per 100 feet
Velocity	Maximum 6 feet per second (Cold Water) Maximum 4 feet per second (Hot Water)
Storm Drainage	
Rainfall Rate	Maximum 1.5 Inch/hr
Piping Slope	Minimum 1/8” per foot
Waste and Vent Piping	
Sizing	Per Code
Piping Slope	Minimum 1/4” per foot

Table 6:: Plumbing Piping Sizing Criteria

3.1.2 Domestic Cold Water System

Modify cold water supply to boiler system by providing a new pressure reducing valve station and connection to the boiler system.

3.1.3 Sanitary Sewer System

Modify system as required in the boiler room to provide adequate drainage for equipment in the room.

3.1.4 Natural Gas System

Modify existing gas supply to boiler system, provide new gas valve train with all required valves and flexible connection to boiler gas inlet.

4.0 Fire Protection Systems

4.1.1 Design Criteria

The fire sprinkler system shall comply with NFPA 13, and local Fire Marshal requirements. Modify existing sprinkler heads and system, as required, within boiler room and mechanical room to address any revisions to the room and/or equipment installed in the room. All fire sprinkler piping to be exposed.

5.0 Electrical

5.1 Power Service and Distribution

5.1.1 Service

The existing electrical utility service and building distribution system is adequate for the alterations of this project. The scope of work involves direct replacement of equipment, and will not result in an increased load on the branch panel, distribution panel, or the overall utility service.

5.1.2 Distribution

Branch circuiting will be removed in conjunction with the removal of the existing boiler, pumps, and air compressors, including associated controls and equipment. Boiler room equipment and receptacles are currently fed from Panel F5 (208Y/120V, 3-phase, 4-wire), located in the existing Mechanical Room 25. Remove all branch circuit wiring and conduit back to source. Conduit and wire shall not be reused during new construction.

Remove line voltage power for existing mechanical controls scheduled to be removed. Provide line voltage power, where required, for new mechanical controls. Reuse existing branch circuits and branch circuit breakers for new mechanical control panels.

Starters for PUMP-1 and PUMP-2 are currently installed adjacent to Panel F5. Remove starters and all associated wire and conduit. New PUMP-1 and PUMP-2 shall be controlled through a dedicated new VFD.

Removal of existing equipment and the spare capacity in Panel F5 will allow boiler equipment to be connected to this same panel. The new boiler and pumps will match the power requirements of the removed equipment. Provide disconnecting means, circuit breaker and wire according to manufacturer's recommendation; match existing circuit breaker manufacturer and AIC rating. Any existing branch circuit breaker in good condition and with the correct rating may be reused during new construction.

5.1.3 Emergency and Standby Power Systems

The boiler room equipment will not be served by a backup power system.

5.2 Lighting

5.2.1 Interior Lighting

The existing lighting system in place is adequate for the space within the scope of work. Existing lighting fixtures may require relocation or removal/reinstallation to accommodate the construction process and new mechanical work. Provide electrical work as required for mechanical renovation work.

5.3 Signal Systems

5.3.1 Fire Alarm

Provide a ceiling mounted heat detector in the boiler room, and connect to the existing building fire alarm system.

5.4 Electrical System Add and Deduct Alternates

5.4.1 Add Alternate 1

Adjust electrical scope of work as required to provide scope outlined in HVAC Add Alternate 1.

5.4.2 Add Alternate 2

Adjust electrical scope of work as required to provide scope outlined in HVAC Add Alternate 2.

5.4.3 Deduct Alternate 1

Adjust electrical scope of work as required to provide scope outlined in HVAC Deduct Alternate 1.

5.4.4 Deduct Alternate 2

Adjust electrical scope of work as required to provide scope outlined in HVAC Deduct Alternate 2.

5.4.5

6.0 Appendix

6.1 Appendix A: MEP Drawings:

ME1 SYMBOLS LIST – MECHANICAL AND ELECTRICAL

ME2 EQUIPMENT SCHEDULES

ME3 FIRST FLOOR OVERALL PLAN AND SCHEDULES

ME4 ENLARGED BOILER ROOM FLOOR PLAN

ME5 ENLARGED MECHANICAL ROOM FLOOR PLAN

ME6 HOT WATER FLOW DIAGRAM

ME7 CONTROLS DIAGRAM AND DETAILS

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF LATEST GOVERNING LOCAL FIRE CODES AND BUILDING CODES.
2. CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR SAFETY OF ALL PERSONS ON OR ABOUT THE CONSTRUCTION SITE IN ACCORDANCE WITH APPLICABLE LAWS AND CODES. GUARD ALL HAZARDS IN ACCORDANCE WITH THE SAFETY PROVISIONS OF THE LATEST MANUAL OF ACCIDENT PREVENTION PUBLISHED BY THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL TRADE PERMITS AND INSPECTIONS.
4. EXISTING INFORMATION SHOWN ON FLOOR PLANS IS FROM ORIGINAL RECORD DRAWINGS AND FIELD INVESTIGATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS IN THE FIELD BEFORE COMMENCEMENT OF WORK. THE CONTRACTOR IS REQUIRED TO REPORT TO THE ARCHITECT DISCREPANCIES OR INCONSISTENCIES BETWEEN THE SPECIFIED DESIGN AND EXISTING CONDITIONS FOR CLARIFICATION PRIOR TO COMMENCEMENT OF THE WORK. ABSOLUTE ACCURACY OF THE DRAWINGS CAN NOT BE GUARANTEED. WHILE EVERY EFFORT HAS BEEN MADE TO COORDINATE THE LOCATION OF EXISTING EQUIPMENT, PIPING, ETC., IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE EXACT REQUIREMENTS GOVERNED BY ACTUAL JOB CONDITIONS. REPORT TO OWNER OF RECORD, IN WRITING, CONDITIONS WHICH WILL PREVENT PROPER PROVISION OF THE WORK SHOWN ON THESE DOCUMENTS.
5. THE SUBMISSION OF BID PROPOSAL SHALL BE CONSIDERED AS CONCLUSIVE EVIDENCE THAT THE CONTRACTOR IS THOROUGHLY FAMILIAR WITH THE INTENT OF THE CONTRACT DOCUMENTS AND SCOPE OF WORK. THE CONTRACTOR, PRIOR TO BIDDING, SHALL VISIT THE JOB SITE, CHECK EXISTING INSTALLATIONS AND SYSTEMS RELATED TO HIS WORK AND SHALL, IN THE BID PROPOSAL, INCLUDE ALL LABOR AND MATERIAL REQUIRED TO PROVIDE COMPLETE SYSTEMS.
6. CONTRACTOR SHALL COMPLETE THE WORK WITH MINIMUM INTERFERENCE WITH EXISTING SYSTEMS. ANY SHUTDOWN OF THE EXISTING SYSTEM SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR, AND OWNER'S REPRESENTATIVE, AT LEAST ONE WEEK IN ADVANCE.
7. PROTECT ALL ACTIVE UTILITIES, INFRASTRUCTURE, AND EQUIPMENT WITHIN PROJECT AREA DURING DEMOLITION AND CONSTRUCTION PHASES.
8. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH ARCHITECTURAL AND ALL OTHER TRADES WITH FULLY COORDINATED SHOP DRAWINGS. PROVIDE ALL WORK REQUIRED FOR INSTALLATION AND OPERATION OF COMPLETE, FUNCTIONING SYSTEMS.
9. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND SHALL NOT BE SCALED TO DETERMINE EXACT LOCATIONS EQUIPMENT, DUCTWORK. EXISTING CONDITIONS SHALL BE FIELD VERIFIED FOR EXACT LOCATION AND SIZES OF EXISTING UTILITIES, AND PROPOSED POINT OF CONNECTIONS TO EXISTING SYSTEMS. INSTALL ALL EQUIPMENT, DUCTWORK, AND PIPING TO BEST SUIT FIELD CONDITIONS AFTER COORDINATION WITH THE WORK OF OTHER TRADES.
10. SEAL ALL EXISTING AND NEW FIRE RATED PIPE AND DUCTWORK PENETRATIONS WITH UL LISTED AND FIRE MARSHAL APPROVED FIRE RETARDANT MATERIALS AND METHODS.
11. PROVIDE OFFSETS AND/OR TRANSITIONS TO NEW OR EXISTING PIPING AND DUCTWORK REQUIRED AS RESULT OF JOB CONDITIONS OR LACK OF COORDINATION WITH OTHER TRADES AT NO ADDITIONAL COST TO OWNER AND SUBJECT TO ARCHITECTS REVIEW.
12. CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS STEEL AND COMPONENTS REQUIRED TO SUPPORT PIPE, MECHANICAL EQUIPMENT, AND ELECTRICAL/CONTROL PANELS RELATED TO MECHANICAL EQUIPMENT. PROVIDE FLOOR SUPPORT COMPONENTS, HANGERS AND SEISMIC RESTRAINTS AS REQUIRED. MECHANICAL CONTRACTOR SHALL SHIM TO LEVEL ALL EQUIPMENT AS REQUIRED.
13. REPLACE ALL EXISTING PIPE SUPPORTS AND INSULATION AS REQUIRED TO MEET PROJECT SPECIFICATIONS.
14. CORE DRILL WALL/FLOOR FOR PIPE PENETRATIONS AFTER APPROVAL BY STRUCTURAL ENGINEER. DIAMETER OF WALL/FLOOR OPENING SHALL BE 2 INCHES LARGER THAN THE DIAMETER OF PIPE WITH INSULATION. SEAL ALL PENETRATIONS WITH UL APPROVED SEALANT.
15. INSTALL SHUT-OFF VALVES AT EACH BRANCH PIPE LINE AND FOR EVERY PIECE OF EQUIPMENT.
16. ALL CONTROL PANELS SHALL BE MOUNTED NO LESS THAN 4 FEET ABOVE THE FINISHED FLOOR. HIGHEST ELECTRICAL DEVICE PLACEMENT SHALL NOT EXCEED 6'-3" ABOVE FINISHED FLOOR.
17. ALL MATERIALS AND WORKMANSHIP ARE SUBJECT TO APPROVAL BY OWNER, ARCHITECT, AND ENGINEER OF RECORD. ANY PORTION OF THE WORK OR EQUIPMENT FOUND TO BE DEFECTIVE SHALL BE REPLACED BY THE CONTRACTOR AS PART OF THIS CONTRACT AT NO ADDITIONAL COST TO THE OWNER.
18. DISPOSE OF REMOVED/DEMOLISHED EQUIPMENT AND MATERIAL AS DIRECTED BY OWNER'S REPRESENTATIVE.
19. PROTECT EXISTING BUILDING STRUCTURES AND ADJACENT SPACES DURING DEMOLITION AND CONSTRUCTION. PATCH AND REPAIR AND REFINISH EXISTING WORK DAMAGED BY WORK UNDER THIS DIVISION TO MATCH ADJACENT UNDISTURBED AREAS. PATCHING AND REFINISHING IS TO BE PERFORMED BY WORKMEN SKILLED IN THE TRADES INVOLVED. DO NOT CUT ANY STRUCTURAL MEMBERS WITHOUT THE REVIEW AND APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD.
20. CONTRACTOR SHALL PROVIDE DUST COVERS AS REQUIRED TO CONTAIN DUST AND DEBRIS WITHIN CONSTRUCTION AREA AND KEEP DIRT AND DUST TO A MINIMUM AND TO COMPLY WITH ALL CODE REQUIREMENTS.
21. CLEAN ALL EXPOSED SURFACES AND NEW EQUIPMENT AFTER COMPLETION.
22. GENERAL CONTRACTOR SHALL RETAIN INDEPENDENT TESTING AGENCY FOR TESTING AND BALANCING OF AIR AND WATER SYSTEMS. TESTING AGENCY SHALL BE MEMBER OF AABC AND SHALL SUBMIT THE FINAL BALANCE REPORT WITHIN 10 DAYS OF THE COMPLETION OF WORK. TESTING AGENCY SHALL ALLOW A 90-DAY PERIOD AFTER COMPLETION OF TESTING DURING WHICH TIME ADJUSTMENTS TO THE SYSTEM MAY BE REQUESTED BY THE ENGINEER WITHOUT ADDITIONAL COST TO THE OWNER.
23. MANUFACTURERS DRAWINGS AND INSTALLATION INSTRUCTIONS SHALL BE FOLLOWED IN ALL CASES WHERE THE DIRECTIONS OR DETAILS ARE NOT SHOWN ON THE DRAWINGS.
24. THERMOSTATS SHALL MEET ALL TITLE 24 REQUIREMENTS AND BE ABLE TO MAINTAIN SPACE TEMPERATURE SET POINTS FROM 55°F TO 85°F.
25. SEISMIC BRACING OF MECHANICAL EQUIPMENT, PIPING, AND DUCTWORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE 2013 CALIFORNIA BUILDING CODE. ALL ANCHORING AND SEISMIC RESTRAINT OF PIPE AND EQUIPMENT SHALL BE REVIEWED AND APPROVED (STAMPED AND SIGNED CALCULATIONS SHALL BE PROVIDED FOR REVIEW WITH EVERY EQUIPMENT SUBMITTAL) BY A CALIFORNIA LICENSED STRUCTURAL ENGINEER-APPROVED CALCULATIONS AND DETAILS SHALL BE INCLUDED WITH ALL DUCT, PIPE, AND EQUIPMENT SUBMITTALS.

HVAC PIPING

BBD	BBD	BOILER BLOWDOWN
D	D	DRAIN (CONDENSATE/INDIRECT)
PC	PC	PUMPED CONDENSATE
CHWS	CHWS	CHILLED WATER SUPPLY
CHWR	CHWR	CHILLED WATER RETURN
HWS	HWS	HEATING WATER SUPPLY
HWR	HWR	HEATING WATER RETURN
A	A	COMPRESSED AIR

NEW AND EXISTING WORK

EXISTING WASTE (BELOW GRADE OR FLOOR)

EXISTING COLD WATER

EXISTING DUCT WORK

NEW WASTE (BELOW GRADE OR FLOOR)

NEW COLD WATER

NEW DUCT WORK

MECHANICAL EQUIPMENT DESIGNATION

EF-XXX

- UNIT NUMBER
- FLOOR UNIT IS LOCATED ON
- EQUIPMENT TYPE

EQUIPMENT

MECHANICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	HP	HORSEPOWER
AHP	APPARATUS HOUSING PLENUM	HTG	HEATING
ALT	ALTERNATIVE	ID	INSIDE(DIAMETER/DIMENSION)
AL	ALUMINUM	IE	INVERT ELEVATION
APD	AIR PRESSURE DROP	IN	INCH(ES)
APPROX	APPROXIMATELY	ISOL	ISOLAT(OR)(ION)
ARCH	ARCHITECT(URAL)	KW	KILOWATT
AUTO	AUTOMATIC	KWH	KILOWATT HOUR
BI	BACKWARD INCLINED	L	LENGTH
BLDG	BUILDING	LAT	LEAVING AIR TEMP
BSMT	BASEMENT	LB	POUND
BTU	BRITISH THERMAL UNIT	LDB	LEAVING DRY BULB
BTUH	BRITISH THERMAL UNITS PER HOUR	LF	LINEAR FEET
CFH	CUBIC FEET PER HOUR	LFT	LEAVING FLUID TEMPERATURE
CFM	CUBIC FEET PER MINUTE	LVG	LEAVING
CFS	CUBIC FEET PER SECOND	LWB	LEAVING WET BULB
CLG	CEILING OR COOLING	LWT	LEAVING WATER TEMPERATURE
CONC	CONCRETE	MAX	MAXIMUM
CONN	CONNECT(ION)	MBH	THOUSAND BTU PER HOUR
CONT	CONTINUE(ED)(UATION)	MECH	MECHANICAL
CL	CENTERLINE	MFR	MANUFACTURER
DDC	DIRECT DIGITAL CONTROL	MIN	MINIMUM
DEFL	DEFLECTION	MISC	MISCELLANEOUS
DN	DOWN	MTD	MOUNTED
DP	DEW POINT	NIC	NOT IN CONTRACT
DWG	DRAWING	OC	ON CENTER DISTANCE
EA	EXHAUST AIR	OSA	OUTSIDE AIR
EAD	EXHAUST AIR DAMPER	PH	PHASE
EAT	ENTERING AIR TEMPERATURE	PSI	POUNDS PER SQUARE INCH
EDB	ENTERING DRY BULB	PVC	POLYVINYL CHLORIDE
EFF	EFFICIENCY	R (RAD)	RADIUS
EFT	ENTERING FLUID TEMPERATURE	RA	RETURN AIR
ELEC	ELECTRIC(AL)	REV	REVISION
ELEV	ELEVATION	RH	RELATIVE HUMIDITY
ENGR	ENGINEER	RPM	REVOLUTIONS PER MINUTE
EQ	EQUAL	SA	SUPPLY AIR
EQUIP	EQUIPMENT	SCFM	STANDARD CUBIC FEET PER MINUTE
ESP	EXTERNAL STATIC PRESSURE	SECT	SECTION
EWB	ENTERING WET BULB	SENS	SENSIBLE
EWT	ENTERING WATER TEMPERATURE	SIM	SIMILAR
EX	EXTRACTOR	SP	STATIC PRESSURE
EXH	EXHAUST	SPEC	SPECIFICATION
EXIST	EXISTING	SQ	SQUARE
EXP	EXPANSION	SF	SQUARE FOOT(FEET)
F	DEGREES FAHRENHEIT	SQ IN	SQUARE INCH(ES)
FC	FORWARD CURVED	SS	STAINLESS STEEL
FIG	FIGURE	STL	STEEL
FILT	FILTER	STRUCT	STRUCTUR(E)(AL)
FLEX	FLEXIBLE	SWP	SINGLE WALL PLENUM
FPD	FLUID PRESSURE DROP	TEMP	TEMPERATURE
FPM	FEET PER MINUTE	TSP	TOTAL STATIC PRESSURE
FPS	FEET PER SECOND	TYP	TYPICAL
FT	FEET/FOOT	V	VOLTS
FU	FIXTURE UNIT	VEL	VELOCITY
FUT	FUTURE	VERT	VERTICAL
FV	FACE VELOCITY	VFD	VARIABLE FREQUENCY DRIVE
GA	GAGE/GAUGE	W	WIDTH
GAL	GALLON	WG	WATER GAUGE
GALV	GALVANIZED	WPD	WATER PRESSURE DROP
GPH	GALLONS PER HOUR	WTD	WATER TEMPERATURE DROP
GPM	GALLONS PER MINUTE	WTR	WATER TEMPERATURE RISE
H	HEIGHT	W/	WITH
HORIZ	HORIZONTAL	W/O	WITHOUT

DEMOLITION LEGEND

REMOVE EXISTING DUCT

REMOVE EXISTING PIPE

CONTROL SYMBOLS

	DAMPER WITH OPERATOR
	2-WAY CONTROL VALVE
	3-WAY CONTROL VALVE
DO	DIGITAL OUTPUT FROM DDC PANEL
DI	DIGITAL INPUT TO DDC PANEL
AO	ANALOG OUTPUT FROM DDC PANEL
AI	ANALOG INPUT TO DDC PANEL
DP	DIFFERENTIAL PRESSURE SWITCH
EP	EP VALVE
SP	STATIC PRESSURE CONTROLLER
VP	VELOCITY PRESSURE TRANSMITTER
R	PNEUMATIC RELAY
ES	DAMPER END SWITCH
CO	CARBON MONOXIDE SENSOR
CO2	CARBON DIOXIDE SENSOR
AMS	AIR MONITORING STATION
VPS	VELOCITY PRESSURE PROBE
PE	PE SWITCH
SMK	DUCT SMOKE DETECTOR
WFM	WATER FLOW METER WITH ELECTRONIC TRANSMITTER
PB	PUSH BUTTON SWITCH
SM	SWITCHED MAIN AIR
PT	PRESSURE TRANSMITTER
M	MAIN AIR
H	ELECTRONIC HUMIDITY TRANSMITTER
H HL	DUCT MOUNTED HIGH LIMIT HUMIDISTAT
T	ELECTRONIC TEMPERATURE SENSOR
FS	FLOW SWITCH
T	ELECTRONIC SENSOR WITH AVERAGING

SYMBOLS

A	ACCESS PANEL	K	CAP EXISTING / CAP FOR FUTURE
B	BELOW GRADE / FLOOR	R	RELOCATE EXISTING
C	CONNECT TO EXISTING	X	REMOVE EXISTING
E	EXISTING TO REMAIN	1	NOTE

CALL OUT SYMBOLS

WALL MOUNTED / PENDANT MOUNTED

T TEMPERATURE

H HUMIDITY

CO CARBON MONOXIDE

CO2 CARBON DIOXIDE

NOX NITROGEN OXIDE

ROOM SENSORS

MISC. VALVES & COCKS

SHUT-OFF VALVE
GLOBE VALVE
S SHUT-OFF VALVE W/ TAMPER SWITCH
TRIPLE DUTY VALVE
CHECK VALVE
2-WAY CONTROL VALVE
3-WAY CONTROL VALVE
BALANCING VALVE
FC FLOW CONTROL VALVE
SOLENOID VALVE
PRESSURE REDUCING VALVE
MAV AAV AIR VENT (MANUAL/AUTOMATIC)
RELIEF VALVE
STRAINER
STRAINER W/ BLOWDOWN
DV DRAIN VALVE
HB HOSE BIBB
WH WALL HYDRANT
G GH GROUND HYDRANT
F&T/B STEAM TRAP
PRESSURE GAUGE
PRESSURE/TEMPERATURE TEST PLUG
THERMOMETER
F FLOW SWITCH
T TEMPERATURE TRANSMITTER
S (SIZE) SHOCK ARRESTOR
V VACUUM BREAKER
WFM WATER FLOW METER
RPBA REDUCED PRESSURE BACKFLOW ASSEMBLY
DCVA DOUBLE CHECK VALVE ASSEMBLY
DCDA DOUBLE CHECK DETECTOR ASSEMBLY
BWV BACKWATER VALVE
UG UNDERGROUND GATE VALVE W/BOX
PIV UNDERGROUND GATE W/POST INDICATOR
OUTSIDE SCREW & YOKE
Y PATTERN BOILER BLOWDOWN VALVE
NON-RETURN STOP VALVE
QUICK OPENING BOILER BLOWDOWN VALVE

MISC. FITTINGS & SYMBOLS

DIRECTION OF FLOW
DIRECTION OF SLOPE
PIPE SLEEVE
REDUCER
ANCHOR
ELBOW (90°)
ELBOW (45°)
TEE
CROSS
PIPING CONNECTIONS
JOINT OR COUPLING POINT
UNION
FLANGED CONNECTION
CAP
PLUG OR BLIND FLANGE
RISER
ELBOW UP
ELBOW DOWN
TEE UP
TEE DOWN
HORIZONTAL TEE
FLEXIBLE CONNECTION
BALL JOINT
MC MECHANICAL COUPLING

DRAWING LIST

DRAWING NO.	DRAWING TITLE	DRAWING SCALE
ME1	SYMBOLS LIST - MECHANICAL AND ELECTRICAL	NONE
ME2	EQUIPMENT SCHEDULE	NONE
ME3	FIRST FLOOR OVERALL FLOOR PLAN	1/8"=1'-0"
ME4	ENLARGED BOILER ROOM FLOOR PLAN	AS SHOWN
ME5	ENLARGED MECHANICAL ROOM FLOOR PLAN	AS SHOWN
ME6	HOT WATER FLOW DIAGRAM	NONE
ME7	CONTROLS DIAGRAM AND DETAILS	NONE

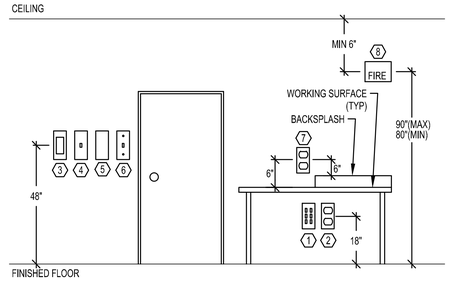
GENERAL NOTE

THIS IS A STANDARD LEGEND SHEET, THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET THAT DO NOT APPEAR ON THE DRAWINGS.

ELECTRICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	KVA	KILOVOLT AMP
A	AMPERE (AMP)	KVAR	KILOVOLT AMPS REACTIVE
AL	ALUMINUM	LA	LIGHTNING ARRESTOR
ARCH	ARCHITECT / ARCHITECTURAL	LTG	LIGHTING
ATS	AUTOMATIC TRANSFER SWITCH	LV	LOW VOLTAGE
CB	CIRCUIT BREAKER	MATV	MASTER ANTENNA TELEVISION
C	CONDUIT	MCA	MINIMUM CIRCUIT AMPS
CCTV	CLOSED CIRCUIT TELEVISION	MCB	MAIN CIRCUIT BREAKER
CKT	CIRCUIT	MCC	MOTOR CONTROL CENTER
CLG	CEILING	MDP	MAIN DISTRIBUTION PANEL
CT	CURRENT TRANSFORMER	MECH	MECHANICAL
CU	COPPER	MH	METAL HALIDE
DN	DOWN	MLO	MAIN LUGS ONLY
EMERG	EMERGENCY	MV	MERCURY VAPOR
EMT	ELECTRIC METALLIC TUBING	MTS	MANUAL TRANSFER SWITCH
EP	EXPLOSION PROOF	NIC	NOT IN CONTRACT
EPO	EMERGENCY POWER OFF	NL	NIGHT LIGHT CIRCUIT
EWC	ELECTRIC WATER COOLER	PA	PUBLIC ADDRESS
FA	FIRE ALARM	PE	PHOTO ELECTRIC CELL
FLA	FULL LOAD AMPS	PF	POWER FACTOR
FLUOR	FLUORESCENT	PNL	PANELBOARD
FCIC	FURNISHED BY CONTRACTOR INSTALLED BY CONTRACTOR	PVC	POLYVINYL CHLORIDE CONDUIT
		PWR	POWER
FOIC	FURNISHED BY OWNER INSTALLED BY CONTRACTOR	SDP	SUB-DISTRIBUTION PANEL
		STR	STARTER
FOIO	FURNISHED BY OWNER INSTALLED BY OWNER	SV	SOLENOID VALVE
		SW	SWITCH
GFP	GROUND FAULT PROTECTION	TD	TIME DELAY
GFI	GROUND FAULT INTERRUPTER	TP	TAMPERPROOF
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	TTB	TELEPHONE TERMINAL BOARD
GRC	GALVANIZED RIGID CONDUIT	TTC	TELEPHONE TERMINAL CABINET
GRD	GROUND	TV	TELEVISION
HP	HORSEPOWER	TYP	TYPICAL
HPS	HIGH PRESSURE SODIUM	UG	UNDERGROUND
HV	HIGH VOLTAGE	UPS	UNINTERRUPTABLE POWER SUPPLY
HZ	HERTZ	V	VOLTAGE
IG	ISOLATED GROUND	VA	VOLT AMPERES
INC	INCANDESCENT	VP	VAPOR PROOF
JB	JUNCTION BOX	W	WATTS
KW	KILOWATT	WP	WEATHER PROOF
KWH	KILOWATT HOUR	XFMR	TRANSFORMER
KV	KILOVOLT	XFSW	TRANSFER SWITCH

ELECTRICAL DEVICE MOUNTING HEIGHTS



GENERAL NOTES:

1. LOCATE ALL FIRE ALARM DEVICES PER CODE.
2. LOCATE ALL ACCESSIBLE SWITCHES PER ADA GUIDELINES.
3. FIELD COORDINATE ALL ABOVE COUNTER DEVICES WITH MILLWORK CONTRACTOR.
4. IF APPLICABLE, TELCOM CONSULTANTS DRAWINGS TAKE PRECEDENCE OVER THIS DETAIL FOR TELCOM DEVICES.

NOTES:

1. TELECOM OUTLET
2. RECEPTACLE
3. FIRE ALARM PULL STATION
4. LIGHT SWITCH
5. CARD READER
6. WALL PHONE
7. ABOVE COUNTER DEVICE MAINTAIN A CONSISTANT HEIGHT THROUGHOUT SPACE
8. FIRE ALARM STROBE

ELECTRICAL EQUIPMENT DESIGNATION

E 4 L - 1 - 1A - A

POWER TYPE:
- BLANK - NORMAL POWER
- E - EMERGENCY POWER
- U - UNINTERRUPTIBLE POWER

VOLTAGE:
- 2 - 208Y/120V
- 4 - 480Y/277V
- 5 - 4160Y/2400V
- 15 - 12470Y/7200V

EQUIPMENT:
- D - MAIN DISTRIBUTION PANEL
- S - SUB DISTRIBUTION PANEL
- B - BUSWAY
- M - MOTOR CONTROL CENTER
- A - AUTOMATIC TRANSFER SWITCH
- P - POWER PANEL
- L - LIGHTING PANEL
- T - TRANSFORMER
- U - UPS
- LRC - LIGHTING RELAY CONTROL PANEL

BUILDING LEVEL:
- 0 - BASEMENT
- 1 - FIRST LEVEL
- 2 - SECOND LEVEL
- 3 - THIRD LEVEL
- 4 - FOURTH LEVEL
- ETC.

GRID LOCATION:
- 1A - NEAR INTERSECTION OF GRID LINES 1 AND A

IDENTIFIER:
- A - FIRST IN SERIES OF EQUIPMENT
- B - SECOND IN SERIES OF EQUIPMENT
- ETC.

DESIGNATION SYMBOLS

123	EQUIPMENT DESIGNATOR SEE SCHEDULE.
E / X	EXISTING TO REMAIN, EXISTING TO BE REMOVED
R / F	EXISTING TO BE RELOCATED, FUTURE
N / C	NEW, CONNECT TO
1	NOTE

DATE: 04/01/2016
SCALE: NONE
DRAWN BY: ZL
CHECKED BY: MAA
REVISION NO.

PAE CONSULTING ENGINEERS, INC.
808 SW Third Ave., Suite 300 / Portland, OR 97204-2426
P: 503-226-2921 / F: 503-226-2930 / www.pae-engineers.com

SYMBOL LIST - MECHANICAL AND ELECTRICAL

COLLEGE OF MARIN
FUSSELMAN HALL BOILER

JOB NO. 16-1195

ME1

PUMP SCHEDULE

TAG NUMBER	LOCATION	SERVICE	TYPE	FLUID TYPE	PERFORMANCE			MOTOR							APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	NOTES
					DESIGN FLOW (GPM)	HEAD (FT. WC.)	PUMP EFFICIENCY %	TYPE	HP	BHP	RPM	VFD	VOLT/ PHASE	EMERG. POWER?			
HWP-1	BOILER RM 18	HEATING HOT WATER	CLOSED-COUPLED	WATER	75	45	68.17	ODP	2	1.25	1750	YES	460/3	N	167	BELL & GOSSETT E-1532	1, 2
HWP-2	BOILER RM 18	HEATING HOT WATER	CLOSED-COUPLED	WATER	75	45	68.17	ODP	2	1.25	1750	YES	460/3	N	167	BELL & GOSSETT E-1532	1, 2

GENERAL NOTES:
A. N/A

NOTES:
1. REDUNDANT PUMPS.
2. PROVIDE UNIT WITH VFD, BY ABB ACH 50(OR APPROVED EQUAL). PROVIDES MANUAL BYPASS.

BOILER SCHEDULE

TAG NUMBER	LOCATION	SERVICE	TYPE	FUEL			FLUID					ELECTRICAL			MINIMUM EFFICIENCY (AFUE)	APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	NOTES
				TYPE	INPUT CAPACITY (MBH)	OUTPUT CAPACITY (MBH)	SUPPLY TEMP (°F)	RETURN TEMP (°F)	MAX FLOW (GPM)	MIN FLOW (GPM)	MAX WPD (FT. WG)	FLA	VOLT/ PHASE	EMERG. POWER?				
B-1	BOILER ROOM	HEATING HOT WATER	CONDENSING	NAT. GAS	2,000	1,855	-	-	300	30	-	12	208 / 1	N	-	2,714	-	1

GENERAL NOTES:
A. UNITS MOUNTED ON HOUSEKEEPING PAD.
B. MINIMUM EFFICIENCY IS AT 96% FIRE, 100 DEG F RETURN WATER TEMPERATURE AND 140 DEG F SUPPLY WATER TEMPERATURE.
C. PROVIDE A MINIMUM SIDE CLEARANCE OF 36 INCHES FOR EACH BOILER.

NOTES:
1. PROVIDE CONDENSATE NEUTRALIZATION KIT FOR BOILER AND ONE YEAR'S SUPPLY OF NEUTRALIZATION AGENT.

AIR HANDLING UNIT

TAG NUMBER	LOCATION	SERVICE	SUPPLY FAN										HYDRONIC HEATING COIL					DX REFRIGERANT COIL					NOTES
			FINAL FILTER MERV RATING	TOTAL AIRFLOW CFM	FAN TYPE	QUANTITY	TSP (IN. WG.)	FAN RPM	MOTOR BHP	MOTOR HP	VOLT/ PHASE	VFD	EAT (°F)	LAT (°F)	GPM	EWT (°F)	LWT (°F)	COOLING EAT (°F DB/WB)	COOLING LAT (°F DB/WB)	FLA	APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	
(E)AHU-1	MECH. RM 25	MAIN BUILDING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1, 2
(E)AHU-2	MECH. RM 25	MAIN BUILDING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1, 2
(E)AHU-3	MECH. RM 25	MAIN BUILDING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1, 2

GENERAL NOTES:
A. UNITS MOUNTED ON HOUSEKEEPING PAD.
B. CONTRACTOR TO VERIFY CAPACITY, PREFORMANCE, AND CONDITION OF ALL EXISTING AIR HANDLING UNITS PRIOR TO SUBMISSION OF BID.

NOTES:
1. UNITS ARE EXISTING AND SHOWN FOR REFERENCE ONLY.
2. PER ADD ALTERNATE #1, REPLACE AIR HANDLING UNIT WITH NEW UNIT TO MATCH. REFER TO BOD FOR FURTHER INFORMATION.

FAN SCHEDULE

TAG NUMBER	LOCATION	SERVICE	TYPE	AIRFLOW				MOTOR				EMERG. POWER?	APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	NOTES
				CFM	OUTLET VELOCITY (FPM)	TSP (IN WG)	FAN RPM	HP	BHP	VOLT/ PHASE	FLA				
(E)EF-1	BOILER RM 18	EXHAUST	INLINE	-	-	-	-	-	-	-	-	-	-	-	1, 3
(E)EF-2	MECH. RM 25	EXHAUST	INLINE	-	-	-	-	-	-	-	-	-	-	-	1, 2
(E)SF-1	MECH. RM 25	SUPPLY	INLINE	-	-	-	-	-	-	-	-	-	-	-	1, 2

GENERAL NOTES:
A. CONTRACTOR TO VERIFY CAPACITY, PREFORMANCE, AND CONDITION OF ALL EXISTING FANS PRIOR TO SUBMISSION OF BID.

NOTES:
1. EXISTING UNIT SHOWN FOR REFERENCE ONLY.
2. PER ADD ALTERNATE #2 REPLACE FAN WITH NEW FAN TO MATCH. REFER TO BOD FOR FURTHER INFORMATION.
3. PROVIDE NEW FAN TO MATCH EXISTING.

GENERAL NOTES:
A. CONTRACTOR TO SIZE EXPANSION TANK, AIR SEPARATOR AND CHEMICAL POT FEEDER TO MEET HOT WATER SYSTEM REQUIREMENTS.

DATE: 04/01/2016
SCALE: NONE
DRAWN BY: ZL
CHECKED BY: MAA
REVISION NO.

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EQUIPMENT SCHEDULE

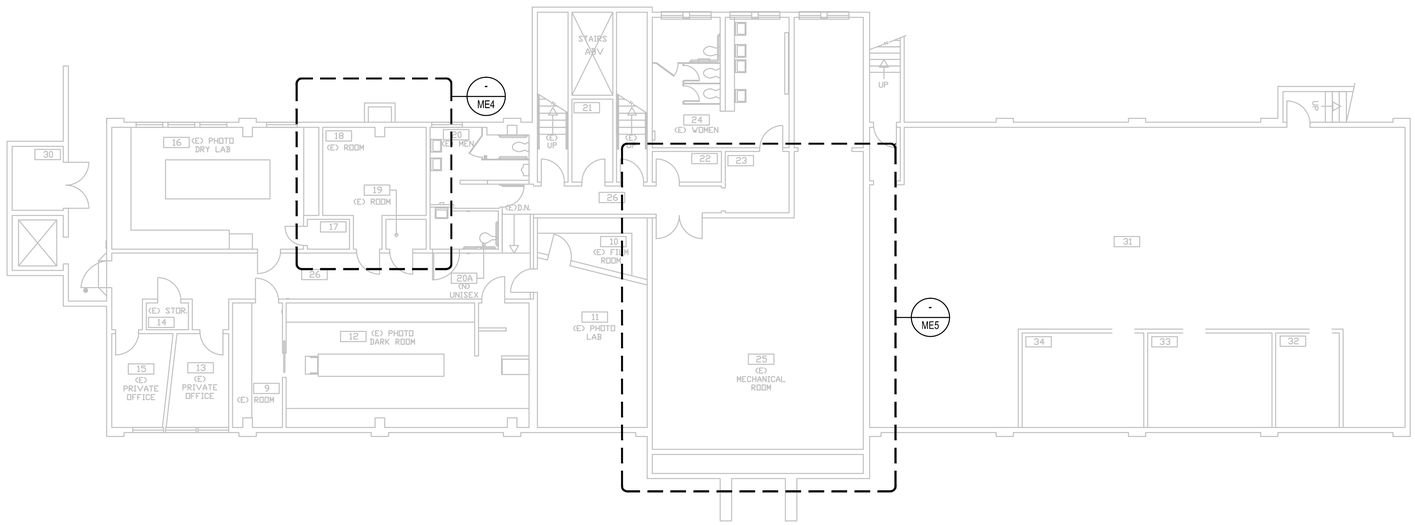
COLLEGE OF MARIN
FUSSELMAN HALL BOILER

JOB NO. 16-1195

ME2

GENERAL NOTES:

A. REPLACE ALL (E)PNEUMATIC CONTROLS IN BUILDING WITH (N) DDC CONTROLS
B. PROVIDE ALL (N) DDC CONTROLS IN BOILER AND MECHANICAL ROOM.
C. PROVIDE (N) CONNECTION FROM CONTROLLERS ON AIR HANDLING EQUIPMENT TO (N) DDC CONTROLS IN BOILER ROOM WITH START/STOP/AND STATUS SIGNALS.
D. PRIOR TO SUBMITTING PROPOSAL CONTRACTOR SHALL VISIT PROJECT SITE AND THOROUGHLY INSPECT ALL EXISTING CONDITIONS.
E. CONTRACTOR SHALL FIRE STOP ALL WALL OPENINGS NEW AND EXISTING WITH A UL LISTED, FIRE MARSHALL APPROVED METHOD AND MATERIALS.
F. REFER TO BASIS OF DESIGN FOR ALL ADD / DEDUCT ALTERNATIVES FOR PRICING.



1 / ME3 FIRST FLOOR PLAN – MECHANICAL
SCALE: 1/8" = 1'-0"

DATE: 04/01/2016
SCALE: 1/8"=1'-0"
DRAWN BY: ZL
CHECKED BY: MAA
REVISION NO.

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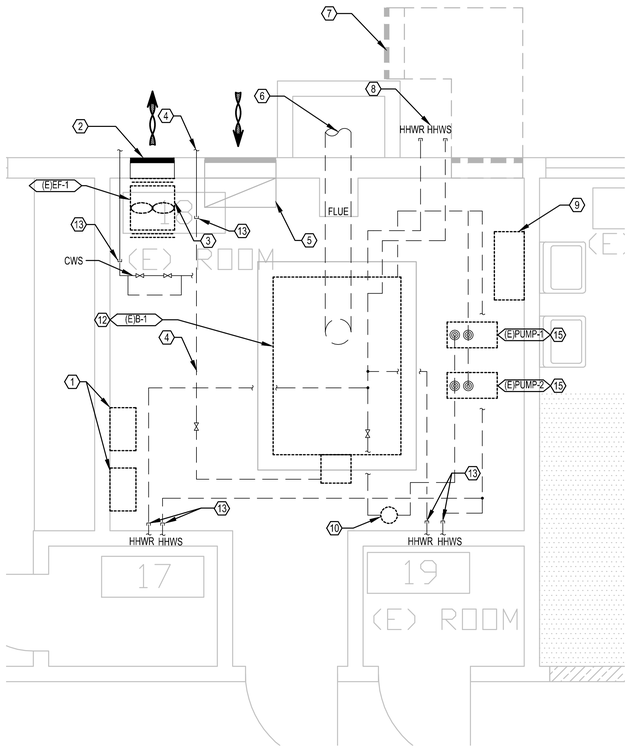
FIRST FLOOR OVERALL FLOOR PLAN

COLLEGE OF MARIN
FUSSELMAN HALL BOILER

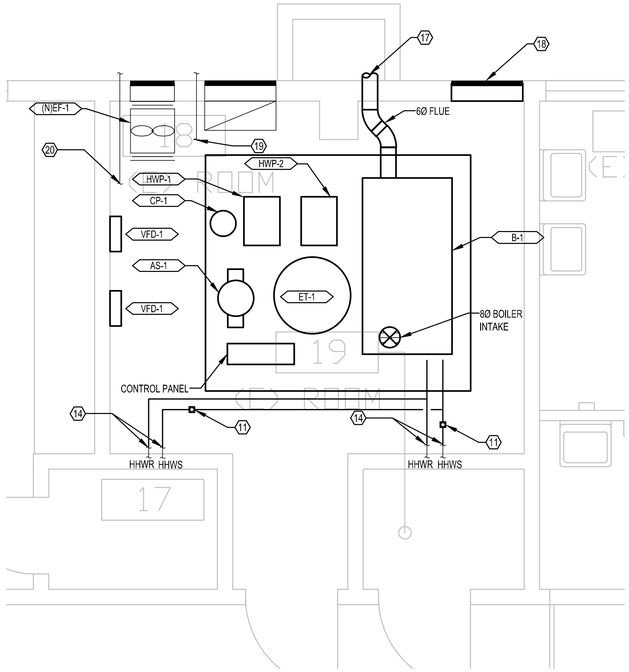
JOB NO. 16-1195

ME3



2 ME4 DEMO ENLARGED FLOOR PLAN – BOILER ROOM

SCALE: 1/2" = 1'-0"



1 ME4 ENLARGED FLOOR PLAN – BOILER ROOM

SCALE: 1/2" = 1'-0"

GENERAL NOTES:

A. REFER TO BASIS OF DESIGN FOR INFORMATION REGARDING ALL ALTERNATES.

NOTES:

1. (E) AIR COMPRESSOR, AIR DRYER, AND OTHER PNEUMATIC CONTROL EQUIPMENT TO BE DEMOLISHED.
2. (E) LOUVER TO REMAIN.
3. (E) EXHAUST FAN TO BE REMOVED. PROVIDE NEW FAN TO MATCH EXISTING.
4. (E) GAS SERVICE TO BE REUSED, DEMOLISH PIPE AND VALVE TRAIN AS SHOWN.
5. (E) COMBUSTION AIR. DUCT TO REMAIN.
6. DEMOLISH (E) BOILER FLUE AND (E) INSULATION UP TO ROOF, INCLUDING TERMINATION CAP.
7. (E) LOUVER AND DUCTWORK OUTSIDE BUILDING TO BE DEMOLISHED.
8. (E) HHWS/R PIPE TO BE REMOVED/ DEMOLISHED. PIPE USED TO SERVE DIXON HALL, BUT IS CURRENTLY CAPPED AND ABANDONED. SEAL WALL OPENING.
9. (E) EXPANSION TANK TO BE DEMOLISHED.
10. (E) AIR SEPARATOR TO BE DEMOLISHED.
11. NEW CIRCUIT SETTER BALANCING VALVE TO BALANCE WATER FLOW.
12. (E) BOILER TO BE DEMOLISHED.
13. CAPPED PIPE FOR FUTURE CONNECTION.
14. CONNECT TO (E) PIPING LOCATIONS AND ROUTE TO NEW HOT WATER SYSTEM. SIZE PIPE TO MATCH.
15. (E) PUMP-1 AND PUMP-2 TO BE DEMOLISHED AND REMOVED.
16. NOT USED.
17. ROUTE NEW FLUE UP TO ROOF AND TERMINATE WITH NEW CAP.
18. PROVIDE NEW WEATHER PROOF LOUVER TO MATCH WITH EXISTING OPENING.
19. CONNECT TO (E) PIPING FOR GAS SUPPLY FOR BOILER W/GAS VALVES.
20. CONNECT TO (E) PIPING FOR COLD WATER SUPPLY FOR BOILER SYSTEM.

DATE: 04/01/2016
SCALE: AS SHOWN
DRAWN BY: ZL
CHECKED BY: MAA

REVISION NO.

PAE CONSULTING ENGINEERS, INC.
808 SW Third Ave., Suite 300 / Portland, OR 97204-2426
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ENLARGED BOILER ROOM PLAN

COLLEGE OF MARIN
FUSSELMAN HALL BOILER

JOB NO. 16-1195

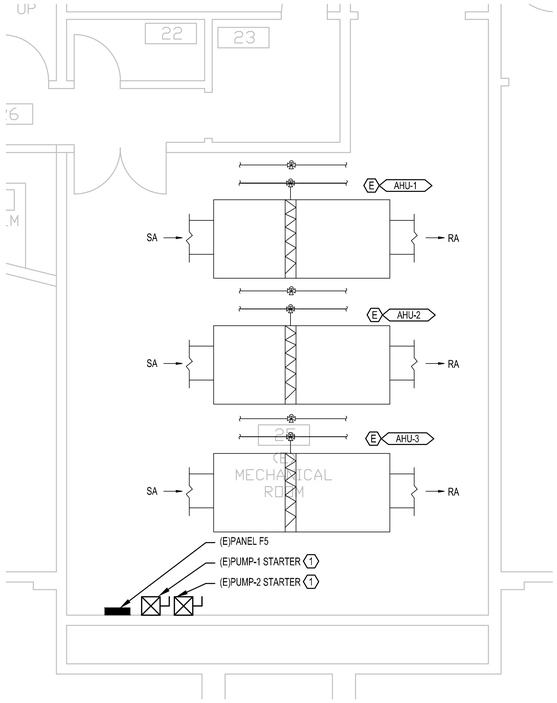
ME4

GENERAL NOTES:

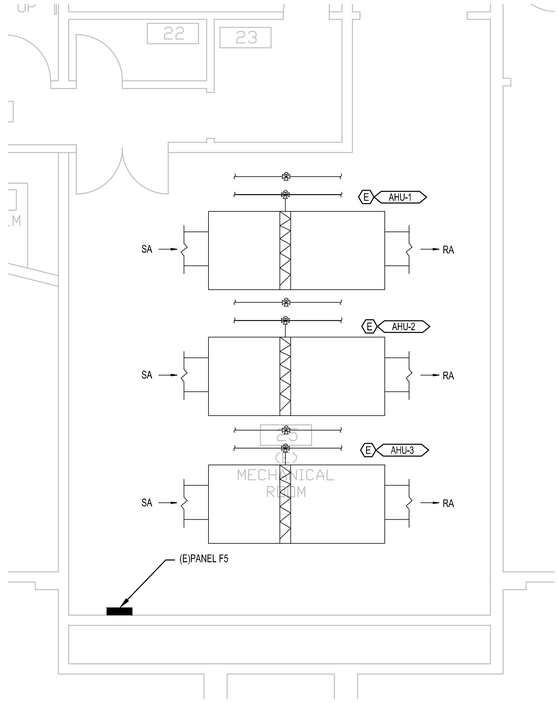
A. REFER TO WORK NOTES ON SHEET ME3 AND BASIS OF DESIGN FOR CONTROL.
B. (E) EF-2 & (E)SF-1 TO BE FIELD VERIFY.

NOTES:

1. (E) STARTERS TO BE DEMOLISHED.



2 ME5 DEMO ENLARGED FLOOR PLAN – MECHANICAL ROOM
SCALE: 1/4" = 1'-0"



1 ME5 ENLARGED FLOOR PLAN – MECHANICAL ROOM
SCALE: 1/4" = 1'-0"

DATE: 04/01/2016
SCALE: AS SHOWN
DRAWN BY: ZL
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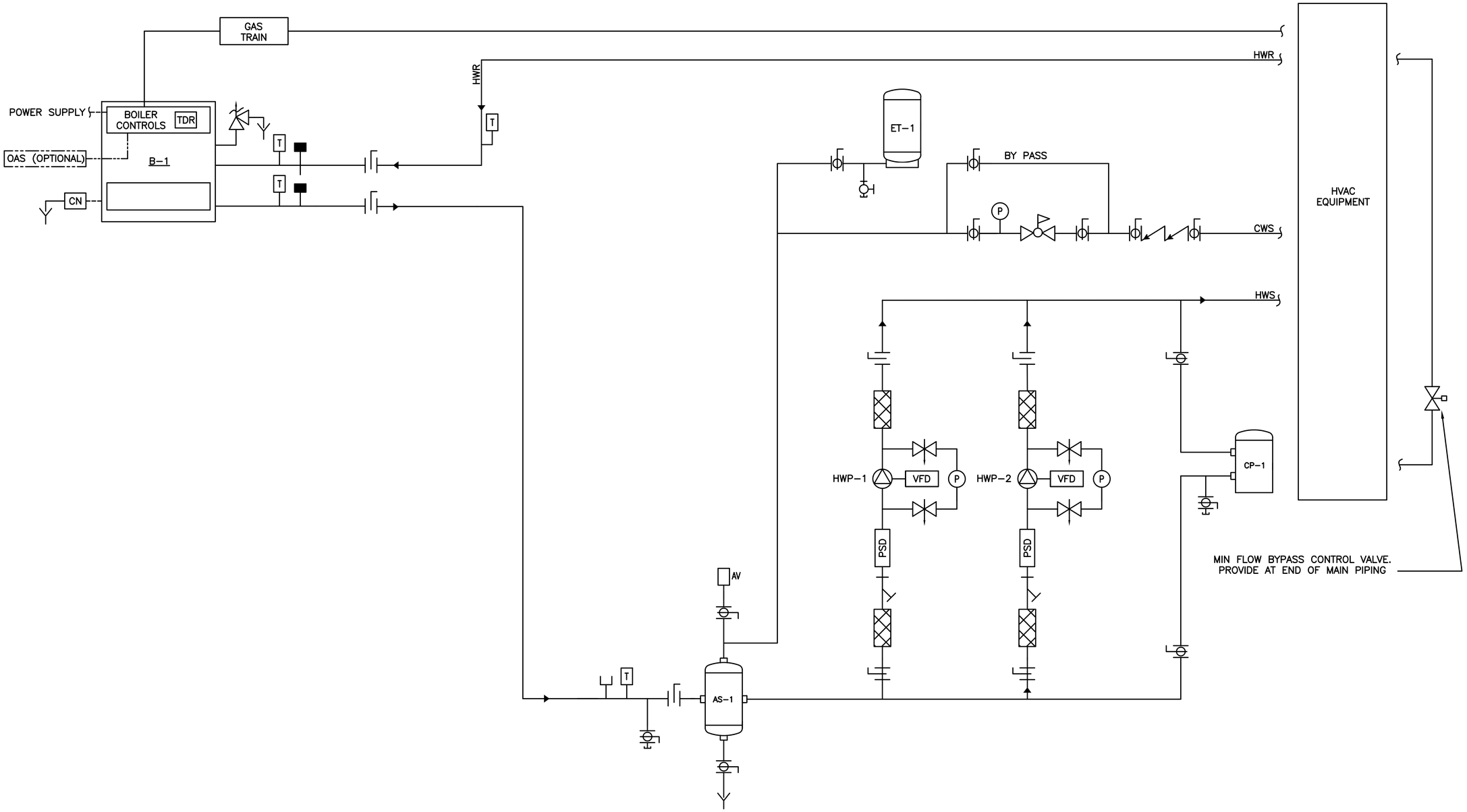
ENLARGED MECHANICAL ROOM FLOOR PLAN

COLLEGE OF MARIN
FUSSELMAN HALL BOILER

JOB NO. 16-1195

ME5



1 ME6 HOT WATER FLOW DIAGRAM
NONE

DATE: 04/01/2016
SCALE: NONE
DRAWN BY: ZL
CHECKED BY: MAA
REVISION NO.

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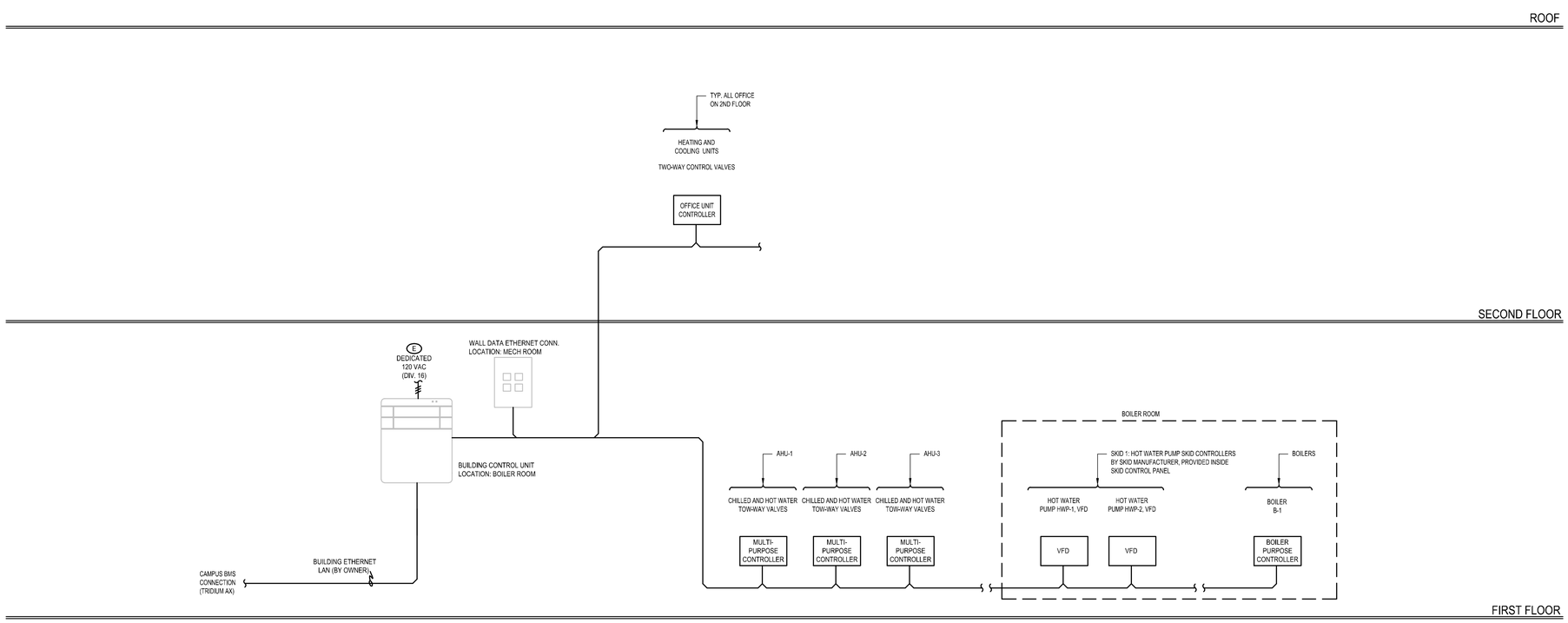
HOT WATER FLOW DIAGRAM
COLLEGE OF MARIN
FUSSELMAN HALL BOILER

JOB NO. 16-1195

ME6

NOTES:

1. FOR GENERAL SYSTEM REQUIREMENTS SEE PROJECT REFER TO BASIS OF DESIGN AND GENERAL NOTES ON ME1.
2. ALL CONTROL WIRING SHALL BE FURNISHED AND INSTALLED BY THE CONTROLS CONTRACTOR IN ACCORDANCE WITH DIVISION 26 WIRING TO BE IN CONDUIT.
3. PROVIDE GRAPHIC PROGRAMMING LANGUAGE VIEWED AND MAINTAINED FROM OPERATOR WORK STATION AND INTERACTIVE GRAPHICS FOR USER INTERFACE.
4. ALL CONTROLS INFORMATION IS DIAGRAMMATIC (CORRECT COUNTS FOR ALL CONTROL DEVICES REQUIRED FOR A COMPLETE SYSTEM SHALL BE PROVIDED BY CONTROLS CONTRACTOR).
5. PROVIDE NECESSARY INTERFACE TO CONNECT TO OTHER MANUFACTURER MICROPROCESSOR BASED EQUIPMENT. COORDINATE WITH MANUFACTURER'S AS REQUIRED TO MAKE THIS CONNECTION POSSIBLE.
6. ALL DIGITAL INPUTS (DI) AND OUTPUTS (DO) SHALL HAVE RUNTIME ACCUMULATION FOR MAINTENANCE MONITORING.
7. PROVIDE A MINIMUM OF 80% ADDITIONAL POINTS BEYOND THOSE SHOWN ON DRAWINGS.
8. CONTROLS SYSTEM SHALL BE INTEGRATED WITH CAMPUS NETWORK TO ALLOW USE OF THE CONTROL SYSTEM AT ANY WORKSTATION IN BUILDING AND ANY BUILDING ON CAMPUS. MULTI-LEVEL PASSWORDS SHALL BE INCORPORATED.
9. BASIS OF DESIGN IS DELTA CONTROL PROVIDE FOR A FULLY FUNCTIONING OPEN PROTOCOL BACNET BASED CONTROLS SYSTEM.
10. THE CONTROL SYSTEM SHALL CONTINUE TO OPERATE DURING A POWER OUTAGE (PROVIDE A MINIMUM OF 8 HOUR BATTERY TIME).
11. THE OUTSIDE REFERENCES FOR TEMPERATURE SHALL BE CONNECTED TO A MINIMUM OF TWO SEPARATE POINTS OF OUTSIDE AIR AT TWO OPPOSITE SIDES OF THE BUILDING. SHIELD OUTSIDE AIR TEMPERATURE SENSORS FROM DIRECT SUNLIGHT. CONTROL SYSTEM SHALL USE THE AVERAGE SIGNAL BETWEEN TWO SOURCES, IF THE SIGNALS DIFFER MORE THAN 30% THE CONTROL SYSTEM SHALL ISSUE ALARM.
12. PROVIDE QTY AND DETERMINE LOCATION OF ALL 120V POWER CONNECTIONS REQUIRED FOR ALL PANELS, TRANSFORMERS, CONTROLLERS, ETC. TO ACCOMPLISH INSTALLATION AND A FULLY FUNCTIONING SYSTEM.
13. CONTRACTOR SHALL SUBMIT DETAILED OPERATING SEQUENCES FOR ENGINEER'S REVIEW AND APPROVAL, AND SHALL PROVIDE ALL NECESSARY POINTS, SENSORS, HARDWARE, AND SOFTWARE TO DELIVER THE DESIGN INTENT DETAILED IN THE SEQUENCE OF OPERATIONS FOR A FULLY FUNCTIONAL SYSTEM.



1 ME7 CONTROLS DIAGRAM

NONE

DATE: 04/01/2016
SCALE: NONE
DRAWN BY: ZL
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CONTROL DIAGRAM AND DETAILS

COLLEGE OF MARIN FUSSELMAN HALL BOILER

JOB NO. 16-1195

ME7