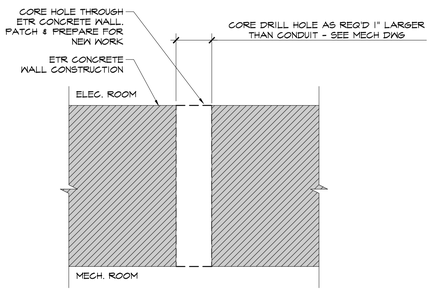
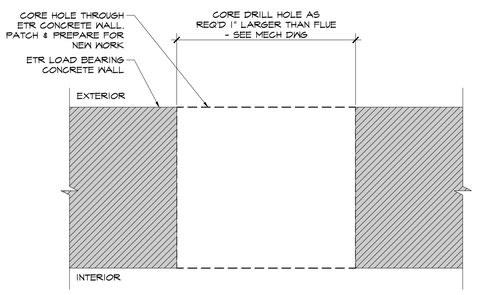
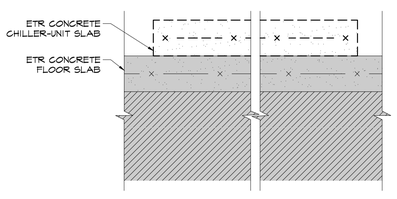


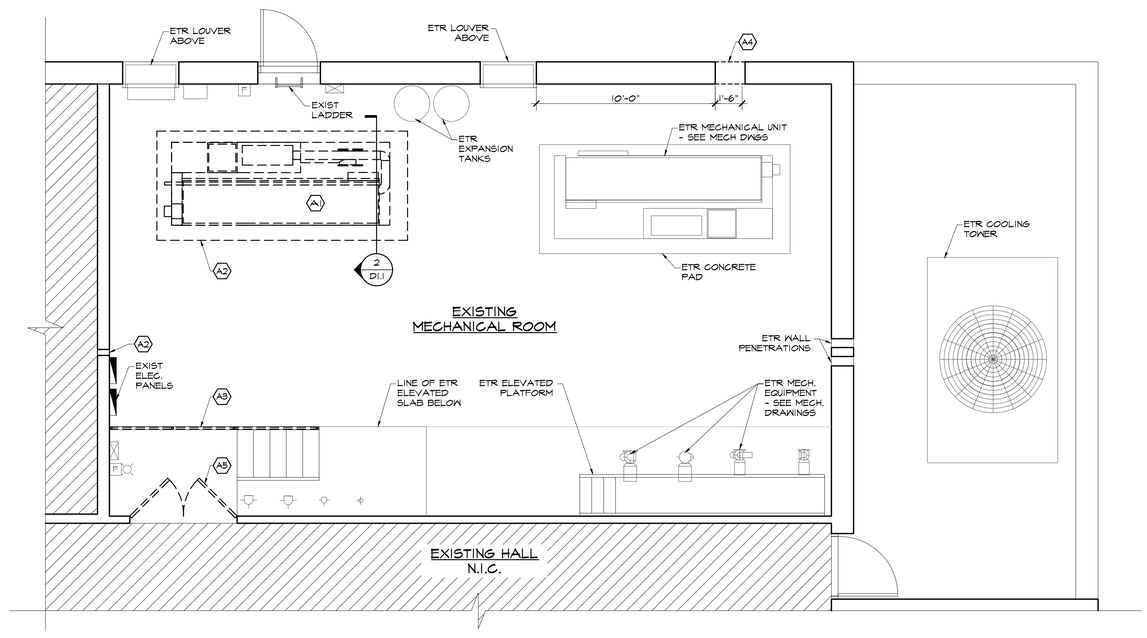
4 / A1.1 DEMO ELECTRICAL CONDUIT THRU WALL DETAIL
SCALE: 1 1/2" = 1'-0"



3 / D1.1 DEMO CORE HOLE DETAIL
SCALE: 1 1/2" = 1'-0"



2 / D1.1 DEMO CHILLER UNIT SLAB DETAIL
SCALE: 1 1/2" = 1'-0"



1 DEMOLITION FLOOR PLAN
SCALE: 1/4" = 1'-0"

LEGEND

ALL ITEMS SHOWN DASHED — — ARE TO BE REMOVED

GENERAL KEYED NOTES

A1 REMOVE CHILLER IN ITS ENTIRETY. REMOVE ALL ELECTRICAL BACK TO CIRCUIT. COORDINATE DEMOLITION WITH AVAILABLE DOOR OPENINGS & CORRIDORS. DISASSEMBLE AS NEEDED TO REMOVE FROM BUILDING WITHOUT MODIFICATIONS TO WALLS OR OPENINGS. REFER TO MECHANICAL DRAWINGS FOR SCOPE & EXTENT OF PIPING REMOVAL/MODIFICATION.

A2 GC TO REMOVE EXISTING CONCRETE EQUIPMENT PAD IN ITS ENTIRETY - SEE 2/D1.1.

A3 GC TO REMOVE & SALVAGE EXISTING RAILING FOR REUSE/REINSTALLATION IN NEW WORK.

A4 GC TO CORE HOLE FOR NEW BOILER EXHAUST FLUE AS INDICATED. MUST BE A 10'-0" MINIMUM CLARENCE FROM ANY/ALL OTHER EXTERIOR OPENINGS. VERIFY SIZE WITH MECHANICAL DRAWINGS & COORDINATE FINAL LOCATION WITH MECHANICAL ENGINEER & CCRI - SEE 3/D1.1.

A5 IF REQUIRED TO REMOVE & DELIVER MATERIAL & EQUIPMENT, GC TO REMOVE EXISTING DOORS AND REINSTALL AT THE END OF EACH SHIFT. REMOVE DOOR & FRAME FOR MODIFICATION & REINSTALLATION ONCE ALL LARGE EQUIPMENT DELIVERIES HAVE BEEN COMPLETED - SEE A1.1.

A6 GC TO CORE HOLE FOR NEW ELECTRICAL CONDUIT THROUGH EXISTING MASONRY WALL WHERE INDICATED. VERIFY SIZE WITH ELECTRICAL DRAWINGS & COORDINATE FINAL SIZE & LOCATION WITH ELECTRICAL ENGINEER & CCRI - SEE 4/D1.1.

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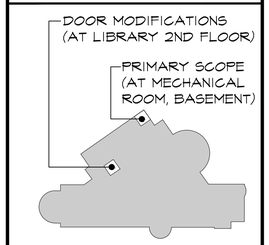


KEYPLAN

REVISIONS

NUMBER	REMARKS	DATE

FOR CONSTRUCTION

CCRI CHILLER REPLACEMENT NEWPORT CAMPUS

1 JOHN H. CHAFEE BOULEVARD
NEWPORT, RHODE ISLAND
02840
Newport County

DRAWING TITLE
DEMOLITION FLOOR PLAN & DETAILS

DATE	PROJ NO
DEC. 20, 2019	19160
DRAWN BY	CHECKED BY
NJB	DH

DRAWING NUMBER
D1.1

GENERAL CONSTRUCTION NOTES

1) THE CONTRACTOR SHALL OBTAIN ALL PERMITS AND INSPECTIONS NECESSARY TO INSURE ISSUANCE OF AN OCCUPANCY CERTIFICATE UPON COMPLETION OF THE WORK.

2) THE CONTRACTOR SHALL MAINTAIN ALL INSURANCE REQ'D BY THE OWNER AND/OR GOVERNMENTAL AUTHORITIES AND SHALL PROVIDE PROOF OF SUCH INSURANCE AS REQUIRED.

3) ALL WORK SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, TOWN OF NEWPORT, RHODE ISLAND REQUIREMENTS AND AS PUT FORTH IN THESE CONSTRUCTION DOCUMENTS. WHERE CONFLICTS OCCUR, THE MOST STRINGENT REQUIREMENTS SHALL BE MET.

4) THE CONTRACTOR SHALL BE RESPONSIBLE FOR BRACING ALL WORK DURING CONSTRUCTION.

5) THE DRAWINGS MAY NOT BE TO SCALE. SEE PLANS AND DETAILS FOR DIMENSIONS.

6) THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS BEFORE COMMENCING CONSTRUCTION AND REPORT ANY DISCREPANCIES TO THE ARCHITECT BEFORE PROCEEDING.

8) THE CONTRACTOR SHALL ANCHOR WALL MOUNTED EQUIPMENT AND ACCESSORIES TO EXISTING WALLS AS REQUIRED FOR PROPER SUPPORT. PROVIDE BLOCKING AS REQUIRED.

9) NOTHING IN THE SPECIFICATIONS OR DRAWINGS SHALL BE CONSTRUED TO ALLOW WORK NOT IN ACCORDANCE WITH THE 'CODE' REQUIREMENTS. WHEN REQUIREMENTS SHOWN OR SPECIFIED ARE LESS THAN THOSE DICTATED IN THE CODE, THE CONTRACTOR SHALL FURNISH AND/OR INSTALL THE LARGER SIZE OR HIGHER STANDARD WITHOUT EXTRA COST TO THE OWNER.

11) "PROVIDE" SHALL MEAN TO "SUPPLY & INSTALL".

12) SEE PROJECT MANUAL FOR ALL PRODUCT SPECIFICATIONS.

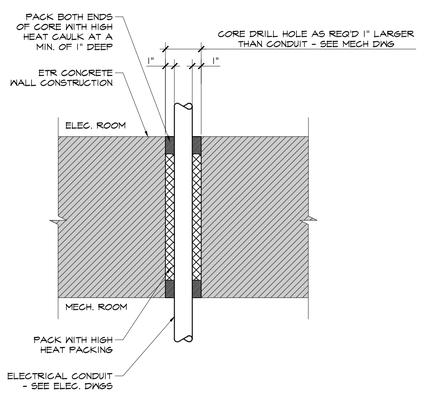
13) SEE SPECIFICATIONS FOR AVAILABLE INFORMATION & DOCUMENTATION PERTAINING TO HAZARDOUS MATERIAL TESTING PERFORMED AT THE SITE. NO ABATEMENT WORK HAS BEEN PERFORMED RELATED TO THOSE FINDINGS. IT WILL BE THE GENERAL CONTRACTORS RESPONSIBILITY TO PERFORM ANY ABATEMENT RELATED OR IMPACTED BY THE PROPOSED SCOPE OF BUILDING ALTERATIONS & REPAIRS SHOWN IN THESE CONTRACT DOCUMENTS.

DIMENSION NOTE:

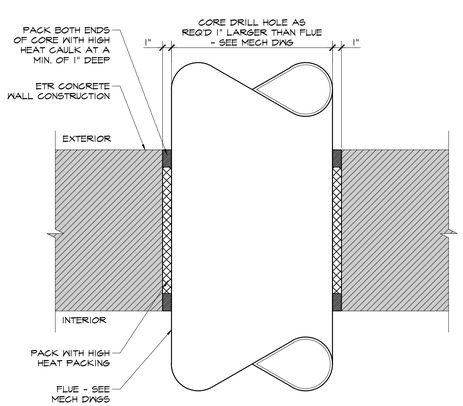
GC SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO START OF CONSTRUCTION & CONSULT W/ ARCHITECT IF DIFFERENT THAN SHOWN.

GENERAL KEYED NOTES

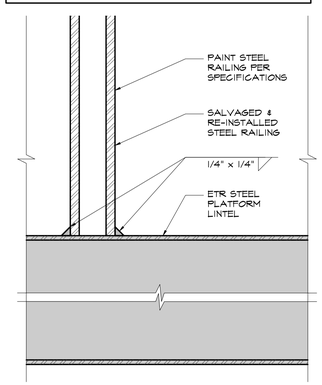
1. GC TO PROVIDE NEW MECHANICAL UNIT & ALL ASSOCIATED EQUIPMENT. REFER TO MECHANICAL DRAWINGS FOR SCOPE & EXTENT OF EQUIPMENT CONSTRUCTION.
2. GC TO PROVIDE NEW CONCRETE SLAB PER SPECIFICATIONS AS PAD FOR NEW MECHANICAL UNIT. GC TO COORDINATE DIMENSIONS OF CONCRETE SLAB WITH DIMENSIONS OF MECHANICAL EQUIPMENT & DIMENSIONS OF VIBRATION ISOLATION EQUIPMENT. COORDINATE LOCATION OF SLAB WITH MECHANICAL ENGINEER & CCRI - SEE 2/A1.1 & MECH. DRAWINGS - TYP.
3. GC TO REINSTALL EXISTING SALVAGED RAILING PER SPECIFICATIONS - SEE 3/A1.1
4. GC TO CORE HOLE FOR NEW BOILER EXHAUST FLUE WHERE INDICATED. MUST BE A 10'-0" MINIMUM CLARENCE FROM ALL OTHER EXTERIOR OPENINGS. VERIFY SIZE WITH MECHANICAL DRAWINGS & COORDINATE FINAL SIZE & LOCATION WITH MECHANICAL ENGINEER & CCRI - SEE 4/A1.1.
5. GC TO REMOVE &REINSTALL EXISTING HARDWARE, FRAME & DOORS TO SWING OUT OF MECHANICAL ROOM & REINSTALL DOORS AT END OF EACH SHIFT - PATCH & REPAIR FRAME WHERE/IF NECESSARY.
6. LOCATION OF REMOVED CONCRETE EQUIPMENT PAD. GC TO PATCH, REPAIR & FINISH SLAB TO BE FLUSH & SMOOTH WITH EXISTING FLOOR SLAB.
7. PROVIDE RE-ATTACHED STEEL RAILING WITH NEW PAINT PER SPECIFICATIONS.
8. GC TO CORE HOLE FOR NEW ELECTRICAL CONDUIT THROUGH EXISTING MASONRY WALL WHERE INDICATED. VERIFY SIZE WITH ELECTRICAL DRAWINGS & COORDINATE FINAL SIZE & LOCATION WITH ELECTRICAL ENGINEER & CCRI - SEE 5/A1.1.
9. REMOVE EXISTING DOOR HARDWARE FROM EXISTING TO REMAIN DOOR AND DOOR FRAME. COORDINATE HARDWARE REMOVAL W/ FULL SCOPE AS OUTLINED IN SPECIFICATIONS.
10. INSTALL NEW DOOR HARDWARE. SEE PROJECT MANUAL FOR HARDWARE SPECIFICATIONS; SET #1. PROVIDE ALL ACCESSORIES & ELECTRICAL CONNECTIONS/ WIRING. UTILIZE SPARE CIRCUIT AT NEAREST ELECTRICAL PANEL.



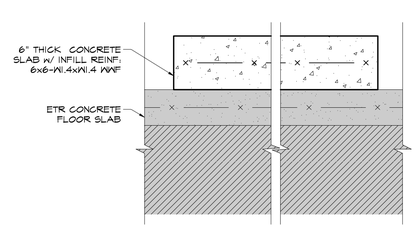
5 A1.1 ELECTRICAL CONDUIT THRU WALL DETAIL
SCALE: 1 1/2" = 1'-0"



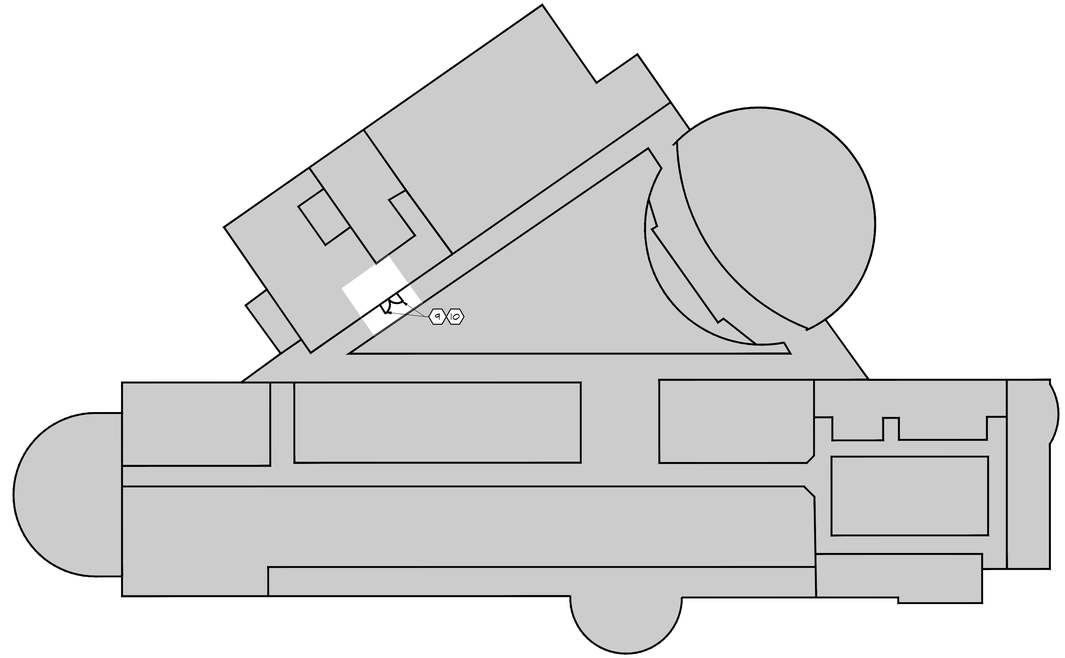
4 A1.1 FLUE PENETRATION THRU WALL DETAIL
SCALE: 1 1/2" = 1'-0"



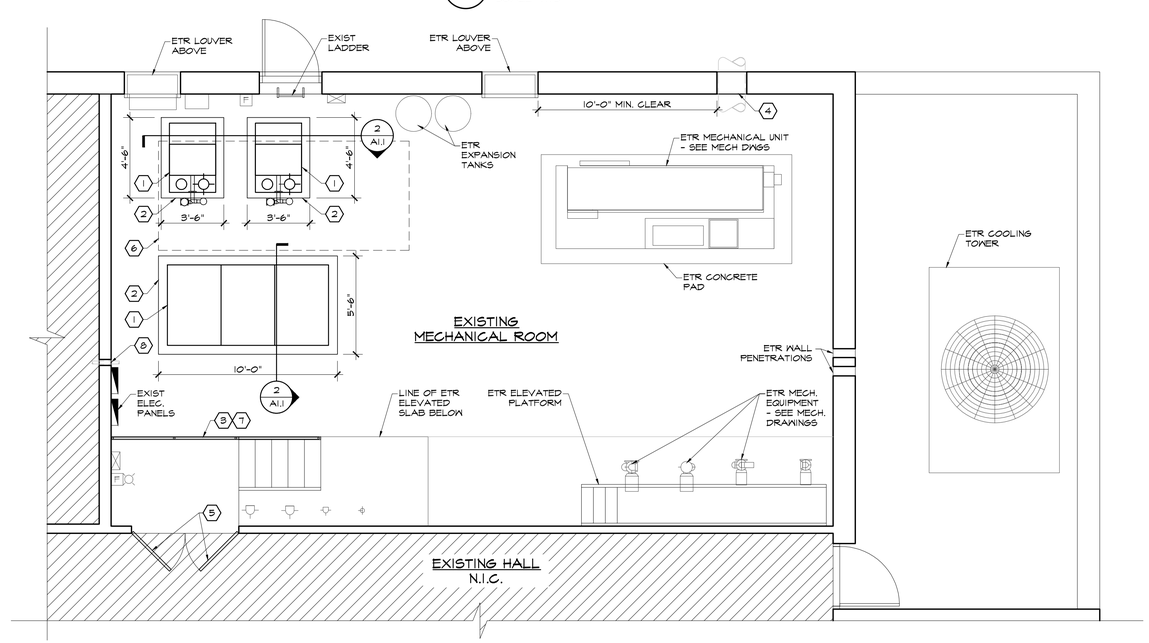
3 A1.1 TYPICAL WELDED RAILING CONNECTION DETAIL
SCALE: 3" = 1'-0"



2 A1.1 PROPOSED CHILLER UNIT SLAB DETAIL
SCALE: 1 1/2" = 1'-0"



6 SECOND FLOOR PLAN (DOOR HARDWARE REPLACEMENT)
SCALE: NTS



1 PARTIAL BASEMENT FLOOR PLAN
SCALE: 1/4" = 1'-0"

N PLAN

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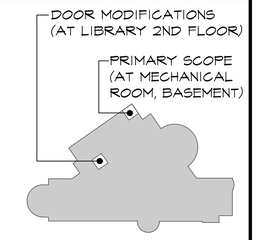

KEYPLAN N

REVISIONS

NUMBER	REMARKS	DATE

FOR CONSTRUCTION

CCRI CHILLER REPLACEMENT NEWPORT CAMPUS

1 JOHN H. CHAFEE BOULEVARD
NEWPORT, RHODE ISLAND
02840
Newport County

DRAWING TITLE
FLOOR PLAN & DETAILS

DATE	PROJ NO
DEC. 20, 2019	19160
DRAWN BY	CHECKED BY
NJB	DH

DRAWING NUMBER
A1.1

GENERAL NOTES

A. THERE SHALL BE NO SERVICE INTERRUPTION
B. PRIOR TO COMMENCING WORK CONTRACTOR SHALL VERIFY EXACT LOCATION OF DOMESTIC WATER, VENT AND DEPTH OF EXISTING SEWER LINES IN THE FIELD.
   a. ALL PIPING SHALL BE IDENTIFIED ON REDLINE DRAWINGS TO BE PROVIDED BY CONTRACTOR TO ENGINEER, OWNER AND ARCHITECT. INCLUDING SIZE, INVERT ELEVATIONS, DIRECTION OF FLOW
C. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
D. CONTRACT DOCUMENT DRAWINGS FOR MECHANICAL WORK (HVAC, PLUMBING, AND FIRE PROTECTION) ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
E. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
F. ALL PIPING ON THIS PLAN SHALL BE CONCEALED UNLESS OTHERWISE NOTED.
G. REPAIR PAVING/FLOOR AFTER INSTALLATION AND INSPECTION OF UTILITIES INSTALLED. PAINT FLOOR TO MATCH PREVIOUS OR MATCH AND COMPLY WITH ARCHITECTURAL DRAWINGS.
H. CONTRACTOR TO RECONNECT EXISTING ELECTRICAL GROUNDING/BONDING TO COLD WATER PIPING SYSTEM.
I. PROVIDE VIBRATION ISOLATION FOR ALL MECHANICAL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
J. PROVIDE VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO AND WITHIN 50 FEET OF ISOLATED EQUIPMENT (EXCEPT AT BASE ELBOW SUPPORTS AND ANCHOR POINTS) THROUGHOUT MECHANICAL EQUIPMENT ROOMS. DO THE SAME FOR SUPPORTS OF STEAM MAINS WITHIN 50 FEET OF BOILER OR PRESSURE REDUCING VALVES.
K. PROVIDE VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS OF STEAM MAINS WITHIN 50 FEET OF BOILERS AND PRESSURE REDUCING VALVES.
L. THE LOCATION OF EXISTING UNDERGROUND/UNDERSLAB UTILITIES IS SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL PAY FOR AND REPAIR ALL DAMAGES CAUSED BY FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES UNLESS OTHERWISE INDICATED.
M. COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
N. MAINTAIN A MINIMUM OF 6'-8" CLEARANCE TO UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT, ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.
O. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.
P. LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY. PROVIDE ACCESS PANELS WHERE REQUIRED.
Q. TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). TESTING, ADJUSTING, AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH THE AABC STANDARDS.
R. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
S. REINFORCEMENT, DETAILING, AND PLACEMENT OF CONCRETE SHALL CONFORM TO ASTM 315 AND ACI 318. CONCRETE SHALL CONFORM TO ASTM C94. CONCRETE WORK SHALL CONFORM TO ACI 318, PART ENTITLED "CONSTRUCTION REQUIREMENTS." COMPRESSIVE STRENGTH IN 28 DAYS SHALL BE 3,000 PSI. TOTAL AIR CONTENT OF EXTERIOR CONCRETE SHALL BE BETWEEN 5 AND 7 PERCENT BY VOLUME. SLUMP SHALL BE BETWEEN 3 AND 4 INCHES. CONCRETE SHALL BE CURED FOR 7 DAYS AFTER PLACEMENT.
T. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
U. ALL CONTROL WIRE AND CONDUIT SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND DIVISION 16 OF THE SPECIFICATION.
V. Q. CONCRETE HOUSEKEEPING PADS TO SUIT MECHANICAL EQUIPMENT SHALL BE SIZED AND LOCATED BY THE MECHANICAL CONTRACTOR. MINIMUM CONCRETE PAD THICKNESS SHALL BE 6 INCHES. PAD SHALL EXTEND BEYOND THE EQUIPMENT A MINIMUM OF 6 INCHES ON EACH SIDE. CONCRETE HOUSEKEEPING PADS SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. IT SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO COORDINATE SIZE AND LOCATION OF CONCRETE HOUSEKEEPING PADS WITH GENERAL CONTRACTOR.
W. ALL MECHANICAL ROOM DOORS SHALL BE A MINIMUM OF 4'-0" WIDE.
X. WHERE BEAMS ARE INDICATED TO BE PENETRATED WITH DUCTWORK OR PIPING, COORDINATE DUCTWORK AND PIPING LAYOUT WITH BEAM OPENING SIZE AND OPENING LOCATIONS. COORDINATION SHALL BE DONE PRIOR TO FABRICATION OF DUCTWORK, CUTTING OF PIPING, OR FABRICATION OF BEAMS.
Y. WHEN MECHANICAL WORK (HVAC, PLUMBING, SHEET METAL, FIRE PROTECTION, ETC.) IS SUBCONTRACTED, IT SHALL BE THE MECHANICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
Z. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATE ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
AA. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT (UNLESS OTHERWISE NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
BB. PROVIDE ACCESS PANELS FOR INSTALLATION IN WALLS AND CEILINGS, WHERE REQUIRED, TO SERVICE DAMPERS, VALVES, SMOKE DETECTORS, AND OTHER CONCEALED MECHANICAL EQUIPMENT. ACCESS PANELS SHALL BE TURNED OVER TO GENERAL CONTRACTOR FOR INSTALLATION.
CC. ALL EQUIPMENT, PIPING, DUCTWORK, ETC., SHALL BE SUPPORTED AS DETAILED, SPECIFIED, AND REQUIRED TO PROVIDE A VIBRATION FREE INSTALLATION.
DD. ALL DUCTWORK, PIPING AND EQUIPMENT SUPPORTED FROM STRUCTURAL STEEL SHALL BE COORDINATED WITH GENERAL CONTRACTOR, ALL ATTACHMENTS TO STEEL BAR JOISTS, TRUSSES, OR JOIST GIRDERS SHALL BE AT PANEL POINTS. PROVIDE BEAM CLAMPS MEETING MSS STANDARDS.
EE. WELDING TO STRUCTURAL MEMBERS SHALL NOT BE PERMITTED. THE USE OF C-CLAMPS SHALL NOT BE PERMITTED.
FF. MECHANICAL EQUIPMENT, DUCTWORK, AND PIPING SHALL NOT BE SUPPORTED FROM METAL DECK.
GG. ALL ROOF MOUNTED EQUIPMENT CURBS FOR EQUIPMENT PROVIDED BY THE MECHANICAL CONTRACTOR SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR AND INSTALLED BY THE GENERAL CONTRACTOR.
HH. LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED.
II. ALL OPENINGS IN FIRE WALLS DUE TO DUCTWORK, PIPING, CONDUIT, ETC., SHALL BE FIRE STOPPED WITH A PRODUCT SIMILAR TO 3M OR APPROVED EQUAL.
JJ. ALL AIR CONDITIONING CONDENSATE DRAIN LINES FROM EACH AIR HANDLING UNIT AND ROOFTOP UNIT SHALL BE PIPED FULL SIZE OF THE UNIT DRAIN OUTLET, WITH "P" TRAP, AND PIPED TO NEAREST DRAIN. SEE DETAILS SHOWN ON THE DRAWINGS OR THE CONTRACT SPECIFICATIONS FOR DEPTH OF AIR CONDITIONING CONDENSATE TRAP.
KK. REFER TO TYPICAL DETAILS FOR DUCTWORK, PIPING, AND EQUIPMENT INSTALLATION.

NOTE TO CONTRACTORS

A. ALL CONTRACTORS SHALL PERFORM A WALKDOWN OF THE ENTIRE SCOPE OF THE PROJECT
B. ERRORS IN ESTIMATES FROM TAKEOFFS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AT NOT ADDITIONAL COST TO OWNER.
C. EXISTING CONDITIONS SHOWN IN DRAWINGS ARE FROM COMBINATION OF PREVIOUS PROJECT DRAWINGS, PROJECT PHOTOS, AND WALK-DOWNS.
D. FINAL LAYOUTS AND ROUTING ARE INFERRED WITHIN THESE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR HAS LATITUDE TO ALTER ROUTING AS NECESSARY, WITH INPUT FROM THE ENGINEER OF RECORD. THIS IS NECESSARY TO ENSURE PROPER OPERATION OF ALL COMPONENTS WITHIN THE PROJECT
E. PLEASE REFER TO SPECIFICATIONS FOR PIPING MATERIALS, SPECIALTIES, HANGERS, ETC...

SCOPE OF WORK

A. GENERAL
   a. PROVIDE ALL EQUIPMENT, DUCTWORK, PIPING, CONTROLS, ETC TO PROVIDE A FULLY FUNCTIONAL SYSTEM. OUTLINE SCOPE OF PROJECT BELOW
      - SAFELY ISOLATE, DEMO AND REMOVE ONE EXISTING BROAD CHILLER AND ACCESSORIES. ELECTRICAL, CONTROLS, MECHANICAL AND PIPING RELATED EXCLUSIVELY TO THE CHILLER AND NOT RELATED TO REMAINING ITEMS.
      - PROVIDE NEW CHILLER MODULE, NEW BOILERS, NEW EXHAUST FAN, NEW CONTROLS AND RELATED ITEMS.
      - THE HYDRONIC WATER SYSTEMS WILL BE TIED INTO EXISTING AND WILL BE REFERRED TO AS SYSTEM 1. THE REMAINING CHILLER/BOILER EQUIPMENT WILL BE REFEREED TO AS SYSTEM 2. SYSTEMS 1 AND 2 SHALL NOT BE OPERATED AT THE SAME TIME. THE CONTROLS CONTRACTOR WILL ENSURE ONE OF THE SYSTEMS IS ISOLATED FROM MAIN DISTRIBUTION PIPING FOR CHILLED WATER SUPPLY AND RETURN, CONDENSER WATER SUPPLY AND RETURN, AND HEATING HOT WATER SUPPLY AND RETURN.
      - A REFRIGERANT MONITORING SYSTEM WILL BE INSTALLED TO PROMOTE SAFETY AND COMPLIANCE.
      - PROVIDE NEW CHILLED WATER AND HEATING HOT WATER SYSTEMS TO PROVIDE HEATING AND COOLING TO SERVE VARIOUS BUILDING LOADS.
      - BUILDING LOADS HAVE NOT BEEN EVALUATED AND THE NEW EQUIPMENT IS TO OFFSET THE REPLACEMENT OF THE EXISTING CHILLER/ BOILER WHILE PROVIDING SOME ADDITIONAL CAPACITY.

HVAC/ SHEETMETAL NOTES

A. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE HVAC SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
B. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS.
C. IN CORRIDORS WHERE CEILING SPEAKERS AND AIR DIFFUSERS ARE INDICATED BETWEEN THE SAME LIGHT FIXTURES, INSTALL BOTH DEVICES AT THE QUARTER POINTS BETWEEN THE SAME FIXTURE.
D. UNLESS OTHERWISE SHOWN, LOCATE ALL ROOM THERMOSTATS AND HUMIDISTATS 4'-0" (CENTERLINE) ABOVE FINISHED FLOOR. NOTIFY THE ENGINEER OF ANY ROOMS WHERE THE ABOVE LOCATION CANNOT BE MAINTAINED OR WHERE THERE IS A QUESTION ON LOCATION.
E. ALL DUCTWORK SHALL CLEAR DOORS AND WINDOWS.
F. ALL DUCTWORK DIMENSIONS, AS SHOWN ON THE DRAWINGS, ARE INTERNAL CLEAR DIMENSIONS AND DUCT SIZE SHALL BE INCREASED TO COMPENSATE FOR DUCT LINING THICKNESS.
G. PROVIDE ALL 90 DEGREE SQUARE ELBOWS WITH DOUBLE RADIUS TURNING VANES UNLESS OTHERWISE INDICATED. ELBOWS IN DISHWASHER, KITCHEN, AND LAUNDRY EXHAUST SHALL BE UNVANED SMOOTH RADIUS CONSTRUCTION WITH A RADIUS EQUAL TO 1 1/2 TIMES THE WIDTH OF THE DUCT. PROVIDE ACCESS DOORS UPSTREAM OF ALL ELBOWS WITH TURNING VANES.
H. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING, AND OTHER CEILING ITEMS AND MAKE MINOR DUCT MODIFICATIONS TO SUIT.
I. FIELD ERECTED AND FACTORY ASSEMBLED AIR HANDLING UNIT COILS SHALL BE ARRANGED FOR REMOVAL FROM THE UPSTREAM SIDE WITHOUT DISMANTLING SUPPORTS. PROVIDE GALVANIZED STRUCTURAL STEEL SUPPORTS FOR ALL COILS (EXCEPT LOWEST COIL) IN BANKS OVER TWO COILS HIGH TO PERMIT INDEPENDENT REMOVAL OF ANY COIL.
J. ALL AIR HANDLING UNITS SHALL OPERATE WITHOUT MOISTURE CARRYOVER.
K. LOCATE ALL MECHANICAL EQUIPMENT (SINGLE DUCT, DUAL DUCT, VARIABLE VOLUME, CONSTANT VOLUME AND FAN POWERED BOXES, FAN COIL UNITS, CABINET HEATERS, UNIT HEATERS, UNIT VENTILATORS, COILS, STEAM HUMIDIFIERS, ETC.) FOR UNOBSTRUCTED ACCESS TO UNIT ACCESS PANELS, CONTROLS AND VALVING.
L. FINNED TUBE RADIATION ENCLOSURES SHALL BE WALL TO WALL UNLESS OTHERWISE INDICATED.
M. PROVIDE FLEXIBLE CONNECTIONS IN ALL DUCTWORK SYSTEMS (SUPPLY, RETURN, AND EXHAUST) CONNECTED TO AIR HANDLING UNITS, FANS, AND OTHER EQUIPMENT WHICH REQUIRE VIBRATION ISOLATION. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT THE POINT OF CONNECTION TO THE EQUIPMENT UNLESS OTHERWISE INDICATED.
N. UNLESS OTHERWISE NOTED, ALL DUCTWORK IS OVERHEAD, TIGHT TO THE UNDERSIDE OF THE STRUCTURE, WITH SPACE FOR INSULATION IF REQUIRED.
O. RUNS OF FLEXIBLE DUCT SHALL NOT EXCEED 5 FEET (EDIT MAXIMUM LENGTH OF FLEXIBLE DUCT TO SUIT PROJECT; 5 FEET MAXIMUM RECOMMENDED LENGTH, 8 FEET MAXIMUM LENGTH).
P. ALL DUCTWORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN DUCTS, INCLUDING DIVIDED DUCTS AND TRANSITIONS AROUND OBSTRUCTIONS, SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
Q. PROVIDE ACCESS DOORS IN DUCTWORK TO PROVIDE ACCESS FOR ALL SMOKE DETECTORS, FIRE DAMPERS, SMOKE DAMPERS, VOLUME DAMPERS, HUMIDIFIERS, COILS, AND OTHER ITEMS LOCATED IN THE DUCTWORK WHICH REQUIRE SERVICE AND/OR INSPECTION.
R. PROVIDE ACCESS DOORS IN DUCTWORK FOR OPERATION, ADJUSTMENT, AND MAINTENANCE OF ALL FANS, VALVES, AND MECHANICAL EQUIPMENTS. ALL DUCTS SHALL BE GROUNDED ACROSS FLEXIBLE CONNECTIONS WITH FLEXIBLE COPPER GROUNDING STRAPS. GROUNDING STRAPS SHALL BE BOLTED OR SOLDERED TO BOTH THE EQUIPMENT AND THE DUCT.
S. SMOKE DETECTORS SHALL BE FURNISHED AND WIRED BY THE ELECTRICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR MOUNTING THE SMOKE DETECTOR IN DUCTWORK AS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS.
T. TERMINATE GAS VENTS FOR UNIT HEATERS, WATER HEATERS, HIGH PRESSURE PARTS WASHER, HIGH PRESSURE CLEANER, AND OTHER GAS APPLIANCES A MINIMUM OF 3'0" ABOVE ROOF WITH RAIN CAP (EDIT APPLIANCES AND HEIGHT ABOVE ROOF TO MEET CODE AND TO SUIT PROJECT REQUIREMENTS).
U. SEE SPECIFICATIONS FOR DUCTWORK GAUGES, BRACING, HANGERS, AND OTHER REQUIREMENTS.
V. EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. DETAILED DESCRIPTIONS ARE PROVIDED IN THE ARCHITECTURAL SPECIFICATIONS.
W. EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. LOUVER SIZES, LOCATIONS, AND DETAILS SHALL BE COORDINATED WITH GENERAL CONTRACTOR.
X. EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. LOUVER SIZES, LOCATIONS, MOUNTING, AND DETAILS SHALL BE COORDINATED WITH OTHER TRADES INVOLVED.

REFRIGERANT MONITORING APPROACH

A. ALTERNATIVE APPROACH FOR REFRIGERANT MONITORING
   a. EQUIP MECH ROOM WITH REFRIGERANT VAPOR DETECTION AND ALARM SYSTEM IAW IMC 1105 AND ALARM ANNUNCIATION SHALL BE NO LESS THAN 15 DECIBELS ABOVE AMBIENT NOISE IN ADDITION TO TWO DISTINCTIVE VISUAL ALARM (HS-1).
   b. ALARM SHALL BE ACTIVATED WHEN THE REFRIGERANT VAPOR TLV-TLW IS EXCEEDED. ALARM SHALL BE POWERED AND SUPERVISED BY BAS.
   c. ALARM SHALL BE INSTALLED, MAINTAINED AND TESTED IAW IFC AND MANUFACTURERS REQUIREMENTS.
   d. ALARMS SHALL BE ANNUNCIATED INSIDE THE MECH ROOM AND OUTSIDE EACH ENTRANCE TO THE MECH ROOM. AN ALARM CONDITION SHALL INITIATE THE MECHANICAL VENTILATION SYSTEM IAW IFC 606 (DETECTOR REQUIREMENTS) AS DICTATED BY QUANTITIES IAW IMC TABLE 1103.1.
   e. ACTIVATION OF FANS SHALL BE PROVIDED BY A TAMPER RESISTANT COVER WITH "ON" CONTROL LOCATED IMMEDIATELY ADJACENT TO AND OUTSIDE EACH MECH. ROOM EXIT. REFRIGERANT SENSORS SHALL BE CALIBRATED BASED ON NO MORE THAN 25% OF THE OF THE LFL OR 50% OF IDLH. ACGIH HAS (3) LEVELS AEL WHERE EXPOSURE OF 8 HOURS PER DAY FOR 40 HOURS PER WEEK WITHOUT HAVING AN ADVERSE EFFECT. LEVEL 2 STEL WHICH IS DEFINED AS THREE TIMES THE AEL (NOT TO BE EXPOSED FOR MORE THAN 30 MINUTES AT A TIME). LEVEL 3 EMERGENCY EXPOSURE LIMIT EEL AT THAT LIMIT PERSONS SHOULD NOT BE IN THE ROOM AT ALL WITHOUT A SELF-CONTAINED BREATHING APPARATUS.
   f. PROVIDE TWO COLORED AND LABELED INDICATOR LAMPS RESPONDING TO THE DIFFERENTIAL PRESSURE ACROSS THE PURGE FAN. ON LAMP SHALL INDICATE FLOW; THE OTHER SHALL INDICATE NO FLOW.
   g. PROVIDE REFRIGERANT PRESSURE LIMITING AND PRESSURE RELIEF VALVES AND PIPING.
   h. BREAK GLASS AND KEYED SWITCHES SHALL BE UL COMPLIANT. EXTERIOR BUILDING SWITCHES SHALL BE PROTECTED AGAINST VANDALISM VIA KNOX BOX OR EQUIVALENT

PIPING NOTES

A. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE PIPING SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
B. ELEVATIONS AS SHOWN ON THE DRAWINGS ARE TO THE CENTERLINE OF ALL PRESSURE PIPING AND TO THE INVERT OF ALL GRAVITY PIPING.
C. MAINTAIN A MINIMUM OF 36" OF GROUND COVER OVER ALL UNDERGROUND HVAC PIPING BUT ENSURE FROST LINE IN CONSIDERED AND MET.
D. UNLESS OTHERWISE NOTED, ALL CHILLED WATER AND HEATING WATER PIPING SHALL BE 3/4 INCH SIZE (EDIT SYSTEM TYPE OR PIPE SIZE TO SUIT PROJECT REQUIREMENTS).
E. PROVIDE AN AIR VENT AT THE HIGH POINT OF EACH DROP ALL HYDRONIC PIPING SYSTEMS INCLUDING BUT NOT LIMITED TO IN THE HEATING WATER, CHILLED WATER, AND OTHER CLOSED WATER PIPING SYSTEMS (EDIT SYSTEM TYPES TO SUIT PROJECT REQUIREMENTS). ALL PIPING SHALL GRADE TO LOW POINTS. PROVIDE HOSE END DRAIN VALVES AT THE BOTTOM OF ALL RISERS AND LOW POINTS.
F. UNLESS OTHERWISE NOTED, ALL PIPING IS OVERHEAD, TIGHT TO UNDERSIDE OF STRUCTURE OR SLAB, WITH SPACE FOR INSULATION IF REQUIRED.
G. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.
H. ALL VALVES SHALL BE INSTALLED SO THAT VALVE REMAINS IN SERVICE WHEN EQUIPMENT OR PIPING ON EQUIPMENT SIDE OF VALVE IS REMOVED.
I. ALL BALANCING VALVES AND BUTTERFLY VALVES SHALL BE PROVIDED WITH POSITION INDICATORS AND MAXIMUM ADJUSTABLE STOPS (MEMORY STOPS)
J. PROVIDE CHAINWHEEL OPERATORS FOR ALL VALVES IN EQUIPMENT ROOMS MOUNTED GREATER THAN 7'-0" ABOVE FLOOR LEVEL; CHAIN SHALL EXTEND TO 7'-0" ABOVE FLOOR LEVEL.
K. ALL VALVES (EXCEPT CONTROL VALVES) AND STRAINERS SHALL BE FULL SIZE OF PIPE BEFORE REDUCING SIZE TO MAKE CONNECTIONS TO EQUIPMENT AND CONTROLS.
L. UNIONS AND/OR FLANGES SHALL BE INSTALLED AT EACH PIECE OF EQUIPMENT, IN BYPASSES, AND IN LONG PIPING RUNS (100 FEET OR MORE) TO PERMIT DISASSEMBLY FOR ALTERATION AND REPAIRS.
M. PITCH STEAM PIPING DOWNWARD IN THE DIRECTION OF FLOW 1/4 INCH IN 10 FEET (1 INCH IN 40 FEET) MINIMUM. PITCH ALL STEAM RETURN LINES DOWNWARD IN THE DIRECTION OF CONDENSATE FLOW 1/2 INCH PER 10 FEET (1 INCH IN 20 FEET) MINIMUM. WHERE LENGTH OF BRANCH LINES ARE LESS THAN 8 FEET, PITCH BRANCH LINES TOWARD MAINS 1/2 INCH PER FOOT MINIMUM.
N. PITCH UP ALL STEAM AND CONDENSATE RUNOUTS TO RISERS AND EQUIPMENT 1/2 INCH PER FOOT. WHERE THIS PITCH CANNOT BE OBTAINED, RUNOUTS OVER 8 FEET IN LENGTH SHALL BE ONE SIZE LARGER THAN NOTED.
O. TAP ALL BRANCH LINES FROM TOP OF STEAM MAINS (45 DEGREES PREFERRED, 90 DEGREES ACCEPTABLE).
P. PROVIDE AN END OF MAIN DRIP AT EACH RISE IN THE STEAM MAIN. PROVIDE CONDENSATE DRIPS AT THE BOTTOM OF ALL STEAM RISERS, DOWNFEED RUNOUTS TO EQUIPMENT, RADIATORS, ETC., AT END OF MAINS AND LOW POINTS, AND AHEAD OF ALL PRESSURE REGULATORS, CONTROL VALVES, ISOLATION VALVES, AND EXPANSION JOINTS.
Q. ON STRAIGHT STEAM PIPING RUNS WITH NO NATURAL DRAINAGE POINTS, INSTALL DRIP LEGS AT INTERVALS NOT EXCEEDING 200 FEET WHERE PIPE IS PITCHED DOWNWARD IN THE DIRECTION OF STEAM FLOW AND A MAXIMUM OF 100 FEET WHERE THE PIPE IS PITCHED UP SO THAT CONDENSATE FLOW IS OPPOSITE OF STEAM FLOW.
R. STEAM TRAPS SHALL BE MINIMUM 3/4" SIZE.
S. INSTALL ALL PIPING WITHOUT FORCING OR SPRINGING.
T. ALL PIPING SHALL CLEAR DOORS AND WINDOWS.
U. ALL VALVES SHALL BE ADJUSTED FOR SMOOTH AND EASY OPERATION.
V. ALL PIPING WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
W. PROVIDE FLEXIBLE CONNECTIONS IN ALL PIPING SYSTEMS CONNECTED TO PUMPS, CHILLERS, COOLING TOWERS, AND OTHER EQUIPMENT WHICH REQUIRE VIBRATION ISOLATION EXCEPT WATER COILS. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AS CLOSE TO THE EQUIPMENT AS POSSIBLE OR AS INDICATED ON THE DRAWINGS.
X. SLOPE REFRIGERANT PIPING ONE PERCENT IN THE DIRECTION OF OIL RETURN. LIQUID LINES MAY BE INSTALLED LEVEL.
Y. INSTALL HORIZONTAL REFRIGERANT HOT GAS DISCHARGE PIPING WITH 1/2" PER 10 FEET DOWNWARD SLOPE AWAY FROM THE COMPRESSORS. INSTALL HORIZONTAL REFRIGERANT SUCTION LINES WITH 1/2" PER 10 FEET DOWNWARD SLOPE TO THE COMPRESSOR, WITH NO LONG TRAPS OR DEAD ENDS WHICH MAY CAUSE OIL TO SEPARATE FROM THE SUCTION GAS AND RETURN TO THE COMPRESSOR IN DAMAGING SLUGS.
Z. PROVIDE LINE SIZE LIQUID INDICATORS IN MAIN LIQUID LINE LEAVING CONDENSER OR RECEIVER. INSTALL MOISTURE-LIQUID INDICATORS IN LIQUID LINES BETWEEN FILTER DRYERS AND THERMOSTATIC EXPANSION VALVES AND IN LIQUID LINE TO RECEIVER.
AA. PROVIDE LINE SIZE STRAINER UPSTREAM OF EACH AUTOMATIC VALVE. PROVIDE SHUTOFF VALVE ON EACH SIDE OF STRAINER.
BB. PROVIDE PERMANENT FILTER DRYERS IN LOW TEMPERATURE SYSTEMS AND SYSTEMS USING HERMETIC COMPRESSORS.
CC. PROVIDE REPLACEABLE CARTRIDGE FILTER DRYERS WITH THREE VALVE BYPASS ASSEMBLY FOR SOLENOID VALVES, ADJACENT TO RECEIVERS.
DD. PROVIDE REFRIGERANT CHARGING VALVE CONNECTIONS IN LIQUID LINE BETWEEN RECEIVER SHUTOFF VALVE AND EXPANSION VALVE.

MECHANICAL ABBREVIATIONS LEGEND

ABBREVIATION	DESCRIPTION
AC	AIR CONDITIONING
AFF	ABOVE FINISHED FLOOR
AP	ACCESS PANEL
APD	AIR PRESSURE DROP (INCHES OF WATER COLUMN)
BD	BALANCING (VOLUME) DAMPER
BDD	BACKDRAFT DAMPER
BHP	BRAKE HORSEPOWER
BTUH	BRITISH THERMAL UNIT PER HOUR
CFM	CUBIC FEET PER MINUTE
DB	DRY BULB
DEG F	DEGREES FAHRENHEIT
DIA	DIAMETER
DN	DOWN
DTF	DOWN THRU FLOOR
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE (DEG F)
EC	ELECTRICAL CONTRACTOR
EDB	ENTERING DRY BULB
EF	EXHAUST FAN
ESP	EXTERNAL STATIC PRESSURE (INCHES IN WATER)
EWB	ENTERING WET BULB
F	FURNACE
FD	FLOOR DRAIN
FLA	FULL LOAD AMPS
FP	FIRE PROTECTION
FPM	FEET PER MINUTE
HP	HORSEPOWER
LAT	LEAVING AIR TEMPERATURE (DEG F)
LRA	LOCKED ROTOR AMPS
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPS
MFR	MANUFACTURER
MHP	MOTOR HORSEPOWER
MIN	MINIMUM
MOP	MAXIMUM OVERCURRENT PROTECTION
NC	NOISE CRITERIA
NC	NORMALLY CLOSED
OA	OUTDOOR AIR
RA	RETURN AIR
RL	REFRIGERANT LIQUID
RLA	RUNNING LOAD AMPS
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
TEMP	TEMPERATURE (DEG F)
TYP	TYPICAL
UTF	UP THRU FLOOR
V	VOLTS
W	WATTS
WB	WET BULB
WC	INCHES OF WATER COLUMN (PRESSURE)

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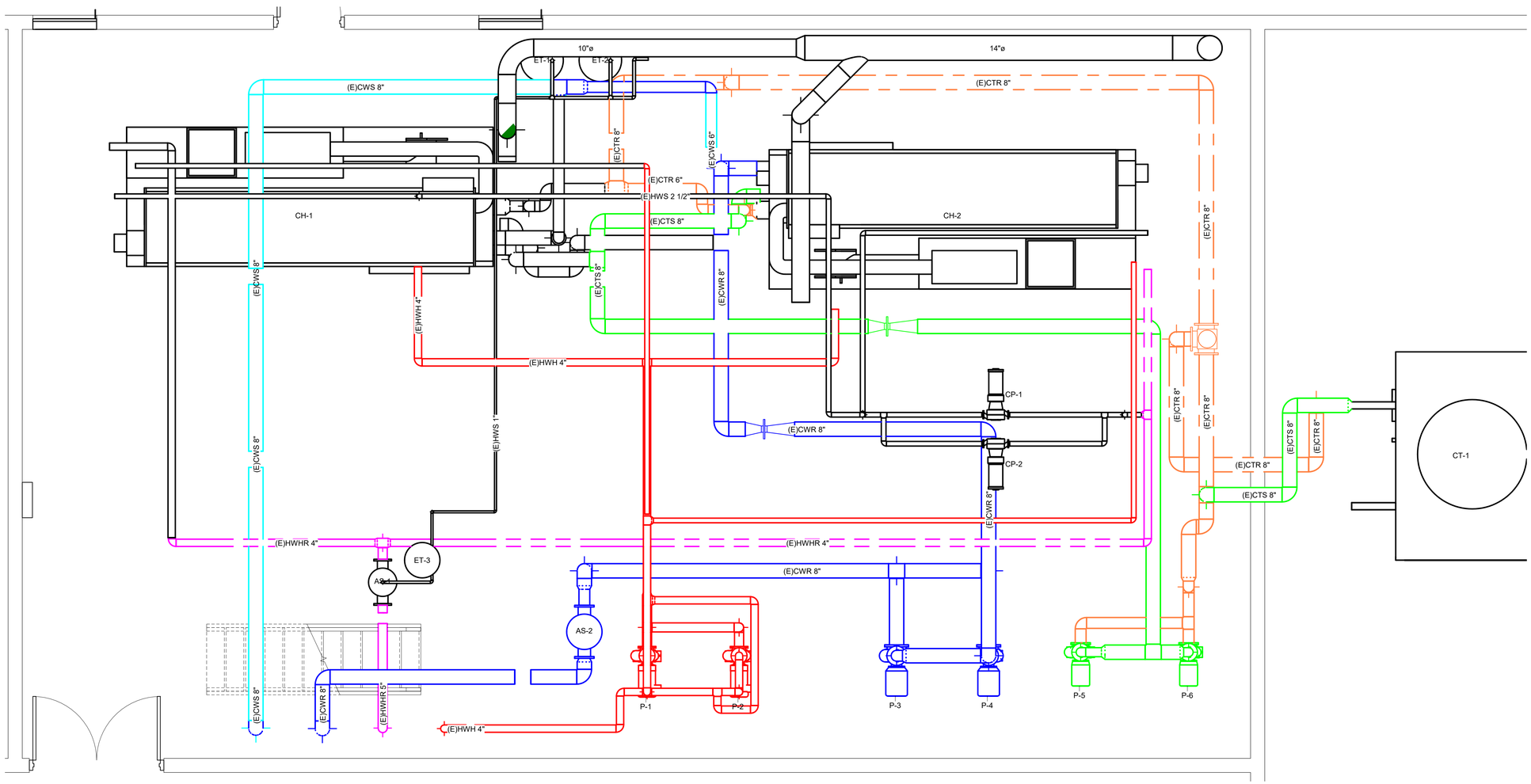

1 (E) MECHANICAL ROOM
3/8" = 1'-0"

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No.	Description	Date
1	IFCR	20DEC19
2	IFCR	02JAN20
3	IFC	22JAN20

CCRI NEWPORT

CCRI CHILLER REPLACEMENT NEWPORT CAMPUS 1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

MECHANICAL PLANS FLOOR EXISTING

Project number	AA-19160 / AGE-1979
Date	22JAN20
Drawn by	AGE
Checked by	AG
Approved by	AG

M1.01

Scale	3/8" = 1'-0"

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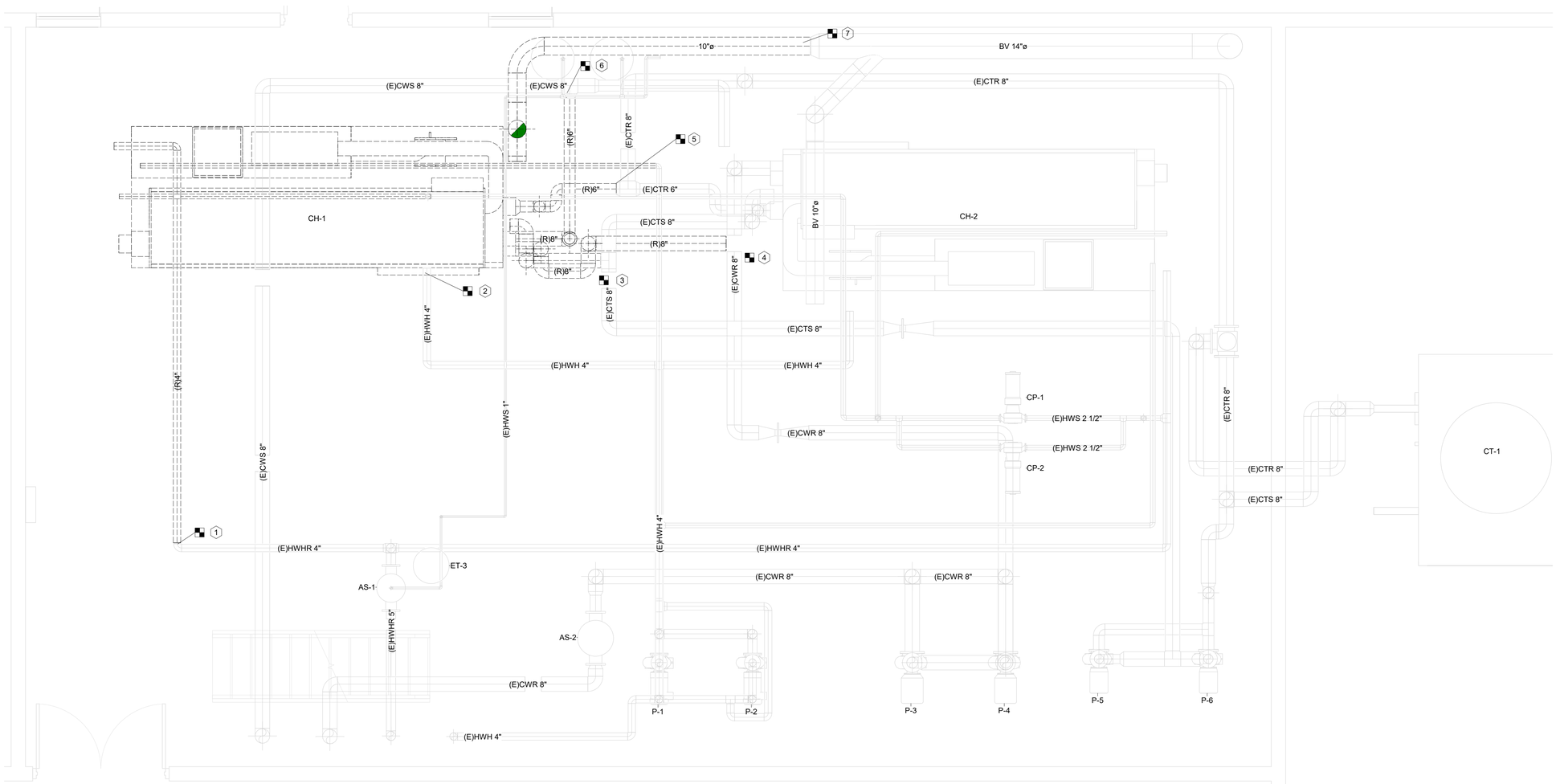
M1.02 DRAWING NOTES

#	NOTE
1	SAFELY ISOLATE AND CUT (E) HWHR 4"
2	SAFELY ISOLATE AND (E) HWH 4"
3	SAFELY ISOLATE AND CUT (E) CTS 8"
4	SAFELY ISOLATE AND CUT (E) CWR 8"
5	SAFELY ISOLATE AND CUT (E) CTR 8"
6	SAFELY ISOLATE AND CUT (E) CWS 8"
7	SAFELY CUT AND CAP 10" BREECHING AT TRANSITION



1 (D) MECHANICAL ROOM
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3	IFC	22JAN20

CCRI NEWPORT

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MECHANICAL PLANS FLOOR PLANS DEMO

Project number	AA-19160 / AGE-1979
Date	22JAN20
Drawn by	AGE
Checked by	AG
Approved by	AG

M1.02

Scale 3/8" = 1'-0"

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SHEET NOTES

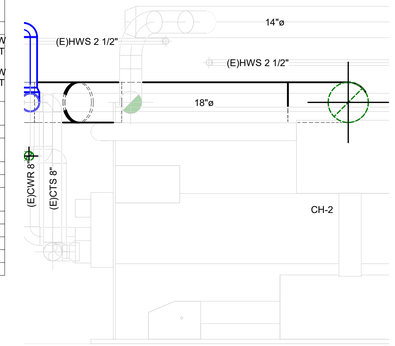
1. MODULAR CHILLER
   - A. DP1- CHILLER DIFFERENTIAL PRESSURE VFD PUMPS
   - B. CHILLER EVAPORATOR
     - a. FULL LOAD GPM 323.4 GPM @ DP2 SET TO 5.499 PSIG & MIN FLOW OF 107.9 GPM
   - C. CHILLER CONDENSER
     - a. FULL LOAD GPM 390.3 GPM @ DP1 SET TO 8.736 PSIG & MIN FLOW 130.1 GPM
   - D. TT1- CHWR, TT2- CHWS
   - E. CHILLER REFRIGERANT CAPACITY IS 18 LBS PER CIRCUIT. TOTAL REFRIGERANT IS (3) TIMES 18 LBS OF R-410A (54 LBS)
     - a. QUANTITY IS BELOW ASHRAE 15 AND ASHRAE 34 LIMITS

M1.03 DRAWING NOTES

#	NOTE
1	ADD CONTROLS TO ENSURE AIR BALANCE FOR COMBUSTION AIR, VENTILATION AIR AND EMERGENCY EXHUAST AIR IS SATISFIED. SEE SPECIFICATIONS, M701 AND M7.02 FOR FURTHER DETAILS.
2	CONFIRM EXHAUST FAN REQUIREMENT FOR REFRIGERANT IS STATIFIED WITH LOW VOLUME OF REFRIGERANT.
3	CONNECT (N) CTR 6: TO (E) CTR 8"
4	HEATING HOT WATER TEMPERATURE SENSOR FOR BOILER
5	CHILLED WATER TEMPERATURE SENSOR
6	CONNECT (N) HWHR 4" TO (E) HWHR 4"
7	CONNECT (N) CWS 6" TO (E) CWS 8"
8	CONNECT (N) HWH 4" TO (E) HWH 4"
9	CONNECT (N) CTS 6" TO (E) CTS
10	CONNECT (N) CWR 6" TO (E) CWR 8"
11	2 WAY AUTOMATIC ISOLATION VALVE
12	INSTALL NEW HOT WATER SYSTEM DP SENSOR
13	INSTALL NEW HOT WATER DP SENSOR AND FLOW SWITCH
14	EXISTING HOT WATER SYSTEM DP SENSOR AND FLOW SWITCH
15	INSTALL NEW CHILLED WATER SYSTEM DP SENSOR
16	INSTALL NEW CHILLED WATER DP SENSOR
17	EXISTING CHILLED WATER SYSTEM DP SENSOR AND FLOW SWITCH

M1.03 DRAWING NOTES

#	NOTE
18	ADD BYPASS FOR CHILLED WATER PIPING AND SET AT MIN FLOW OF 161.8 GPM FOR CHILLER MIN FLOW OF 107.9 GPM WITH DP 1 SET AT 5.499 PSI. THE VOL IS 405 GALLONS BASED ON MIN OF A 2 MIN LOOP AT ALL CONDITIONS ADD BYPASS FOR CHILLED WATER PIPING AND SET AT MIN FLOW OF 161.8 GPM FOR CHILLER MIN FLOW OF 107.9 GPM WITH DP 1 SET AT 5.499 PSI. THE VOL IS 405 GALLONS BASED ON MIN OF A 2 MIN LOOP AT ALL CONDITIONS
19	HORN/STROBE ABOVE DOOR EACH ENTRANCE TO MECHANICAL ROOM ON BOTH INTERIOR AND EXTERIOR OF DOOR
20	TIE-IN NEW CHILLER AND BOILERS TO EXISTING OUTSIDE AIR SENSOR
21	TIE-IN NEW CHILLER AND BOILERS TO EXISTING LOOP DIFFERENTIAL PRESSURE SWITCHES AND TRANSMITTERS
22	CONNECT (N) NG 2" TO (E) NG 2"
23	MACHINERY ROOM DOORS MUST OPEN OUTWARD
24	ES-2 EXHAUST FAN BREAK PURGE BREAK GLASS SWITCH NORMALLY CLOSED. LOCATED NEAR PRIMARY ACCESS DOOR.
25	EMERGENCY SHUTDOWN BREAK GLASS SWITCH. NORMALLY OPEN, LOCATED NEAR PRIMARY ACCESS
26	INSTALL NEW COOLING TOWER WATER SYSTEM DP SENSOR
27	INSTALL NEW COOLING TOWER WATER DP SENSOR
28	EXISTING COOLING TOWER WATER SYSTEM DP SENSOR
29	FUTURE BOILER TIE-IN



2 Section 2
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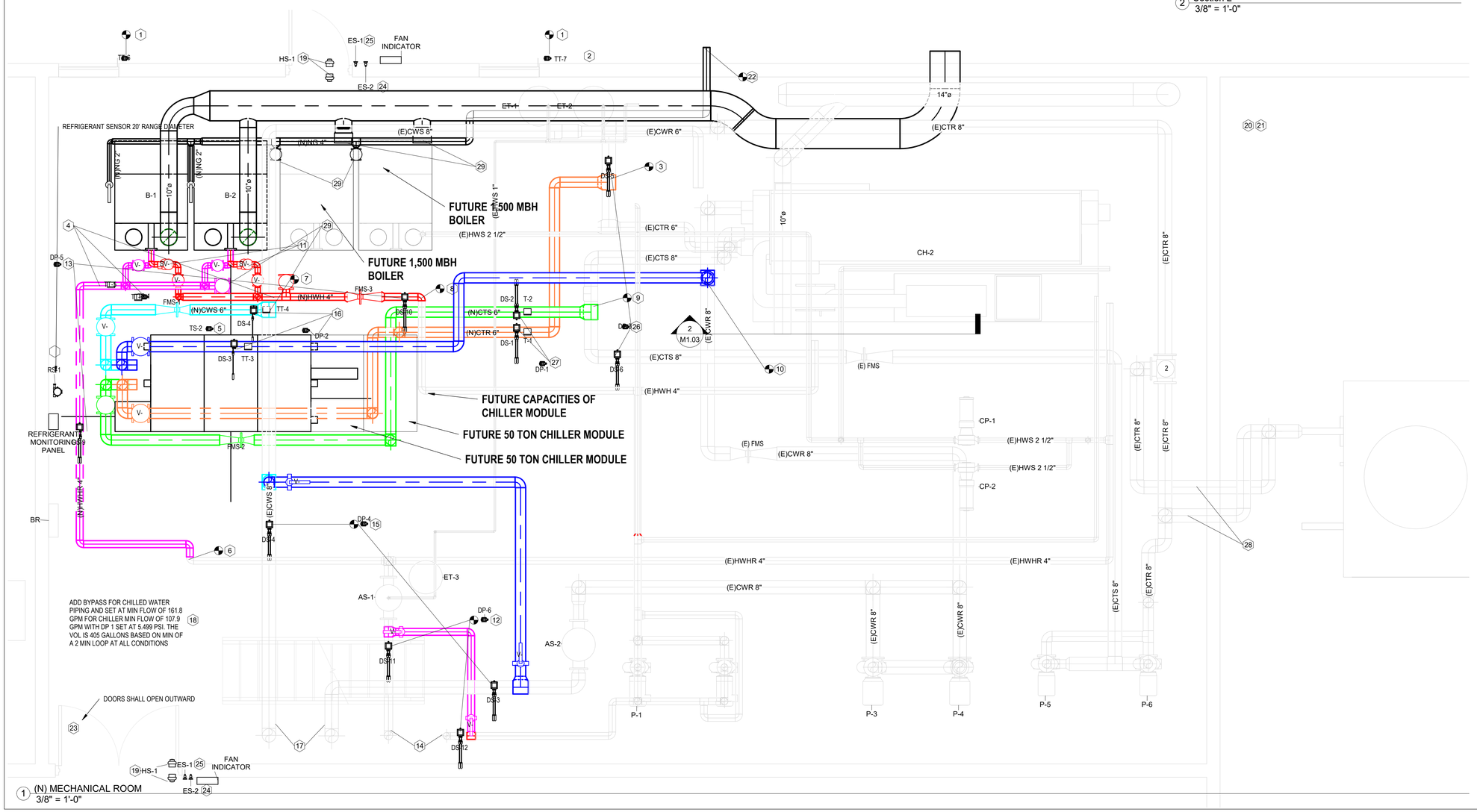

1 (N) MECHANICAL ROOM
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CCRI NEWPORT

CCRI CHILLER REPLACEMENT NEWPORT CAMPUS 1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

MECHANICAL PLANS NEW

Project number	AA-19160 / AGE-1979
Date	22JAN20
Drawn by	AGE
Checked by	AG
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M1.03

Scale 3/8" = 1'-0"

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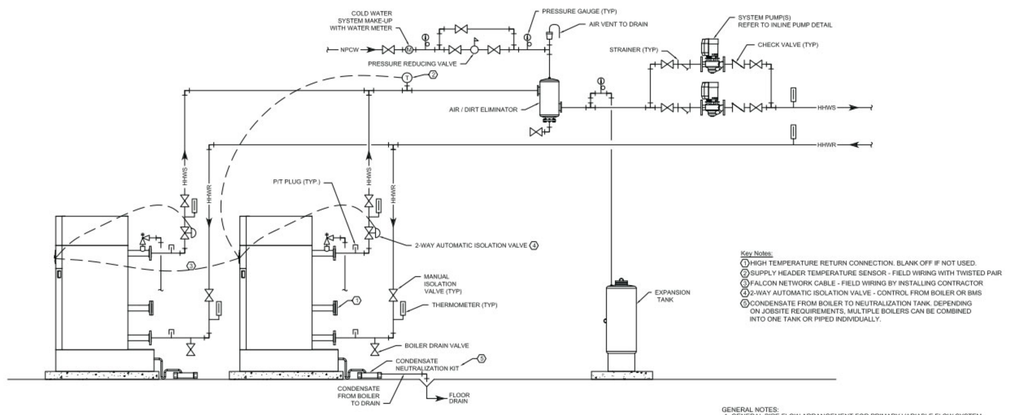


VARIABLE FLOW PRIMARY SYSTEM

SUMMARY PERFORMANCE DATA

							EVAPORATOR			CONDENSER			
Load	Capacity (tons)	kW	THR (MBtu/h)	kW/Ton	EER (Btu/Wh)	COP (kW/kW)	Flow Rate (GPM)	Leaving Temp. °F	ΔP (ft)	Cond Flow (GPM)	Entering Temp. °F	Leaving Temp. °F	ΔP (ft)
100%	135.0	97.16	1.952	0.7197	16.67	4.890	323.7	44.00	12.70	390.3	85.00	95.00	20.18
75%	101.3	51.63	1.391	0.5099	23.53	6.900	323.7	44.00	12.70	390.3	75.00	80.00	20.18
50%	67.50	26.33	0.8999	0.3901	30.76	9.010	323.7	44.00	12.70	390.3	65.00	70.00	20.18
25%	33.75	12.42	0.4474	0.3680	32.61	9.550	323.7	44.00	12.70	390.3	65.00	70.00	20.18

		kW/Ton	EER (Btu/Wh)	COP (kW/kW)
With Tower Relief (per AHRI 550/590)	NPLV.IP	0.4316	27.81	8.156

EVAPORATOR DESIGN DATA	(Based on Water)
Entering Temperature °F	54.00
Leaving Temperature °F	44.00
Design Flow (GPM)	323.7
Pressure Drop (Full Load)	5.499 PSI / 12.70 ft H2O
Chiller Minimum Flow (GPM)	107.9
Min. GPM For Sizing System Bypass	161.8
Heat Exchanger Style	Brazed Plate
Fouling Factor (h-ft2-°F/Btu)	.000100
Header Connection Size (in.)	6
Header Connection Type	Grooved Coupling

CONDENSER DESIGN DATA	(Based on Water)
Entering Temperature °F	85.00
Leaving Temperature °F	95.00
Design Flow (GPM)	390.3
Pressure Drop (Full Load)	8.736 PSI / 20.18 ft H2O
Chiller Minimum Flow (GPM)	130.1
Min. GPM For Sizing System Bypass	195.2
Heat Exchanger Style	Brazed Plate
Fouling Factor (h-ft2-°F/Btu)	.000250
Header Connection Size (in.)	6
Header Connection Type	Grooved Coupling

PHYSICAL DATA	
Length (in.)	See Multistack for Details
Width (in.)	See Multistack for Details
Height (in.)	See Multistack for Details
Estimated Dry Weight (lbs.)	See Multistack for Details
Estimated Operating Weight (lbs.)	See Multistack for Details
Refrigerant Type	R-410A
Refrig. Charge (lbs per circuit)	18

Dimensions are estimated and do not include J-Boxes

5 = 4800

ELECTRICAL DATA	1	2	3	4
(3) MSS050V	3	0	0	0
MCA	*299			
MOP	350			
Voltage	208/60/3			

*

CHILLER DATA	
Compressor Description	Variable Speed Scroll
Options	[illegible]
Comp. RLA (A) (per comp.)	MSS050V=47.7

MOUNTING/LIFTING FRAME	
	Option Not Selected
I-Beam Size	Option Not Selected
Bolt together frame - # of pieces	Option Not Selected
End Type	Option Not Selected

Outside the scope of AHRI Water-Cooled Water-Chilling and Heat Pump Water-Heating Packages Certification Program, but is rated in accordance with AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI).
Combined units or modular chiller array rating is outside of the scope of the AHRI Water-Cooled Water-Chilling and Heat Pump Water-Heating Packages Certification Program. Individual unit ratings are subject to the governing documents of the AHRI Certification Program.

Software Version# : 1.0.4435.29500

MEMBER AHRI

MULTISTACK®
Variable Flow Design Requirements

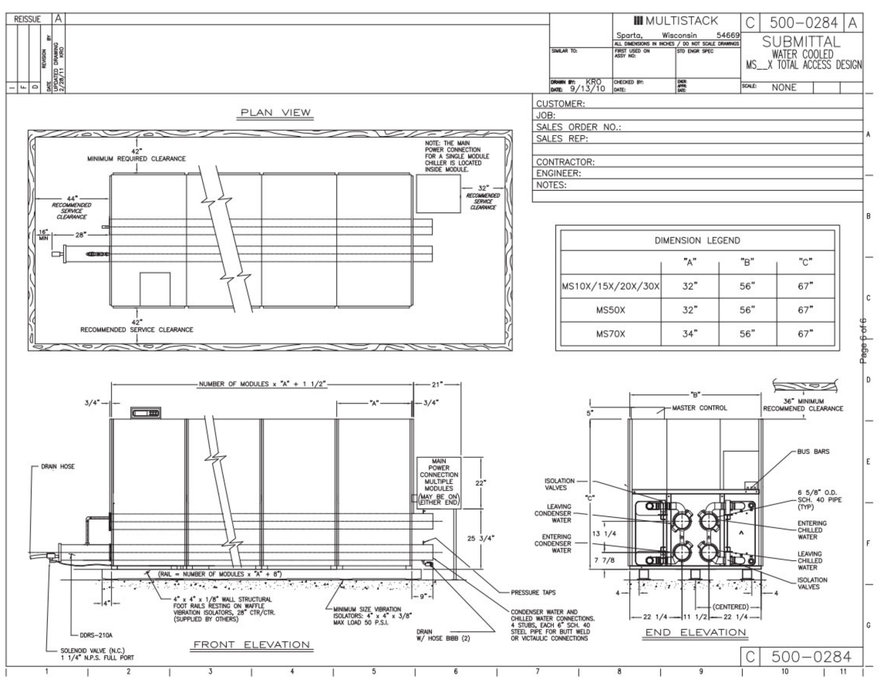
Chilled Water System (Evaporator)

Ensure a chiller DP transmitter (DP1) is incorporated into the piping design and set to: **5.499 PSI**
DP1 to be installed directly after the chiller with no pressure adding devices between the chiller and DP1.
Ensure a system DP transmitter(s) (DP2) is incorporated into the piping design
Ensure a system bypass valve(s) (V1) is incorporated into the piping design
Design of system bypass (V1) must be a characterized ball or globe type valve and be pressure dependent
System bypass valve (V1) stroke time needs to be selected for less than 60 seconds
Chiller minimum flow is: **107.9 GPM**
System bypass valve must be design for a minimum of: **161.8 GPM**
Note: this is a minimum requirement for the chiller ONLY! Other system components such as pumps or air handling units may have higher minimum flow requirements and bypass sizing may be adjusted accordingly.
Bypass loop volume (Includes piping between V1 & chiller): **405 Gallons**
Note: the bypass loop should be designed for a minimim of a 2 minute loop at all conditions. To obtain ensure the above volume is met.
Refer to Multistack Variable Flow Engineering Bulletin for more details
The pump or the bypass valve must control to maintain chiller DP setpoint, the opposite device (Pump or Bypass Valve) must maintain system DP setpoint.
When a pump module is supplied by Multistack it will be factory configured to control to DP across the chiller unless otherwise specified and noted on the chiller selection.

MULTISTACK®
Variable Flow Design Requirements

Condenser Water System

Ensure a chiller DP transmitter (DP1) is incorporated into the piping design and set to: **8.736 PSI**
DP1 to be installed directly after the chiller with no pressure adding devices between the chiller and DP1.
Chiller minimum flow is: **130.1 GPM**
Refer to Multistack Variable Flow Engineering Bulletin for more details
The condenser side water valves may be left open at all times in a user seletable number of modules.
This would be to allow for the cooling tower's, fluid cooler's, pump's, etc. minimum flow.
When a pump module is supplied by Multistack it will be factory configured to control to DP across the chiller unless otherwise specified and noted on the chiller selection.



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No.	Description	Date
1	IFCR	20DEC19
2	IFCR	02JAN20
3	IFC	22JAN20

CCRI NEWPORT

CCRI CHILLER REPLACEMENT
NEWPORT CAMPUS
1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

MECHANICAL DETAILS

Project number	AA-19160 / AGE-1979
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M5.00

Scale

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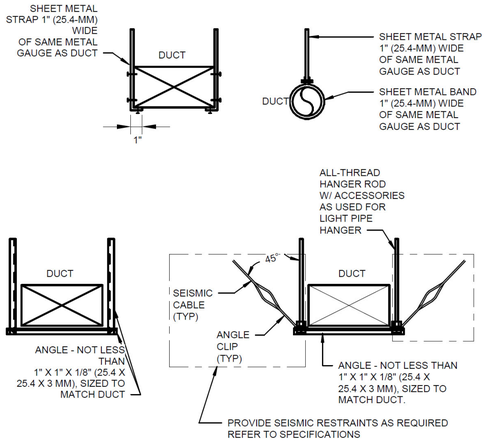
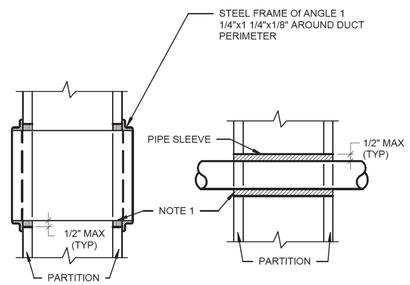


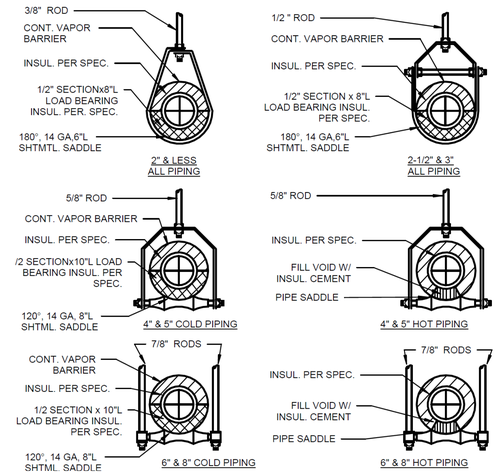
DUCTWORK HANGERS

NOTE:
DUCT PENETRATION SHOWN IS WHERE FIRE DAMPER IS NOT REQUIRED BY CODE

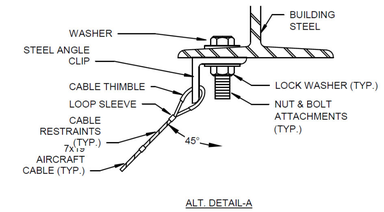


1 AT FIRE RATED PARTITIONS, ADD ADDITIONAL LAYER OF FIRE SAFING INSULATION
2 AROUND PENETRATION SO AS TO FILL CAVITY.
DUCT AND PIPE PENETRATIONS THRU CORRIDOR WALLS ABOVE THE CEILING ARE TO BE FIRE STOPPED AROUND THE PENETRATION.

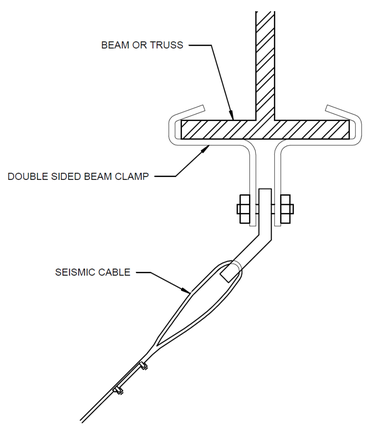
DUCTWORK AND PIPING PENETRATIONS



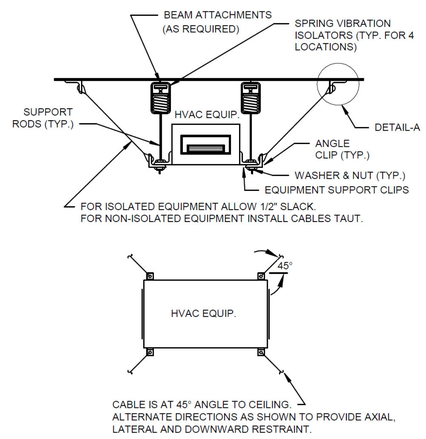
PIPE HANGER DETAIL



DETAIL A BOLTED RESTRAINTS



DETAIL A CLAMP TO BEAM RESTRAINTS



RESTRAINTS FOR HVAC EQUIPMENT SUSPENDED FROM CEILINGS

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MECHANICAL DETAILS

Project number	AA-19160 / AGE-1979
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M5.01

Scale

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GENERAL CONTROLS

1. SETPOINTS
2. BACNET COMMUNICATIONS INTERFACE
   A. FOR ALL EQUIPMENT DESIGNATED WITH A BACNET COMMUNICATION INTERFACE MODULE. THE CONTROLS CONTRACTOR SHALL REVIEW THE SEQUENCE OF OPERATION IDENTIFIED BELOW AND COORDINATE WITH EACH APPROVED EQUIPMENT MANUFACTURER TO PROVIDE THE DESIGNATED POINTS EITHER THROUGH THE INTERFACE OR A HARD WIRE CONNECTION (AT NO ADDITIONAL COST) WHERE CAPABILITY IS NOT AVAILABLE THROUGH INTERFACE.
   B. THE CONTROLS CONTRACTOR. SHALL IDENTIFY POINTS TO BE EITHER COMMANDED, TRENDED OR MONITORED THROUGH THE INTERFACE.
   C. AT A MINIMUM. THE BAS SHALL HAVE CAPABILITY TO ACCESS THE FOLLOWING FUNCTIONS FOR THE SYSTEM AND All.
      a. SUBEQUIPMENT; SYSTEM ENABLE, EQUIPMENT ENABLE, STATUS. ALARM, TEMPERATURE, PRESSURE, RESET SIGNALS, MAINTENANCE ALARM, OPERATION MODE, RUN TIME, FIRING/INPUT RATE. SET POINT ADJUSTMENT, DELAY AND SCHEDULING,
   D. THE CONTROLS CONTRACTOR SHALL COORDINATE WITH EACH APPROVED EQUIPMENT MANUFACTURER TO PROVIDE A FULL LIST OF AVAILABLE POINTS AVAILABLE THROUGH THE INTERFACE. ALL FUNCTIONS TO BE MAPPED THROUGH THE INTERFACE SHOULD BE SUBMITTED FOR ENGINEER APPROVAL.

EXISTING CONDITIONS AND TIE-IN

1. NEW SYSTEM MUST BE COMPLETELY INTEGRATED WITH EXISTING SYSTEM. DUE TO THE NATURE OF THE EXISTING BOTH SYSTEMS WILL NOT RUN SIMULTANEOUSLY. THE EXISTING BROAD ABSORPTION CHILLER WILL BE REFERED TO AS SYSTEM 2, WHILE THE NEW SYSTEM WILL BE REFERED TO AS SYSTEM 1.
2. CONTROLS WILL ENABLE SYSTEM 1 AS THE PRIMARY CONDITIONING SYSTEM TO PROVIDE HOT AND CHILLED WATER.
3. SYSTEM 1 WILL REQUIRE DATA FROM EXISTING SYSTEM SENSORS FOR RELIABLE OPERATION.
4. AS A PART OF THE PROJECT NEW SYSTEM SENSORS WILL BE INSTALLED AT LOCATIONS NOTED ON M1.03.
5. THE CONTROLS CONTRACTOR MUST ENSURE THAT SYSTEM 2 CAN BE TAKEN OFFLINE WITHOUT INTERFERRING WITH SYSTEM 1 OPERATION IN THE FUTURE.
6. THE CONTROLS CONTRACTOR MUST PROVIDE THE ENGINEER OF RECORD (AGE) CONTROL DRAWINGS TO BE IMPLEMENTED INTO THIS AS-BUILT SET OF DRAWINGS UPON COMPLETION OF PROJECT AT NO ADDITIONAL COST TO THE OWNER.
7. THE GENERAL INTENT OF THE OPERATION OF THE PLANT IS DETAILED IN THESE DRAWINGS.
8. WITH THE AIDE OF THE TESTING AND BALANCING CONTRACTOR THE CONTROLS CONTRACTOR WILL BALANCE ALL SYSTEMS IAW WITH MANUFACTURERS RECOMMENDATION, AHJ, IMC, IPC, IFC, NEC AND ALL APPLICABLE LAWS, CODES AND GOOD PRACTICES.
9. THE CONTROLS CONTRACTOR WILL HAVE THE EXPERIENCE TO PERFORM THESE DUTIES AT NO ADDITIONAL COST TO THE OWNER.
10. THE CONTRACTOR SHALL WALKDOWN THE ENTIRE SCOPE OF THE PROJECT TO PROVIDE ACCURATE PROPOSAL. TAKEOFFS PERFORMED THESE DRAWINGS MAY LEAD TO GROSS ESTIMATION ERRORS WHICH WILL COME AT NO ADDITIONAL COST TO THE OWNER.

CONTROLS

SYMBOL	DESCRIPTION
TS	TEMPERATURE SENSOR
T	THERMOSTAT OR THERMOMETER
CO2	CARBON DIOXIDE SENSOR
OS	OCCUPANCY SENSOR
H	HUMIDITY SENSOR OR HUMIDISTAT
SP	STATIC PRESSURE SENSOR
RS	REFRIGERANT SENSOR
CO	CARBON MONOXIDE SENSOR
H	HYDROGEN SENSOR
DSD	DUCT SMOKE DETECTOR
TS	TEMPERATURE SENSOR
SPS	STATIC PRESSURE SENSOR
PS	PRESSURE SENSOR OR SWITCH
DPS	DIFFERENTIAL PRESSURE SENSOR
AFMS	AIR FLOW MONITORING STATION
HS	HUMIDITY SENSOR
MS	MOISTURE SENSOR
FS	FLOW SENSOR OR SWITCH
FM	FLOW METER
CS	CURRENT SENSOR
M	MOTOR
A	ACTUATOR
HM	HYDROGEN MONITOR
RM	REFRIGERANT MONITOR
AI AO DI DO BAS	ANALOG INPUT ANALOG OUTPUT DIGITAL INPUT DIGITAL OUTPUT BUILDING AUTOMATION SYSTEM
	VISUAL ALARM
H	AUDIBLE ALARM

CHILLED WATER SEQUENCE OF OPERATIONS

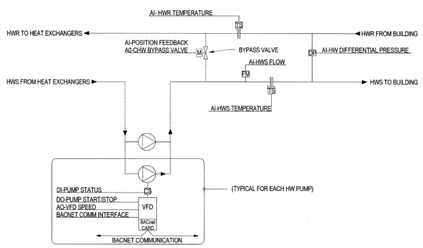
1. THE ATC CONTRACTOR SHALL BE RESPONSIBLE FOR THE IMPLEMENTATION OF ALL CONTROLS, MONITORED POINTS AND ALARMED POINTS REQUIRED BY THIS SECTION. SYSTEM SHALL BE A COMBINATION OF MANUFACTURER-FURNISHED PACKAGED CHILLER CONTROLS AND CONTROLS PROVIDED BY THE ATC CONTRACTOR. THE ATC CONTRACTOR SHALL INSTALL ALL CONTROLS FURNISHED BY THE CHILLER MANUFACTURER. THE ATC CONTRACTOR SHALL COORDINATE AS REQUIRED WITH UNIT MANUFACTURER TO ENSURE ALL MONITORED POINTS AND ALARMED POINTS INDICATED IN THIS SECTION ARE PROVIDED AT FMS GRAPHIC USER INTERFACE. ACCESSIBILITY OF ANY REQUIRED POINTS ONLY VIA LOCAL UNIT CONTROLLER IS NOT ACCEPTABLE.
2. CHILLED WATER SUPPLY TEMPERATURE SET POINT: SET POINT SHALL BE RESET ON A LINEAR SCHEDULE BASED ON OUTSIDE AIR TEMPERATURE. PROVIDE CONTROL FUNCTIONS AS REQUIRED. SET POINT SHALL BE 44°F (ADJ.) AT 70°F (ADJ.) OUTDOOR AIR TEMPERATURE, AND 48°F (ADJ.) AT 50°F (ADJ.).
3. CHILLER SHALL NOT START UNTIL FLOW IS PROVED BY WATER FLOW SWITCH WIRED TO CHILLER CONTROL PANEL. FLOW SWITCH SHALL BE FURNISHED AND WIRED BY THIS CONTRACTOR.
4. CHILLERS SHALL HAVE AUTOMATED LEAD / STAND-BY OPERATION, ON A WEEKLY ROTATION, TO EQUALIZE RUN TIME OF EACH CHILLER.
5. CHILLED WATER DISTRIBUTION PUMPING OPERATION:
   A. THE FMS SHALL START LEAD PUMP(S) UPON A CALL TO ENERGIZE THE LEAD CHILLER. PUMPS SHALL BE INTERLOCKED WITH CHILLER OPERATION.
   B. DIFFERENTIAL PRESSURE SENSOR ACROSS HYDRONIC SUPPLY AND RETURN MAIN SHALL MODULATE CHILLED WATER DISTRIBUTION PUMP SPEED AS REQUIRED, VIA INDIVIDUAL VARIABLE FREQUENCY DRIVES, TO MAINTAIN SET POINT. INITIAL SET POINT SHALL BE 5 PSI (ADJ.). SET POINT TO BE DETERMINED IN FIELD BY TAB CONTRACTOR.
   C. PUMPS SHALL HAVE AUTOMATED LEAD / STAND-BY OPERATION, ON A WEEKLY ROTATION, TO EQUALIZE RUN TIME OF EACH PUMP.
   D. ON THE FAILURE OF ONE PUMP THE STAND-BY PUMP SHALL BE STARTED AUTOMATICALLY.
   E. MINIMUM PUMP FLOW SHALL BE MAINTAINED VIA A DIFFERENTIAL PRESSURE BY-PASS VALVE. REFER TO CHILLER MANUFACTURER'S IOM FOR MINIMUM FLOW SETPOINT.
   F. FREEZE PROTECTION: THE CHILLED WATER PUMPS SHALL OPERATE WHEN OUTDOOR AIR TEMPERATURE IS 25°F (ADJ.) OR BELOW.
6. CHILLED WATER PUMPS SHALL BE INTERLOCKED WITH CHILLER AND SHALL NOT BE ENERGIZED UNLESS CHILLER IS ENERGIZED. STANDBY PUMP SHALL RUN UPON FAILURE OF ANY OF THE ABOVE.
7. ALARMS / SAFETIES:
   A. THE CONTROL SYSTEM SHALL INITIATE ALARMS IN ACCORDANCE WITH ANY OF THE CONDITIONS BELOW, INDICATE AND DESCRIBE ANY ALARM AT THE FMS' GRAPHIC USER INTERFACE.
      a. THE CHILLER IS COMMANDED TO RUN AND RUN STATUS IS NOT SENSED V/A CURRENT TRANSFORMER AFTER A START-UP DELAY OF 15 SECONDS (ADJ.).
      b. ANY PUMP IS COMMANDED TO RUN AND RUN STATUS IS NOT SENSED V/A CURRENT TRANSFORMER AFTER A START-UP DELAY OF 15 SECONDS (ADJ.). REGISTER AS A PUMP FAILURE AND START STAND-BY PUMP.
      c. CHILLED WATER SUPPLY OR RETURN TEMPERATURE VARIES MORE THAN 5° F (ADJ.) ABOVE OR BELOW SET POINT FOR 5 MINUTES (ADJ.) OR LONGER.B.
   B. WHENEVER A UNIT IS SHUT DOWN BECAUSE OF ONE OF THE SAFETIES, THE CONTROL SYSTEM SHALL RETAIN IN MEMORY THE READING AND SET POINT OF EACH DEVICE TO HELP THE OPERATOR IN ISOLATING THE REASON FOR THE PROBLEM.
   C. ALL CONTROL SYSTEM SENSORS SHALL HAVE A HIGH AND LOW SOFTWARE ALARM LIMIT TO INDICATE TEMPERATURE PROBLEMS OR A FAULTY SENSOR.
8. ALL SETPOINTS AND TIME PERIODS INDICATED ABOVE SHALL BE USER-ADJUSTABLE FROM THE FMS' GRAPHIC USER INTERFACE.
9. THE ATC CONTRACTOR SHALL FIELD-INSTALL ALL COMPONENTS REQUIRING FIELD INSTALLATION. ALL ITEMS REQUIRED FOR A COMPLETE OPERATING SYSTEM, BUT NOT PROVIDED BY THE EQUIPMENT MANUFACTURER, SHALL BE BY THIS CONTRACTOR. THE ATC CONTRACTOR SHALL FULLY COORDINATE ALL CONTROL COMPONENTS AND SEQUENCES WITH THE MANUFACTURER'S REQUIREMENTS BEFORE SUBMITTING SHOP DRAWINGS.

HEATING HOT WATER SEQUENCE OF OPERATIONS

1. THE ATC CONTRACTOR SHALL BE RESPONSIBLE FOR THE IMPLEMENTATION OF ALL CONTROLS, MONITORED POINTS AND ALARMED POINTS REQUIRED BY THIS SECTION. SYSTEM SHALL BE A COMBINATION OF MANUFACTURER-FURNISHED PACKAGKED BOILER CONTROLS AND CONTROLS PROVIDED BY THE ATC CONTRACTOR. THE ATC CONTRACTOR SHALL INSTALL ALL CONTROLS FURNISHED BY THE BOILER MANUFACTURER. THE ATC CONTRACTOR SHALL COORDINATE AS REQUIRED WITH UNIT MANUFACTURER TO ENSURE ALL MONITORED POINTS AND ALARMED POINTS INDICATED IN THIS SECTION ARE PROVIDED AT FMS GRAPHIC USER INTERFACE. ACCESSIBILITY OF ANY REQUIRED POINTS ONLY VIA LOCAL UNIT CONTROLLER IS NOT ACCEPTABLE.
2. HOT WATER SUPPLY TEMPERATURE SET POINT: SET POINT SHALL BE RESET ON A LINEAR SCHEDULE BASED ON OUTSIDE AIR TEMPERATURE. PROVIDE CONTROL FUNCTIONS AS REQUIRED. SET POINT SHALL BE 140°F (ADJ.) AT 0°F (ADJ.) OUTDOOR AIR TEMPERATURE, AND 120°F (ADJ.) AT 60°F (ADJ.).
3. HOT WATER DISTRIBUTION PUMPING OPERATION:
   A. THE FMS SHALL START LEAD PUMP(S) IF:
      a. THE AMBIENT TEMPERATURE IS BELOW 60°F (ADJ.) OR;
      b. THERE IS A CALL FOR HEAT AT ANY AIR HANDLER CONTROL VALVE(S) OR;
      c. THERE IS A CALL FOR HEAT AT ANY OF DDC MONITORING SENSOR(S).
   B. DIFFERENTIAL PRESSURE SENSOR ACROSS HYDRONIC SUPPLY AND RETURN MAIN SHALL MODULATE HOT WATER DISTRIBUTION PUMP SPEED AS REQUIRED, VIA INDIVIDUAL VARIABLE FREQUENCY DRIVES, TO MAINTAIN SET POINT. INITIAL SET POINT SHALL BE 5 PSI (ADJ.). SET POINT TO BE DETERMINED IN FIELD BY TAB CONTRACTOR.
   C. PUMPS SHALL HAVE AUTOMATED LEAD / STAND-BY OPERATION, ON A WEEKLY ROTATION, TO EQUALIZE RUN TIME OF EACH PUMP. IN SYSTEMS OF THREE OR MORE PUMPS IN PARALLEL UNDER NORMAL OPERATION, ONE SHALL BE DESIGNATED STAND-BY AND ALL OTHERS SHALL BE DESIGNED "LEAD" AND ARE INTENDED TO OPERATE IN UNISON.
   D. ON THE FAILURE OF ONE PUMP THE STAND-BY PUMP SHALL BE STARTED AUTOMATICALLY.
   E. MINIMUM PUMP FLOW SHALL BE MAINTAINED VIA A DIFFERENTIAL PRESSURE BY-PASS VALVE. REFER TO BOILER MANUFACTURER'S IOM FOR MINIMUM FLOW SET POINT.
4. CARBON MONOXIDE MONITOR SHALL BE INTERLOCKED WITH GAS-FIRED BOILERS AND DOMESTIC HOT WATER HEATERS. PROVIDE LOCAL ALARM AND ALARM AT FMS GRAPHIC USER INTERFACE. INITIATE ALARM AT WARNING CONDITION, INITIAL SETPOINT OF 100 PARTS PER MILLION (PPM) (ADJ.). INITIATE ALARM AND SHUT DOWN ALL GAS-FIRED APPLIANCES AT HIGH LIMIT CONDITION, INITIAL SETPOINT OF 400 PPM (ADJ.).
5. ALARMS / SAFETIES:
   A. THE CONTROL SYSTEM SHALL INITIATE ALARMS IN ACCORDANCE WITH ANY OF THE CONDITIONS BELOW, INDICATE AND DESCRIBE ANY ALARM AT THE FMS' GRAPHIC USER INTERFACE.
      a. ANY PUMP IS COMMANDED TO RUN AND RUN STATUS IS NOT SENSED VIA CURRENT TRANSFORMER AFTER A START-UP DELAY OF 15 SECONDS (ADJ.). REGISTER AS A PUMP FAILURE AND START STAND-BY PUMP.
      b. HOT WATER SUPPLY TEMPERATURE VARIES MORE THAN 5°F (ADJ.) ABOVE OR BELOW SET POINT FOR 5 MINUTES (ADJ.) OR LONGER.
      c. SYSTEM DIFFERENTIAL PRESSURE VARIES MORE THAN 2 PSI (ADJ.) ABOVE SET POINT FOR 5 MINUTES (ADJ.) OR LONGER.
      d. ON A CALL FOR BOILER OPERATION, COMBUSTION AIR DAMPER OPEN STATUS IS NOT SENSED VIA END SWITCH.
      e. ON A CALL FOR BOILER OPERATION, RUN STATUS IS NOT SENSED VIA CURRENT TRANSFORMER AT THE BOILER ROOM EXHAUST FAN.
      f. CARBON MONOXIDE SENSOR REACHES "WARNING" LEVEL.
      g. CARBON MONOXIDE SENSOR READING REACHES "HIGH LIMIT". REGISTER AS CO ALARM AND SHUT DOWN ALL GAS-FIRED BOILERS AND WATER HEATERS.
   B. WHENEVER A UNIT IS SHUT DOWN BECAUSE OF ONE OF THE SAFETIES, THE CONTROL SYSTEM SHALL RETAIN IN MEMORY THE READING AND SET POINT OF EACH DEVICE TO HELP THE OPERATOR IN ISOLATING THE REASON FOR THE PROBLEM.
   C. ALL CONTROL SYSTEM SENSORS SHALL HAVE A HIGH AND LOW SOFTWARE ALARM LIMIT TO INDICATE TEMPERATURE PROBLEMS OR A FAULTY SENSOR.
6. ALL SETPOINTS AND TIME PERIODS INDICATED ABOVE SHALL BE USER-ADJUSTABLE FROM THE FMS' GRAPHIC USER INTERFACE.
7. THE ATC CONTRACTOR SHALL FIELD-INSTALL ALL COMPONENTS REQUIRING FIELD INSTALLATION. ALL ITEMS REQUIRED FOR A COMPLETE OPERATING SYSTEM, BUT NOT PROVIDED BY THE EQUIPMENT MANUFACTURER, SHALL BE BY THIS CONTRACTOR. THE ATC CONTRACTOR SHALL FULLY COORDINATE ALL CONTROL COMPONENTS AND SEQUENCES WITH THE MANUFACTURER'S REQUIREMENTS BEFORE SUBMITTING SHOP DRAWINGS.

CHILLED WATER PUMP CONTROL REQUIREMENTS

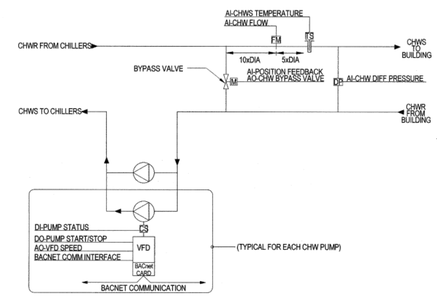
1. GENERAL
   A. THE CHILLED WATER PUMPS CIRCULATE WATER THROUGH THE CHILLERS AND AIR HANDLING UNITS.
   B. THE EQUIPMENT SHALL RUN IN LEAD/LAG OPERATION AS NOTED IN GENERAL CONTROL REQUIREMENTS.
2. STANDBY POWER
   A. THE EQUIPMENT IS CONNECTED TO STANDBY POWER. IN EVENT OF A POWER FAILURE, EQUIPMENT OPERATION SHALL BE SIMILAR TO NORMAL POWER OPERATION.
3. OPERATING MODE
   A. THE CHILLED WATER PUMPS SHALL BE ENABLED WHENEVER:
      a. A DEFINABLE NUMBER OF CHILLED WATER COILS NEED COOLING.
      b. AND, THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJUSTABLE).
   B. TO PREVENT SHORT CYCLING, THE CHILLED WATER PUMP SYSTEM SHALL RUN FOR OR BE OFF FOR 10 MINIMUM TIME PERIODS (ADJUSTABLE).
   C. THE PUMPS SHALL RUN FOR FREEZE PROTECTION ANYTIME THE OUTSIDE AIR TEMPERATURE IS LESS THAN 38°F (ADJUSTABLE).
   D. PROVIDE LEAD/LAG CONTROL FOR PUMPS AS REQUIRED UNDER 1/1 .M701
   E. THE DESIGNATED STAGING ORDER (USER DEFINABLE) OF THE PUMPS SHALL ROTATE ON A WEEKLY BASIS (USER DEFINABLE).
4. CHILLED WATER DIFFERENTIAL PRESSURE CONTROL
   A. THE BAS SHALL MEASURE THE CHILLED WATER DIFFERENTIAL PRESSURE AND MODULATE THE CHILLED WATER PUMP VFDS IN SEQUENCE TO MAINTAIN ITS CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT.
   B. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED
   C. DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.
   D. THE BAS SHALL MODULATE THE CHILLED WATER PUMP SPEEDS TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 15 PSI (ADJUSTABLE) OR AS DETERMINED BY THE TEST AND BALANCE AGENCY.
   E. THE VFDS MINIMUM SPEED SHALL NOT DROP BELOW 15HZ (ADJUSTABLE).
5. CHILLED WATER PRESSURE - SETPOINT RESET
   A. THE CHILLED WATER SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON PRESSURE REQUIREMENTS.
   B. THE CHILLED WATER PRESSURE SETPOINT SHALL RESET TO A LOWER VALUE AS THE FACILITY'S CHILLED WATER CONTROL
   C. VALVES MODULATE BEYOND 90% OPEN. ONCE THE VALVES ARE SATISFIED (VALVES CLOSING) THEN THE CHILLED WATER SETPOINT SHALL GRADUALLY LOWER OVER TIME TO REDUCE PUMP ENERGY USE.
6. CHILLED WATER LOOP BYPASS VALVE MINIMUM FLOW CONTROL
   A. THE BAS SHALL MEASURE CHILLED WATER FLOW THROUGH THE CHILLED WATER LOOP AND, AS THE CHILLED WATER FLOW DROPS BELOW SETPOINT, THE BAS SHALL MODULATE THE CHILLED WATER BYPASS VALVE OPEN TO MAINTAIN THE MINIMUM CHILLED WATER FLOW SETPOINT.
7. CHILLED WATER TEMPERATURE MONITORING
   A. THE FOLLOWING TEMPERATURES SHALL BE MONITORED
      a. CHILLED WATER SUPPLY
      b. CHILLED WATER RETURN
8. ALARMS
   A. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   B. SYSTEM TEMPERATURE
      a. LOW CHILLED WATER FLOW: IF THE CHILLED WATER FLOW IS 25% (ADJUSTABLE) LESS THAN SETPOINT FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
      b. HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 49°F FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
      c. LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
   C. CHILLED WATER PUMP
      a. FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
      b. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
      c. RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
      d. VFD FAULT.
   D. SYSTEM PRESSURE
      a. HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJUSTABLE)
      b. GREATER THAN SETPOINT FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
      c. LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJUSTABLE)
      d. LESS THAN SETPOINT FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).



NOTES:
1. REFER TO PLANS AND PIPING SCHEMATICS FOR HEATING WATER PIPING ARRANGEMENT.
2. EACH PUMP WILL BE PROVIDED WITH A VFD. PROVIDE BACNET COMMUNICATION.
3. BUS INTERFACE TO PICK UP ALL VFD INFORMATION, INCLUDING FAULT INPUTS. MINIMUM HARD WIRED POINTS WILL BE START/STOP AND SPEED CONTROL. LOCATE DP SENSOR NEAR END OF SYSTEM PER FLOOR PLANS.

HOT WATER PUMP CONTROL REQUIREMENTS

1. GENERAL
   A. THE HEATING WATER PUMPS CIRCULATE WATER THROUGH THE HEAT EXCHANGERS, REHEAT COILS AND AIR HANDLING UNITS.
   B. THE EQUIPMENT SHALL RUN IN LEAD/LAG OPERATION AS NOTED IN GENERAL CONTROL REQUIREMENTS.
2. STANDBY POWER
   A. THE EQUIPMENT IS CONNECTED TO STANDBY POWER. IN EVENT OF A POWER FAILURE, EQUIPMENT OPERATION SHALL BE SIMILAR
   B. TO NORMAL POWER OPERATION.
3. OPERATING MODE:
   A. THE HEATING WATER PUMPS SHALL BE ENABLED WHENEVER:
   B. A DEFINABLE NUMBER OF HEATING WATER COILS NEED HEATING.
   C. AND, THE OUTSIDE AIR TEMPERATURE IS LESS THAN 50°F (ADJUSTABLE).
   D. TO PREVENT SHORT CYCLING, THE HEATING WATER PUMPS SHALL RUN FOR OR BE OFF FOR 10
   E. MINIMUM TIME PERIODS (ADJUSTABLE).
4. HEATING WATER DIFFERENTIAL PRESSURE CONTROL
   A. THE BAS SHALL MEASURE THE HEATING WATER DIFFERENTIAL PRESSURE AND MODULATE THE HEATING WATER PUMP VFDS IN SEQUENCE TO MAINTAIN ITS HEATING WATER DIFFERENTIAL PRESSURE SETPOINT.
   B. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED
   C. DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.
   D. THE BAS SHALL MODULATE THE HEATING WATER PUMP SPEEDS TO MAINTAIN A HEATING WATER
   E. DIFFERENTIAL PRESSURE OF 15 PSI (ADJUSTABLE) OR AS DETERMINED BY THE TEST AND BALANCE AGENCY.
   F. THE VFDS MINIMUM SPEED SHALL NOT DROP BELOW 15 HZ (ADJUSTABLE).
5. HEATING WATER PRESSURE - SETPOINT RESET
   A. THE HEATING WATER SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON PRESSURE REQUIREMENTS.
   B. THE HEATING WATER PRESSURE SETPOINT SHALL RESET TO A LOWER VALUE AS THE FACILITY'S HEATING WATER CONTROL VALVES MODULATE BEYOND 90% OPEN. ONCE THE VALVES ARE SATISFIED (VALVES CLOSING) THEN THE HEATING WATER
   C. SETPOINT SHALL GRADUALLY LOWER OVER TIME TO REDUCE PUMP ENERGY USE.
6. HEATING WATER LOOP BYPASS VALVE - MINIMUM FLOW CONTROL
   A. THE BAS SHALL MEASURE HEATING WATER FLOW THROUGH THE HEATING WATER LOOP AND, AS THE HEATING WATER FLOW
   B. DROPS BELOW SETPOINT, THE BAS SHALL MODULATE THE HEATING WATER BYPASS VALVE OPEN TO MAINTAIN THE MINIMUM
   C. HEATING WATER FLOW SETPOINT.
7. HEATING WATER TEMPERATURE MONITORING
   A. THE FOLLOWING TEMPERATURES SHALL BE MONITORED;
      a. HEATING WATER SUPPLY.
      b. HEATING WATER RETURN.
8. ALARMS
   A. ALARMS SHALL BE PROVIDED AS FOLLOWS:
      a. SYSTEM TEMPERATURE
      b. LOW HEATING WATER FLOW: IF THE HEATING WATER FLOW IS 25% (ADJUSTABLE) LESS THAN SETPOINT FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
      c. HIGH HEATING WATER SUPPLY TEMP: IF THE HEATING WATER SUPPLY TEMPERATURE IS GREATER THAN 150T FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
      d. LOW HEATING WATER SUPPLY TEMP: IF THE HEATING WATER SUPPLY TEMPERATURE IS LESS THAN 100°F FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
   B. HEATING WATER PUMP
      a. FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
      b. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
      c. VFD FAULT.
   C. SYSTEM PRESSURE
      a. HIGH HEATING WATER DIFFERENTIAL PRESSURE: IF THE HEATING WATER DIFFERENTIAL
         • PRESSURE IS 25% (ADJUSTABLE) GREATER THAN SETPOINT FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).
      b. LOW HEATING WATER DIFFERENTIAL PRESSURE; IF THE HEATING WATER DIFFERENTIAL
         • PRESSURE IS 25% (ADJUSTABLE) LESS THAN SETPOINT FOR A PERIOD OF 15 MINUTES (ADJUSTABLE).



NOTES:
1. REFER TO PLANS AND PIPING SCHEMATICS FOR CHILLED WATER PIPING ARRANGEMENT.
2. EACH PUMP WILL BE PROVIDED WITH A VFD. PROVIDE BACNET COMMUNICATION BUS INTERFACE TO PICK UP ALL VFD INFORMATION, INCLUDING FAULT INPUTS. MINIMUM HARD WIRED POINTS WILL BE START/STOP, SPEED CONTROL AND STATUS.

A. EVAPORATOR
   a. 347.7 GPM
      • MIN FLOW 115.9 GPM
      • MIN GPM FOR SYSTEM BYPASS 173.8 GPM
      • BYPASS LOOP 435 GALLONS
         1. BASED ON 2 MINUTE LOOP-
   b. EWT 54 F
   c. LWT 44 F
   d. DP 6.275 PSI 14.50 FT
B. CONDENSER
   a. 418.3 GPM
      • MIN FLOW 139.4 GPM
      • MIN GPM FOR SYSTEM BYPASS 209.1 GPM
   b. EWT 85 F
   c. LWT 95 F
   d. DP 9.966 PSI 23.02 FT
C. REFRIGERANT
   a. R-410A
   b. 18 LBS PER CIRCUIT
D. ELECTRICAL DATA
   a. 156A MCA
   b. 200A MOP
   c. VOLTAGE 460/60/3
   d.

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No.	Description	Date
1	IFCR	20DEC19
2	IFCR	02JAN20
3	IFC	22JAN20

CCRI NEWPORT

CCRI CHILLER REPLACEMENT
NEWPORT CAMPUS
1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

MECHANICAL CONTROLS

Project number	AA-19160 / AGE-1979
Date	22JAN20
Drawn by	Author
Checked by	Checker
Approved by	Approver

M7.00

Scale 1" = 400'-0"

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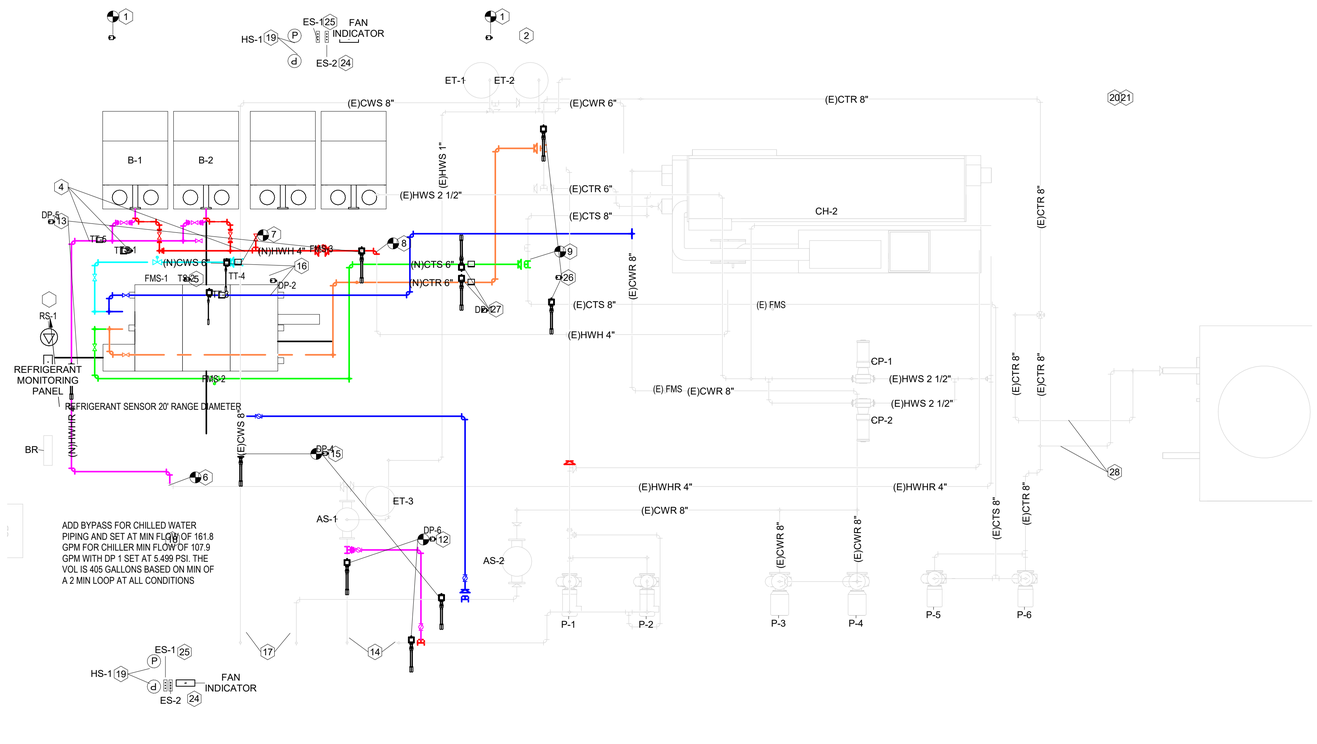
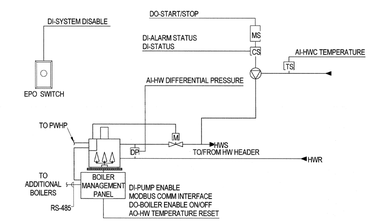
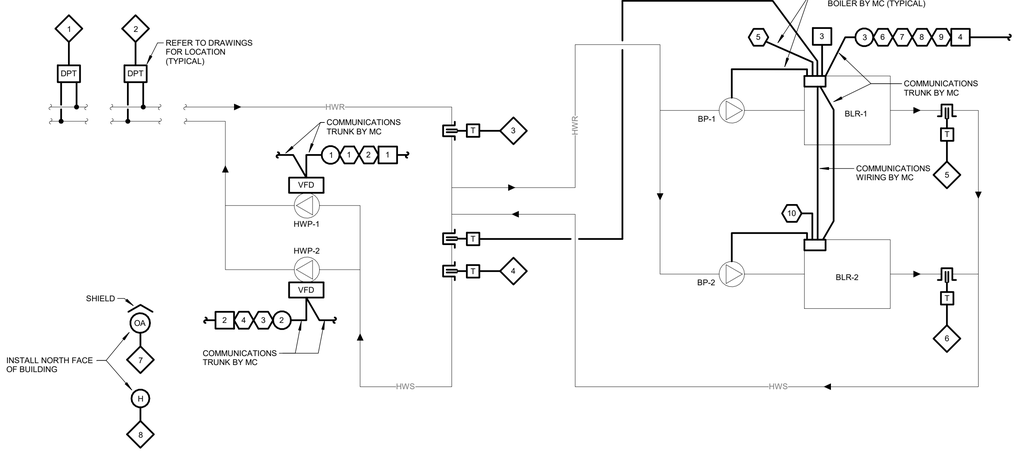


BOILER CONTROL REQUIREMENTS

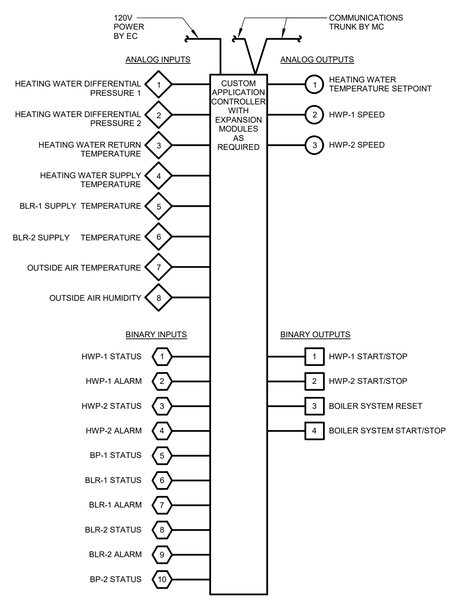
1. GENERAL
   A. THE EQUIPMENT SHALL RUN IN LEAD/LAG OPERATION AS NOTED IN GENERAL CONTROL REQUIREMENTS. SPACE FOR A FOURTH FUTURE BOILER HAS BEEN PROVIDED. THE BAS CONTRACTOR AND BOILER MANUFACTURER
   B. SHALL PLAN FOR THE FUTURE BOILER WHEN PROGRAMMING SYSTEM. FUTURE BOILER WILL ACT AS A STANDBY UNIT.
2. STANDBY POWER
   A. THE BOILER IS CONNECTED TO STANDBY POWER. IN THE EVENT OF A POWER FAILURE, THE BAS SHALL CONTROL THE EQUIPMENT SIMILAR TO NORMAL POWER OPERATION.
3. OPERATION MODE
   A. A BOILER MANAGEMENT SYSTEM (BMS) PROVIDED BY THE BOILER MANUFACTURER WILL CONTROL ALL ASPECTS OF SYSTEM OPERATION INCLUDING STAGING AND CAPACITY CONTROL OF BOILERS.
   B. THE BOILER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.
   C. ALL ASPECTS OF THE BOILER OPERATION SHALL BE CONTROLLED BY THE BOILER'S CONTROL PANEL.
4. THE BOILER SYSTEM SHALL BE ENABLED TO RUN WHENEVER:
   A. A DEFINABLE NUMBER OF HEATING WATER COILS NEED HEATING. AND, OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJUSTABLE).
   B. TO PREVENT SHORT CYCLING, THE BOILER SYSTEM SHALL RUN FOR AND BE OFF FOR 15 MINUTE MINIMUM ADJUSTABLE TIMES (ADJUSTABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.
   C. THE BOILER SYSTEM SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN 38°F (ADJUSTABLE).
5. EQUIPMENT SHUTDOWN
   A. EMERGENCY SHUTDOWN: THE BOILER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING AN
   B. EMERGENCY SHUTDOWN SIGNAL STATUS FROM AN EPO SWITCH IN ROOM.
   C. BOILER SAFETIES AND ALARMS SHALL BE PROVIDED FOR EACH BOILER:
   D. SAFETIES SHALL BE MONITORED AND ALARMS SHALL BE ISSUED FOR THE FOLLOWING:
   E. BOILER ALARM.
   F. LOW WATER LEVEL.
6. **BOILER ISOLATION VALVE**
   A. THE BOILER ISOLATION VALVE SHALL OPEN ANYTIME THE BOILER IS CALLED TO RUN. THE LOW PRESSURE STEAM VALVE SHALL OPEN PRIOR TO THE BOILER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE BOILER IS DISABLED. THE BOILER WATER ISOLATION VALVE SHALL HAVE:
   B. A USER ADJUSTABLE DELAY ON START AND STOP.
   C. THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY BOILER WATER SYSTEM START-UP,
   D. **SHUTDOWN AND SEQUENCING.**
7. **BOILER LEAD/STANDBY OPERATION**
   A. THE BMS SHALL SEQUENCE THE BOILERS IN A LEAD/STANDBY ARRANGEMENT AS NOTED IN THE GENERAL CONTROL
   B. NOTES.
   C. **THE DESIGNATED LEAD BOILER SHALL ROTATE ON A WEEKLY BASIS (USER DEFINABLE).**
   D. ALARMS SHALL BE PROVIDED AS FOLLOWS:
      a. BOILER MANAGEMENT PANEL:
         - BOILER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
         - BOILER ISOLATION VALVES:
         - ISOLATION VALVE FAILURE: VALVE COMMANDED OPEN BUT THE STATUS INDICATES CLOSED.
         - ISOLATION VALVE OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.
         - ISOLATION VALVE RUNTIME EXCEEDED: VALVE STATUS RUNTIME EXCEEDS A USER-DEFINABLE LIMIT



NOTES:
1. REFER TO THE PLANS AND PIPING SCHEMATICS FOR THE HEATING WATER PIPING ARRANGEMENT. REFER TO BOILER SCHEMATIC FOR BOILER SPECIFIC CONTROL DEVICES.
2. COORDINATE WITH BOILER MANUFACTURER FOR INTERFACE WITH BOILER MANAGER CONTROL PANEL REQUIREMENTS.
3. CONTROL CONTRACTOR TO PROVIDE WIRING TO ADDITIONAL BOILERS.



Z - HEATING WATER SYSTEM CONTROL DIAGRAM
1 12" = 1'-0"



CHANGE PUMP NAMES TO MATCH

HEATING WATER SYSTEM SEQUENCE OF OPERATIONS:

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL ENERGIZE THE BOILER SYSTEM AND HEATING WATER PUMPS, WHICH SHALL RUN CONTINUOUS, 24 HOURS PER DAY.

DISTRIBUTION PUMPS, P-1, P-2:
THE BAS SHALL ENABLE THE BUILDINGS HEATING WATER PUMPS P-1 AND P-2 THROUGH THEIR VARIABLE FREQUENCY DRIVES (VFDS) AND THE PUMPS SHALL OPERATE IN A LEAD/STAND-BY FASHION. THE PUMPS ALTERNATE TO EQUALIZE EQUIPMENT RUNTIME. SELECTION OF THE LEAD AND SECOND PUMP IS EVALUATED ON A WEEKLY BASIS (ADJUSTABLE). THE PUMP WITH THE LEAST RUNTIME IS THE LEAD. THE PUMP WITH THE MOST RUNTIME IS THE SECOND. UPON FAILURE OF THE LEAD HEATING WATER PUMP, THE BAS SHALL ALARM AND START THE STANDBY PUMP.

THE SETPOINT AT EACH OF THE TWO (2) HYDRONIC DIFFERENTIAL PRESSURE TRANSMITTERS (SEE DRAWINGS FOR LOCATIONS) SHALL BE MAINTAINED BY THE BAS VARYING THE HEATING WATER PUMP'S (HWP-1 OR 2) SPEED THROUGH EACH PUMP'S DEDICATED VARIABLE FREQUENCY DRIVE (VFD).

BOILERS, B-1, B-2:
THE BOILER COORDINATION PANEL (FURNISHED WITH THE BOILERS) SHALL BE ENABLED VIA A SIGNAL FROM THE BAS. THE BOILER COORDINATION PANEL SHALL DETERMINE THE LEAD BOILER, ENERGIZE THE ASSOCIATED BOILER PUMPS, AND MODULATE HEATING BASED ON ITS INTERNAL SEQUENCING

THE BAS SYSTEM SHALL SEND A MODULATING SIGNAL TO THE BOILER COORDINATION PANEL FOR HEATING WATER SUPPLY TEMPERATURE SETPOINT. THE BOILER PANEL WILL THEN IN TURN STAGE AND SEQUENCE THE LEAD LAG ARRANGEMENT FOR THE HOT WATER SYSTEM. THE SETPOINT SHALL BE DETERMINED BY THE BAS BASED ON AN ADJUSTABLE OUTDOOR AIR RESET SCHEDULE AS FOLLOW:

O.A. TEMPERATURE	BUILDING'S HEATING WATER SUPPLY TEMPERATURE
0	140
60	110

THE BOILER CONTROL SYSTEM, PROVIDED BY THE BOILER MANUFACTURER, IS FACTORY WIRED EXCEPT FOR FIELD- INSTALLED DEVICES (FLOW SWITCHES, LOW WATER CUT OFF, ETC.). FLAME SAFEGUARD CONTROLS ARE INCLUDED WITH THE BOILER. MONITORING, ALARMS, AND DIAGNOSTICS SHALL BE EXTENDED TO THE BAS VIA THE BOILER COORDINATION PANEL.

THE BAS SHALL USE CURRENT SWITCHES TO CONFIRM THE BOILER PUMPS ARE IN THE DESIRED STATE (I.E. ON OR OFF) AND GENERATES AN ALARM IF STATUS DEVIATES FROM DDC START/STOP CONTROL

A BAS TEMPERATURE SENSOR SHALL MONITOR THE BUILDING'S HEATING WATER RETURN TEMPERATURE.

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No.	Description	Date
1	IFCR	20DEC19
2	IFCR	02JAN20
3	IFC	22JAN20

CCRI NEWPORT

CCRI CHILLER REPLACEMENT NEWPORT CAMPUS 1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

MECH CONTROLS HEATING

Project number	AA-19160 / AGE-1979
Date	22JAN20
Drawn by	AGE
Checked by	AG
Approved by	AG

M7.01

Scale: As indicated

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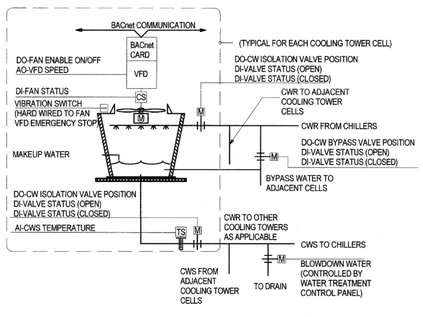
COOLING TOWER CONTROL REQUIREMENTS

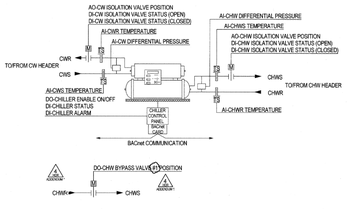
1. GENERAL
   A. CONTROLS
2. STANDBY POWER
   A. COOLING TOWER IS CONNECTED TO STANDBY POWER
3. OPERATION MODE
   A. THE COOLING TOWERS SHALL BE ENABLED WHENEVER THE CHILLERS ARE ENABLED.
   B. VIBRATION SWITCH: THE COOLING TOWER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING A VIBRATION SWITCH STATUS.
   C. CONDENSER WATER ISOLATION VALVE: THE CONDENSER WATER ISOLATION VALVE SHALL OPEN ANYTIME THE COOLING TOWER IS CALLED TO RUN AND SHALL CLOSE ONLY AFTER THE COOLING TOWER IS DISABLED.
   D. THE CONDENSER WATER ISOLATION VALVE SHALL THEREFORE HAVE:
      a. A USER ADJUSTABLE DELAY ON START & STOP.
      b. THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CONDENSER WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.
4. COOLING TOWER VFD FAN
   A. THE BAS SHALL MEASURE THE COOLING TOWER CONDENSER WATER SUPPLY (BASIN) TEMPERATURE AND MODULATE THE BYPASS VALVE, TOWER ISOLATION VALVES AND FAN VFDS IN SEQUENCE TO MAINTAIN SET POINTS IN ORDER TO OPTIMIZE CHILLER PERFORMANCE.
   B. THE FOLLOWING SET POINTS ARE RECOMMENDED VALUES. ALL SET POINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.
   C. BAS SHALL ATTEMPT TO OPTIMIZE CHILLER PERFORMANCE BY LOWERING CONDENSER WATER SUPPLY TEMPERATURE TO 65°F (ADJUSTABLE AS DETERMINED BY CHILLER MANUFACTURER).
   D. THE BAS SHALL OPEN THE BYPASS VALVE WHENEVER THE CONDENSER WATER SUPPLY TEMPERATURE IS BELOW 65°F (ADJUSTABLE).
   E. ON RISING CONDENSER WATER SUPPLY TEMPERATURE, THE BAS SHALL CLOSE THE BYPASS VALVE AND ENABLE THE TOWER AND OPEN THE ISOLATION VALVE TO MAINTAIN SET POINT OF 65°F (ADJUSTABLE).
   F. ON RISING CONDENSER WATER SUPPLY TEMPERATURE, THE BAS SHALL OPEN THE MODULATE THE FAN VFDS ON LEAD AND LAG TOWER IN PARALLEL TO MAINTAIN SET POINT OF 65°F (ADJUSTABLE). WITH BOTH CHILLERS OPERATING AT MORE THAN 50% LOAD, THE BAS SHALL
   G. RESET TEMPERATURE SET POINT TO 80T (ADJUSTABLE).
5. SUMP LEVEL MONITOR
   A. THE BAS SHALL MONITOR THE SUMP LEVEL THROUGH A SERIES OF WATER LEVEL SWITCHES. IF THE SUMP LEVEL RISES ABOVE THE HIGH WATER LEVEL SENSOR, AN ALARM SHALL BE GENERATED.
   B. IF THE SUMP LEVEL RISES ABOVE THE HIGH WATER LEVEL SENSOR, AN ALARM SHALL BE GENERATED.
   C. IF THE SUMP LEVEL DROPS BELOW THE LOW MAKEUP WATER LEVEL SENSOR, AN ALARM SHALL BE GENERATED AND THE MAKEUP VALVE SHALL OPEN.
   D. IF THE SUMP LEVEL DROPS BELOW THE LOW WATER LEVEL SENSOR, AN ALARM SHALL BE GENERATED AND THE COOLING TOWER AND CHILLER SHALL BE SHUTDOWN.
6. CONDENSER WATER TEMPERATURE MONITORING
   A. THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
   B. CONDENSER WATER SUPPLY TEMPERATURE.
   C. CONDENSER WATER RETURN TEMPERATURE.
7. ALARMS
   A. ISOLATION VALVES:
   B. CONDENSER WATER ISOLATION VALVE FAILURE: VALVE COMMANDED OPEN BUT THE STATUS INDICATES CLOSED.
   C. CONDENSER WATER ISOLATION VALVE OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.
   D. CONDENSER WATER ISOLATION VALVE RUNTIME EXCEEDED: VALVE STATUS RUNTIME EXCEEDS A USER-DEFINABLE LIMIT
8. WATER TEMPERATURE
   A. HIGH CONDENSER WATER SUPPLY TEMP: IF THE CONDENSER WATER SUPPLY TEMPERATURE IS GREATER THAN 80°F (ADJUSTABLE).
   B. LOW CONDENSER WATER SUPPLY TEMP: IF THE CONDENSER WATER SUPPLY TEMPERATURE IS LESS THAN 65°F (ADJUSTABLE).
   C. HIGH CONDENSER WATER RETURN TEMP: IF THE CONDENSER WATER RETURN TEMPERATURE IS GREATER THAN 90°F (ADJUSTABLE).
   D. LOW CONDENSER WATER RETURN TEMP: IF THE CONDENSER WATER RETURN TEMPERATURE IS LESS THAN 40°F (ADJUSTABLE).
9. FAN VFD ALARMS
   A. FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
   B. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
   C. RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
   D. VFD FAULT.
10. FUTURE SYSTEM OPERATION
   A. SEQUENCE OF OPERATION ARE PROVIDED AS PART OF PHASE 1 AND CAN BE RECONFIGURED FROM LEAD/LAG
   B. OPERATION TO LEAD/LAG/STANDBY.



NOTES:
1. REFER TO PLANS AND PIPING SCHEMATICS FOR CONDENSER WATER PIPING ARRANGEMENT.
2. REFER TO SEQUENCE OF OPERATION FOR ADDITIONAL REQUIREMENTS.
3. COORDINATE WITH ELECTRICAL INSTALLAR FOR LINE VOLTAGE WIRING AND CONDUIT.
4. EACH FAN SHALL BE OPERATED BY A DEDICATED VFD.
5. VFD BACnet CARD SHALL PROVIDE VFD SPEED OUTPUT, VFD FAULT AND VFD KW AS MINIMUM INPUTS TO BAS HEADEND.
6. PROVIDE ONE BYPASS VALVE PER COOLING TOWER BASIN SYSTEM.
7. PROVIDE ONE BLOWDOWN VALVE PER COOLING TOWER SYSTEM.
8. EACH CELL SHALL HAVE ISOLATION VALVES ON CWS AND CWR PIPES.

WATER COOLED CHILLER CONTROL REQUIREMENTS

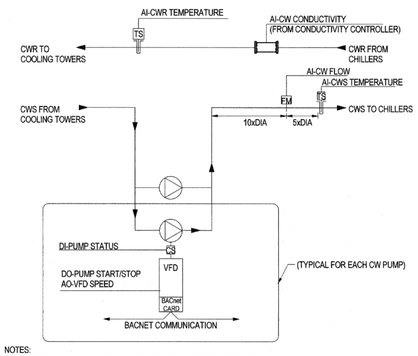
1. GENERAL
   A. THE EQUIPMENT SHALL RUN IN LEAD/LAG OPERATION
2. STANDBY POWER
   A. THE CHILLER IS CONNECTED TO STANDBY POWER. IN THE EVENT OF A POWER FAILURE, THE BAS SHALL CONTROL THE EQUIPMENT SIMILAR TO NORMAL POWER OPERATION
3. OPERATION MODE
   A. ALL ASPECTS OF THE SYSTEM OPERATION SHALL BE CONTROLLED BY THE EQUIPMENT MANUFACTURER'S CONTROL PANEL
   B. THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.
   C. THE CHILLER SHALL BE ENABLED TO RUN WHENEVER: A DEFINABLE NUMBER OF CHILLED WATER COILS NEED COOLING AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJUSTABLE).
   D. TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM TIME PERIOD OF 10 MINUTES (ADJUSTABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.
   E. THE CHILLER SHALL HAVE A USER ADJUSTABLE DELAY ON START. THE CHILLER SHALL BE ENABLED 120 SECONDS (ADJUSTABLE) AFTER PUMP STATUSES ARE PROVEN ON.
   F. THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.
4. EQUIPMENT SHUTDOWN
   A. EMERGENCY SHUTDOWN: THE CHILLER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL STATUS.
   B. REFRIGERANT DETECTION: THE CHILLER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING A REFRIGERANT LEAK DETECTION STATUS.
   C. COOLING TOWER VIBRATION SWITCH: THE CHILLER AND SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING A VIBRATION SWITCH STATUS FROM THE COOLING TOWER CONTROLLER.
5. CHILLER MANAGEMENT
   A. THE BAS SHALL DETERMINE THE FACILITY COOLING LOAD AND SHALL STAGE THE CHILLERS ON IN SEQUENCE TO MEET RISING COOLING DEMAND AND RISING MAIN CHWS TEMPERATURE WHERE:
      a. MAIN CHWS TEMPERATURE IS MEASURED AT A POINT LEAVING THE CHILLER PLANT AND ENTERING THE FACILITY. THIS POINT SHALL BE DOWNSTREAM AND COMMON TO ALL CHILLERS.
   B. THE BAS SHALL DETERMINE THE FACILITY COOLING LOAD FROM:
      a. CHWS FLOW (MAIN CHWS LEAVING CHILLER PLANT)
      b. CHWS TEMPERATURE (MAIN CHWS LEAVING CHILLER PLANT)
      c. CHWR TEMPERATURE (MAIN CHWR RETURNING TO CHILLER PLANT)
      d. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJUSTABLE) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJUSTABLE) MINIMUM RUNTIME.
6. CHILLED WATER CONTROL VALVES
   A. THE CHILLER CONTROL VALVES SHALL BE CONTROLLED BY THE CHILLER MANUFACTURERS CONTROL PANEL. THE CONTROL PANEL SHALL MODULATE THE VALVES TO MAINTAIN CHILLER EVAPORATOR DIFFERENTIAL PRESSURE SET POINT AND TO PREVENT EXCESSIVE PRESSURE DROP AS RECOMMENDED BY MANUFACUTRER.
   B. THE CHILLER CONTROLLER SHALL OPEN THE CONTROL VALVE ANYTIME THE CHILLER IS CALLED TO RUN.
   C. THE CONTROL VALVE SHALL ALSO OPEN WHENEVER THE CHILLED WATER PUMP RUNS FOR FREEZE PROTECTION.
   D. THE CONTROL VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED.
   E. THE CONTROL VALVE SHALL THEREFORE HAVE:
      a. A USER ADJUSTABLE DELAY ON START & STOP.
      b. THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY SYSTEM START-UP, SHUTDOWN AND SEQUENCING.
7. CHILLED WATER SUPPLY TEMPERATURE RESET
   A. THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON COOLING REQUIREMENTS.
   B. THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET TO A LOWER VALUE AS THE FACILITY'S CHILLED WATER VALVES MODULATE BEYOND 90% OPEN. ONCE THE CHILLED WATER COILS ARE SATISFIED (VALVES CLOSING) THEN THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL GRADUALLY RISE OVER TIME TO REDUCE COOLING ENERGY USE.
8. CONDENSER WATER CONTROL VALVE
   A. THE CHILLER CONTROL VALVES SHALL BE CONTROLLED BY THE CHILLER MANUFACTURERS CONTROL PANEL.
   B. THE CONTROL PANEL SHALL MODULATE THE VALVES TO MAINTAIN CHILLER EVAPORATOR DIFFERENTIAL PRESSURE SET POINT AND TO PREVENT EXCESSIVE PRESSURE DROP AS RECOMMENDED BY MANUFACUTRER.
   C. THE CHILLER CONTROLLER SHALL OPEN THE CONTROL VALVE ANYTIME THE CHILLER IS CALLED TO RUN.
   D. THE CONTROL VALVE SHALL ALSO OPEN WHENEVER THE CONDENSER WATER PUMP RUNS FOR FREEZE PROTECTION.
   E. THE CONTROL VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED.
   F. THE CONTROL VALVE SHALL HAVE: A USER ADJUSTABLE DELAY ON START & STOP.
   G. CONDENSER WATER PRESSURE SETPOINT RESET: THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY SYSTEM START-UP, SHUTDOWN AND SEQUENCING.
9. CHILLED WATER TEMPERATURE MONITORING
   A. THE FOLLOWING SHALL BE MONITORED:
      a. CHILLED WATER SUPPLY
      b. CHILLED WATER RETURN
10. ALARMS
   A. ALARMS SHALL BE PROVIDED AS FOLLOWS:
      a. CHILLER:
         • CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
         • CHILLER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
         • CHILLER RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT
      b. CONTROL VALVES:
         • CONTROL VALVE FAILURE; VALVE COMMANDED OPEN BUT THE STATUS INDICATES CLOSED.
         • CONTROL VALVE OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.
      c. SYSTEM TEMPERATURE:
         • HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJUSTABLE).
         • SYSTEM TEMPERATURE: LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJUSTABLE).
11. FUTURE SYSTEM OPERATION
   A. THE CONTROL CONTRACTOR SHALL CONFIGURE THE CONTROL SYSTEM SUCH THAT THE CONTROL HARDWARE AND SEQUENCE OF OPERATION ARE PROVIDED AS PART OF PHASE 1 AND CAN BE RECONFIGURED FROM LEAD/LAG OPERATION TO LEAD/LAG/STANDBY



NOTES:
1. REFER TO PLANS AND PIPING SCHEMATICS FOR CHILLED WATER AND CONDENSER WATER PIPING ARRANGEMENTS.
2. REFER TO SEQUENCE OF OPERATION FOR ADDITIONAL REQUIREMENTS.
3. CHILLED WATER AND CONDENSER WATER ISOLATION VALVES ARE NOT REQUIRED IF THERE IS ONLY ONE CHILLER AND ONE COOLING TOWER.
4. CHILLER CONTROL PANEL BACnet CARD SHALL PROVIDE CHILLED WATER SUPPLY TEMPERATURE SETPOINT, CHILLER FAULTS, CHILLER ELECTRICAL DEMAND AND CHILLER CAPACITY OUTPUT AS MINIMUM INPUTS TO BAS HEADEND.
5. CHILLER MANUFACTURER SHALL PROVIDE HARDWIRED FLOW SENSOR FOR INTERNAL PROOF OF FLOW.
6. PROVIDE ADDITIONAL DIFFERENTIAL PRESSURE SENSORS AS REQUIRED BY DESIGN FOR EXTERNAL FLOW MONITORING AT BAS FOR GPM.

CONDENSER WATER CONTROL REQUIREMENTS

1. GENERAL
   A. THE CONDENSER WATER PUMPS CIRCULATE WATER THROUGH THE CHILLERS AND COOLING TOWERS.
   B. THE EQUIPMENT SHALL RUN IN LEAD/LAG OPERATION
2. STANDBY POWER
   A. THE PUMP IS CONNECTED TO STANDBY POWER. IN EVENT OF A POWER FAILURE, EQUIPMENT OPERATION SHALL BE SIMILAR TO NORMAL POWER OPERATION.
3. OPERATION MODE
   A. THE CONDENSER WATER PUMPS SHALL BE ENABLED WHENEVER THE CHILLED WATER SYSTEM IS ENABLED.
   B. THE CONDENSER WATER PUMPS SHALL OPERATE IN A LEAD/LAG FASHION.
   C. THE LEAD PUMP SHALL RUN FIRST.
   D. IF ANY PUMP FAILS, THE NEXT AVAILABLE PUMP SHALL STAGE ON AND THE FAILED PUMP SHALL BE
      a. REMOVED FROM OPERATION.
      b. ADDITIONAL PUMPS SHALL STAGE ON AS REQUIRED TO MAINTAIN CONDENSER WATER DIFFERENTIAL PRESSURE.
      c. THE DESIGNATED STAGING ORDER (USER DEFINABLE) OF THE PUMPS SHALL ROTATE ON A WEEKLY BASIS (USER DEFINABLE).
4. CONDENSER WATER DIFFERENTIAL PRESSURE CONTROL
   A. THE BAS SHALL MEASURE THE CONDENSER WATER DIFFERENTIAL PRESSURE AND MODULATE THE CONDENSER
   B. WATER PUMP VFDS IN SEQUENCE TO MAINTAIN ITS CONDENSER WATER DIFFERENTIAL PRESSURE SETPOINT.
   C. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FELD ADJUSTED
   D. DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.
   E. THE BAS SHALL MODULATE THE CONDENSER WATER PUMP SPEEDS TO MAINTAIN A CHILLED WATER
   F. DIFFERENTIAL PRESSURE OF 15 PSI (ADJUSTABLE) OR AS DETERMINED BY THE TEST AND BALANCE
   G. AGENCY.
   H. THE VFDS MINIMUM SPEED SHALL NOT DROP BELOW 15HZ (ADJUSTABLE) AS APPLICABLE
5. CONDENSER WATER PRESSURE SETPOINT RESET
   A. THE CONDENSER WATER SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON PRESSURE REQUIREMENTS.
   B. THE CONDENSER WATER PRESSURE SETPOINT SHALL RESET TO A LOWER VALUE AS THE CHILLER CONTROL VALVES MODULATE BEYOND 90% OPEN. ONCE THE VALVES ARE SATISFIED (VALVES CLOSING) THEN THE CONDENSER WATER
   C. SETPOINT SHALL GRADUALLY RISE OVER TIME TO REDUCE PUMP ENERGY USE.
6. CONDENSER WATER TEMPERATURE MONITORING
   A. THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
      a. CONDENSER WATER SUPPLY
      b. CONDENSER WATER RETURN.
7. ALARMS
   A. ALARMS SHALL BE PROVIDED AS FOLLOWS:
      a. CONDENSER WATER PUMP:
         • FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
         • RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
         • RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
         • VFD FAULT.
      b. SYSTEM TEMPERATURE
         • HIGH CONDENSER WATER SUPPLY TEMP: IF THE CONDENSER WATER SUPPLY TEMPERATURE IS GREATER THAN 80T FOR A PERIOD OF 30 MINUTES (ADJUSTABLE).
         • LOW CONDENSER WATER SUPPLY TEMP: IF THE CONDENSER WATER SUPPLY TEMPERATURE IS LESS THAN 40°F FOR A PERIOD OF 30 MINUTES (ADJUSTABLE).
      c. SYSTEM PRESSURE
         • HIGH CONDENSER WATER DIFFERENTIAL PRESSURE: IF THE CONDENSER WATER DIFFERENTIAL PRESSURE IS 25% (ADJUSTABLE) GREATER THAN SETPOINT.
         • LOW CONDENSER WATER DIFFERENTIAL PRESSURE: IF THE CONDENSER WATER DIFFERENTIAL
         • PRESSURE IS 25% (ADJUSTABLE) LESS THAN SETPOINT.
      d. FUTURE SYSTEM OPERATION
         • THE CONTROL CONTRACTOR SHALL CONFIGURE THE CONTROL SYSTEM SUCH THAT THE CONTROL HARDWARE AND
         • SEQUENCE OF OPERATION ARE PROVIDED AS PART OF PHASE 1 AND CAN BE RECONFIGURED FROM LEAD/LAG OPERATION
         • TO LEAD/LAG/STANDBY. REFER TO GENERAL CONTROL DIAGRAM NOTES ON 1.M701 FOR LEAD/LAG/STANDBY OPERATION.

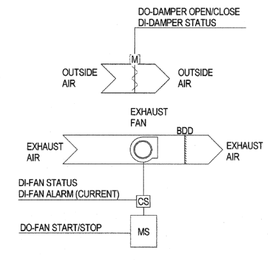


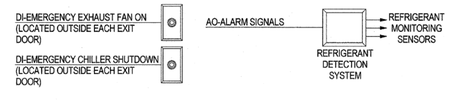
NOTES:
1. REFER TO PLANS AND PIPING SCHEMATICS FOR CONDENSER WATER PIPING ARRANGEMENT.
2. REFER TO SEQUENCE OF OPERATION FOR ADDITIONAL REQUIREMENTS.
3. EACH PUMP SHALL BE OPERATED BY A DEDICATED VFD SET TO A FIXED SPEED.
4. VFD BACnet CARD SHALL PROVIDE VFD SPEED OUTPUT, VFD FAULT AND VFD KW AS MINIMUM INPUTS TO BAS HEADEND.

MECHANICAL ROOM EXHAUST FAN CONTROL REQUIREMENTS

1. GENERAL
   A. THE REFRIGERATION DETECTION SYSTEM SHALL BE A STAND-ALONE REFRIGERANT MONITORING AND ALARMING SYSTEM.
   B. THE SYSTEM CONSISTS OF ONE EXHAUST FAN AND ONE INTAKE CONTROL DAMPER.
   C. THE EXHAUST FAN WILL OPERATE AS CONSTANT VOLUME.
2. STANDBY POWER
   A. THE EQUIPMENT IS CONNECTED TO STANDBY POWER. IN THE EVENT OF A POWER FAILURE, THE BAS SHALL CONTROL THE EQUIPMENT SIMILAR TO NORMAL POWER OPERATION.
3. EXHAUST FAN OPERATION
   A. THE BAS SHALL START THE FAN UPON ACTIVATION OF THE REFRIGERANT LEAK DETECTION ALARM OR MANUAL START OF THE SYSTEM THROUGH THE BREAK GLASS OR OVERRIDE SWITCH AS NOTED BELOW.
   B. UPON INITIATION OF EXHAUST FAN THE BAS SHALL OPEN THE OUTSIDE AIR DAMPER.
4. REFRIGERATION MONITOR & ALARM
   A. THE REFRIGERANT MONITOR SHALL HAVE THREE ALARM LEVELS EACH OF WHICH ARE PROGRAMMABLE.
      a. THE BAS SHALL MONITOR THE REFRIGERANT LEVEL,
         • LEVEL 1 ALARM (CAUTION), AND
         • LEVEL 2 (WARNING).
         • LEVEL 3 (EMERGENCY)
      b. (ES-1) SHUTDOWN OF ALL CHILLERS, PUMPS AND COOLING TOWERS IN THE MACHINE ROOM MAY BE ACCOMPLISHED THROUGH THE USE OF EMERGENCY POWER OFF (EPO) "BREAK GLASS" SWITCHES (ES-1) LOCATED OUTSIDE EACH MACHINE ROOM DOOR OR AUTOMATICALLY BY THE REFRIGERANT MONITORING PANEL
      c. (ES-2) THE ROOM VENTILATION AND EXHAUST FANS SHALL OPERATE IN THE PURGE MODE UPON ACTIVATION INITIATED BY THE USE OF THE EMERGENCY PURGE EXHAUST "BREAK GLASS" SWITCH LOCATED OUTSIDE EACH MACHINE ROOM DOOR.
      d. THE FIREMAN'S OVERRIDE SWITCH OR AUTOMATICALLY FROM THE REFRIGERANT MONITORING ALARM PANEL.
      e. IF THE REFRIGERANT PURGE MODE IS ACTIVATED THROUGH THE USE OF THE EMERGENCY PURGE "BREAK GLASS" SWITCH, THE SYSTEM CAN BE MANUALLY RESET BY REPLACEMENT OF THE BROKEN GLASS OR OVERRIDDEN BY THE FIREMAN'S OVERRIDE KEYED TEST SWITCH.
5. REFRIGERANT MONITORING
   A. THE MACHINE ROOM SHALL HAVE ONE REFRIGERANT DETECTION SENSOR (RS-1) LOCATED IMMEDIATELY ADJACENT TO EACH CHILLER AND ALL SENSORS CONNECTED TO ONE REFRIGERANT MONITORING PANEL.
   B. LEVEL 1 REFRIGERANT LEAK ALARM: THE REFRIGERANT MONITORING PANEL INITIATES THE PURGE MODE BY OPERATING THE VENTILATION AND EXHAUST FAN VFDS AT FULL SPEED. ISSUE WARNING ALARM TO FACILITY OPERATOR VIA THE BAS THAT A MINOR LEAK HAS OCCURRED.
   C. LEVEL 2 REFRIGERANT WARNING ALARM. THE REFRIGERANT MONITORING PANEL ENERGIZES THE ALARM LIGHTS, STROBE AND HORN. A MANUAL SWITCH IS PROVIDED OUTSIDE THE CHILLER DOOR TO SILENCE THE HORN. THE LIGHTS WILL REMAIN ON UNTIL THE ALARM CONDITIONS NO LONGER EXISTS AND THE REFRIGERANT PANEL IS MANUALLY RESET.
   D. LEVEL 3 REFRIGERANT SHUTDOWN ALARM. THE REFRIGERANT MONITORING PANEL WILL AUTOMATICALLY TERMINATE THE OPERATION OF CHILLERS, PUMPS AND COOLING TOWERS. THE FIRE ALARM DETECTION SYSTEM SHALL BE CONNECTED TO THE REFRIGERANT MONITORING PANEL VIA A DRY CONTACT.
      a. THE FIRE ALARM SHALL BE INITIATED UPON DETECTION OF A LEVEL 3 ALARM CONDITION OR A TROUBLE OR LOSS OF POWER TO THE REFRIGERANT MONITORING PANEL.
      b. THE VENTILATION AND EXHAUST FANS SHALL CONTINUE TO OPERATE AS IN LEVEL 1 ALARM CONDITION.
   E. EACH LEVEL IS A LATCHING CIRCUIT AND REQUIRES MANUAL RESET AT THE REFRIGERANT MONITORING PANEL UPON ELIMINATION OF THE ALARM CONDITIONS THE BAS WILL RE-SEQUENCE THE STARTUP PROCEDURES FOR THE CENTRAL PLANT EQUIPMENT.
   F. THE REFRIGERANT MONITORING PANEL SHALL PROVIDE THE BAS A CONTROL SIGNAL.
   G. THE BAS SHALL GENERATE A BAS ALARM FOR EACH ALARM LEVEL.
   H. A REFRIGERANT MONITOR TROUBLE ALARM IS GIVEN TO THE FIRE CONTROL SYSTEM VIA A DRY CONTACT FROM THE REFRIGERANT MONITORING PANEL. THIS ALARM INDICATES A LOSS OF EMERGENCY POWER, NORMAL POWER, EXHAUST FAN POWER, EXHAUST FAN NO FLOW, OR PANEL TROUBLE. THE REFRIGERANT MONITORING PANEL "TROUBLE ALARM" IS ALSO MONITORED BY THE BAS AND ALARM WILL BE DISPLAYED AT THE HOST OPERATING SYSTEM WHENEVER AN ALARM OCCURS.
   I. MACHINE ROOM VENTILATION & EXHAUST POWER OFF (EPO) (ES-2)
6. ALARMS
   A. ADDITIONAL ALARMS SHALL BE PROVIDED AS FOLLOWS:
      a. EQUIPMENT FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
      b. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
      c. EQUIPMENT FAULT VIA CURRENT SWITCH.
      d. OUTSIDE AIR CONTROL DAMPER FAILURE TO PROVE OPEN.

CHILLER ROOM CONTROL MATRIX		
	STATUS	
EQUIPMENT/ DEVICE	NORMAL MODE	REFRIGERATION MONITOR/ SWITCH
CHILLER CH-3	ON	OFF
EXHAUST FAN REF-1	ON	ON
REFRIGERATION MONITOR/SWITCH	ENABLED	ALARM
AUDIBLE/VISUAL ALARMS	OFF	ON





NOTES:
1. REFER TO PLANS FOR FAN AND DEVICE PLACEMENT.

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No.	Description	Date
1	IFCR	20DEC19
2	IFCR	02JAN20
3	IFC	22JAN20

CCRI NEWPORT

CCRI CHILLER REPLACEMENT NEWPORT CAMPUS 1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

MECH CONTROLS COOLING

Project number	AA-19160 / AGE-1979
Date	22JAN20
Drawn by	AGE
Checked by	AG
Approved by	AG

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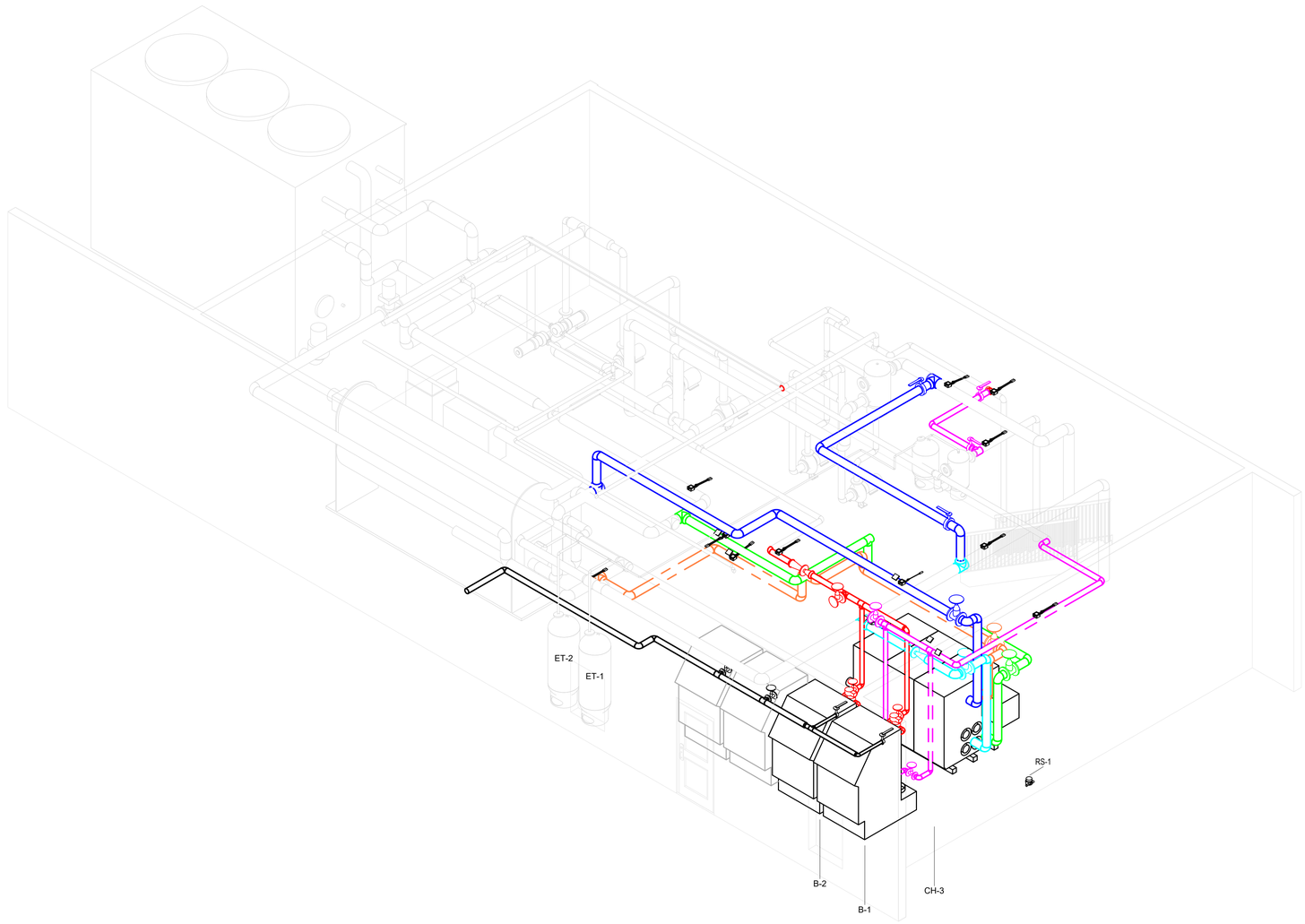

1 3D PLUMBING

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CCRI NEWPORT

CCRI CHILLER REPLACEMENT
NEWPORT CAMPUS
1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

MECHANICAL 3D VIEWS

Project number	AA-19160 / AGE-1979
Date	22JAN20
Drawn by	AGE
Checked by	AG
Approved by	AG

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SYMBOLS

GENERAL SYMBOLS:

- DASHED SYMBOL INDICATES DEVICE OR EQUIPMENT EXISTING TO DEMOLISHED.
- LIGHT SOLID SYMBOL INDICATES DEVICE OR EQUIPMENT EXISTING TO REMAIN.
- DARKER SOLID SYMBOL INDICATES DEVICE, OR EQUIPMENT TO BE PROVIDED.
- INDICATES SURFACE MOUNTED BOX FOR ITEM SHOWN.
- EF 2 — MECHANICAL SCHEDULE REFERENCE.
- 2 — NOTE REFERENCE
- 1 — DEMOLITION NOTE REFERENCE
- # — FEEDER REFERENCE, SEE FEEDER SCHEDULE.
- 3 / E1 — DETAIL NUMBER DESIGNATION. SHEET DETAIL REFERENCED ON.
- 3/E39 — DETAIL OR SECTION REFERENCES IN NOTES.
- +48" — INDICATES MOUNTING HEIGHT ABOVE FINISHED FLOOR.

RACEWAY SYSTEMS

- CONDUIT CONCEALED IN WALL OR CEILING.
- CONDUIT EXPOSED. SIZE AS NOTED.
- CONDUIT IN GROUND OR UNDER SLAB.
- FLEXIBLE CONDUIT.
- CONDUIT TURNING DOWN.
- A–1,3 — HOMERUN TO PANELBOARD "A" – CIRCUITS 1 & 3. CROSS MARKS, IF SHOWN, INDICATE NUMBER OF WIRES. FEEDER OR CIRCUIT NUMBERS AS NOTED. (UNLESS OTHERWISE INDICATED EQUIPMENT GROUNDING CONDUCTOR NOT SHOWN):
- 2 #12 & #12G, 3/4" C.
- 4 #12 & #12G, 3/4" C.
- 3 #12 & #12G, 3/4" C.

MISCELLANEOUS

- J — JUNCTION OR OUTLET BOX. CEILING OR WALL MOUNTED AS INDICATED. LOCATE ABOVE ACCESSIBLE CEILINGS UON.
- CONCRETE SAW CUT TRENCH, PATCH AND REPAIR
- FLUSH — SPECIAL PANEL OR CABINET, AS NOTED. PANELBOARD.
- T — TRANSFORMER, FLOOR MOUNTING TYPE. (PLAN VIEW)
- CB — ENCLOSED CIRCUIT BREAKER.
- F — FUSED SAFETY DISCONNECT SWITCH
- $M — MOTOR STARTER SWITCH.

SINGLE LINE DIAGRAM:

- GROUNDING ELECTRODE
- G — GROUND BUS OR TERMINALS
- SPLICE
- TERMINAL
- FUSED SWITCH
- CARTRIDGE FUSE
- 42,000 — SHORT CIRCUIT CURRENT, AMPS
- TRANSFORMER
- GROUND ROD
- LOW VOLTAGE CIRCUIT BREAKER – ENCLOSED.
- 3 — MOTOR, "3" INDICATES HORSEPOWER.

GENERAL NOTES:

1. THE FOLLOWING GENERAL NOTES APPLY TO ALL ELECTRICAL DRAWINGS.
2. INSTALLATION OF ELECTRICAL MATERIAL SHALL CONFORM WITH LOCAL REGULATIONS AND THE 2020 NATIONAL ELECTRICAL CODE (NEC) AND OTHER GOVERNING CODES AND ORDINANCES.
3. ELECTRICAL EQUIPMENT SHALL BE NRTL LABELED.
4. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH OTHER TRADES AT THE SITE.
5. CONDUIT SIZES ARE BASED ON COPPER CONDUCTORS WITH THHN/THWN–2 INSULATION UNLESS OTHERWISE NOTED. ALL CONDUCTORS SHALL BE COPPER. CONDUCTOR INSULATION SHALL BE THHN/THWN–2 UNLESS OTHERWISE NOTED.
6. MINIMUM CONDUIT SIZE SHALL BE 3/4", UNLESS OTHERWISE NOTED.
7. INSTALL ALL EQUIPMENT, DEVICES, CONDUIT AND CONDUIT SUPPORTS TO MEET SEISMIC CATEGORY "D" REQUIREMENTS.
8. CONDUIT RUNS SHOWN ARE DIAGRAMMATIC ONLY. INSTALL CONDUITS TO SUIT FIELD CONDITIONS.
9. PROVIDE PROPERLY SIZED LUGS AT CIRCUIT BREAKER PANELS, FOR THE CONDUCTORS SHOWN TO CONNECT TO THESE LUGS.
10. INSTALL EXTERIOR MOUNTED ELECTRICAL EQUIPMENT IN WEATHERPROOF, NEMA 3R ENCLOSURES.
11. SEPARATE INSULATED EQUIPMENT GROUNDING CONDUCTOR, SIZED PER NEC TABLE 250.122, SHALL BE PROVIDED, INSTALLED IN THE SAME CONDUIT AS THE CIRCUIT CONDUCTORS, FOR FEEDER AND BRANCH CIRCUITS.
12. THE CONTRACTOR SHALL SUPPLY POWER TO AND MAKE CONNECTION TO MOTORS AND EQUIPMENT REQUIRING ELECTRICAL, INCLUDING FRACTIONAL HORSEPOWER MOTORS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW THE MECHANICAL AND PLUMBING DRAWINGS FOR DUCTS, LINES AND EQUIPMENT.
13. EXACT METHOD AND LOCATION OF CONDUIT PENETRATIONS AND/OR OPENINGS IN CONCRETE WALLS OR FLOORS SHALL BE AS DIRECTED BY THE STRUCTURAL ENGINEER.
14. COMPLY WITH NFPA 70E.

ABBREVIATIONS:

A OR AMP	–	AMPERE
AF	–	AMP FUSE
AF	–	AMP FRAME
A.F.F.	–	ABOVE FINISHED FLOOR
AIC	–	AMPS INTERRUPTING CAPACITY
AS	–	AMP SWITCH
AT	–	AMP TRIP
BCG	–	BARE COPPER GROUND
C	–	CONDUIT
CONT	–	CONTINUED
DIA	–	DIAMETER
DISC	–	POWER DISCONNECT
DIST	–	DISTRIBUTION
EQUIP	–	EQUIPMENT
EG	–	ELECTRICAL GROUND
EXIST, (E)	–	EXISTING
FF	–	FINISHED FLOOR
FT	–	FOOT, FEET
G	–	GROUND
GFI	–	GROUND FAULT INTERRUPTER
GND	–	GROUND
HP	–	HORSE POWER
KAIC	–	THOUSAND AMPERE INTERRUPT CURRENT
KCMIL	–	THOUSAND CIRCULAR MILS
KVA	–	KILA–VOLT–AMP (POWER)
KW	–	KILOWATT(S)
NEC	–	NATIONAL ELECTRICAL CODE
NTS	–	NOT TO SCALE
PH, Ø	–	PHASE
PNL	–	ELECTRICAL POWER DISTRIBUTION PANEL
RMC	–	RIGID METAL CONDUIT
REF	–	REFERENCE
REQD	–	REQUIRED
RM	–	ROOM
SEC	–	SECONDARY
SHT	–	SHEET
SWBD	–	SWITCHBOARD
TRANSF	–	TRANSFORMER
TVSS	–	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TYP	–	TYPICAL
XFMR	–	TRANSFORMER
3W	–	THREE WIRE
3PH	–	THREE PHASE
V	–	VOLT
WP	–	WEATHERPROOF

PANEL	REMOVED LOAD (KVA)	ADDED LOAD (KVA)	NET GAIN LOAD (KVA)
BR*	6.804	3.45	-3.354
MSB**		107.64	107.64

* BR REMOVED CHILLER 1 (6.8KVA) AND ADDED 2 BOILERS (1.75 KVA EACH)

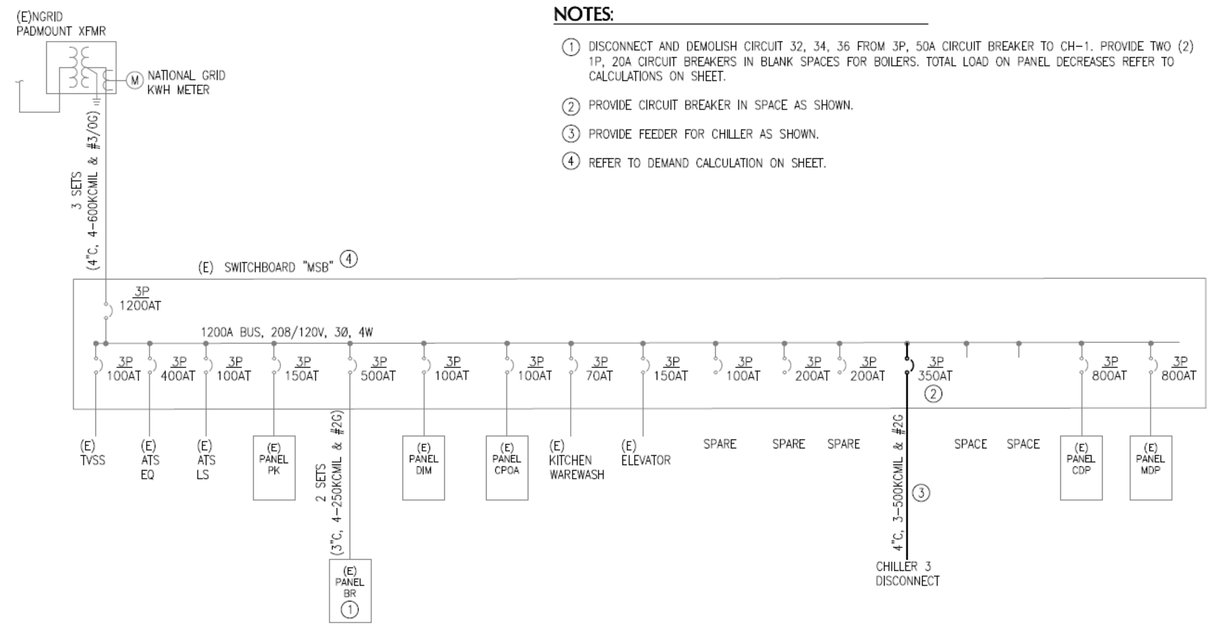
** MSB ADDED A CHILLER AT 299 MCA OR 107 KVA

MAX 1 YEAR UTILITY DEMAND (KW)*	DEMAND WITH .88 PF	125% DEMAND	NEW LOAD (KVA)	NEW CALCULATED DEMAND (KVA)**	NEW DEMAND (A)
170	193	241	107.64	349	970

* PEAK DEMAND FROM DECEMBER 2018 TO DECEMEMBER 2019 OCCURRED IN OCTOBER BILLING

** NEW DEMAND PER NEC ARTICLE 220.87

LOAD CALCULATIONS



PARTIAL ONE-LINE POWER DIAGRAM

NOTES:

1. DISCONNECT AND DEMOLISH CIRCUIT 32, 34, 36 FROM 3P, 50A CIRCUIT BREAKER TO CH–1. PROVIDE TWO (2) 1P, 20A CIRCUIT BREAKERS IN BLANK SPACES FOR BOILERS. TOTAL LOAD ON PANEL DECREASES REFER TO CALCULATIONS ON SHEET.
2. PROVIDE CIRCUIT BREAKER IN SPACE AS SHOWN.
3. PROVIDE FEEDER FOR CHILLER AS SHOWN.
4. REFER TO DEMAND CALCULATION ON SHEET.

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No.	Description	Date
1	IFCR	20DEC19
2	IFCR	02JAN20
3	ELECTRICAL REV	16JAN20

CCRI NEWPORT

CCRI CHILLER REPLACEMENT NEWPORT CAMPUS 1 JOHN H. CHAFEE BLVD, NEWPORT, RI 02840

ELECTRICAL GENERAL

Project number	AA-19160 / AGE-1979
Date	16JAN20
Drawn by	AGE
Checked by	MTO
Approved by	AGE

E0.01

Scale

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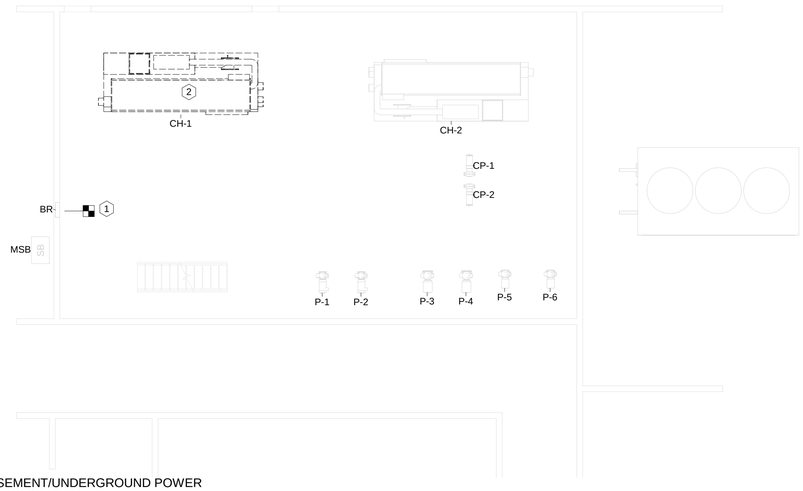
DEMOLITION NOTES

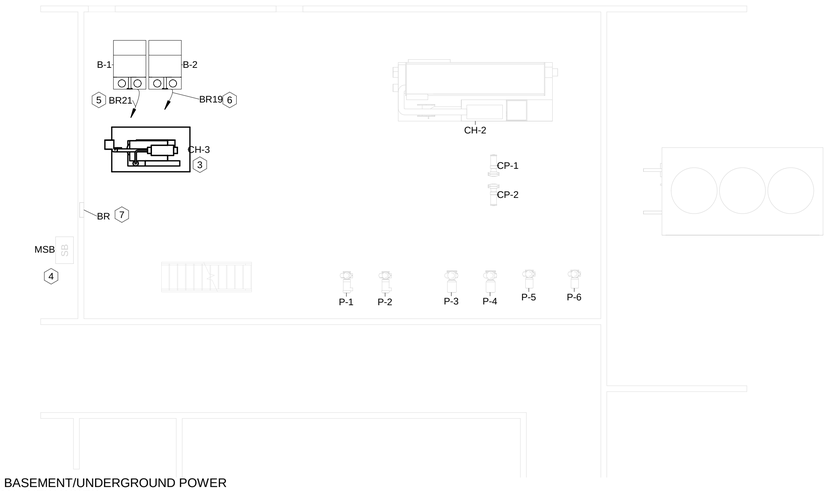
1. EXISTING PLANS DO NOT INDICATE COMPLETE EXISTING WIRING CONDITIONS. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO START OF WORK.
2. BEFORE ANY WIRING IS CUT, CONTRACTOR SHALL VERIFY USAGE OF WIRING TO BE CUT TO ASSURE THAT SERVICES REQUIRED ARE NOT DISCONTINUED PROVIDE ADDITIONAL WIRING DEVICES AND OTHER ACCESSORIES TO ENSURE CONTINUITY OF SERVICE TO OTHER PARTS OF INSTALLATION TO REMAIN.
3. REMOVE ALL EXISTING WIRING NOT TO REMAIN IN SERVICE.
4. REMOVE ALL CONDUITS NO LONGER REQUIRED.
5. PHASE WORK TO ASSURE CONTINUITY OF ELECTRICAL, TELEPHONE AND SIGNAL SERVICES TO PARTS OF FACILITIES THAT WILL REMAIN IN USE.
6. DELIVER ALL SALVAGEABLE MATERIAL AS DETERMINED BY ENGINEER AT NO ADDITIONAL COST TO THE SCHOOL. PACK MATERIAL IN BOXES. COIL ALL CABLES AND TIE.
7. ABANDON CONDUITS BELOW GRADE NO LONGER REQUIRED. PULL OUT ALL WIRES IN ABANDONED CONDUITS.

E1.01 DRAWING NOTES

#	NOTE
1	REMOVE CHILLER 1 CIRCUIT FROM 50 AMP CB 3 POLE FROM BR 32,34,36
2	DEMOLISH CHILLER 1 CIRCUIT WIRING AND CONDUIT BACK TO PANEL BR
3	ENSURE CHILLER IS PROVIDED WITH VFD AND DISCONNECT SWITCH. RUN FEEDER 4"C, 3-500KCMIL+#2G FROM DISCONNECT TO MSB 11
4	PROVIDE 400A CIRCUIT BREAKER FRAME WITH 350A TRIP IN "MSB". TERMINATE CHILLER CIRCUIT IN CIRCUIT BREAKER. COORDINATE OUTAGE WITH CCRI.
5	RUN 3/4" C, 2#12+#12G,TO BR
6	RUN 3/4" C, 2#12+#12G,TO BR
7	PROVIDE TWO (2) NEW SINGLE POLE 20A CIRCUIT BREKAERS IN BR (E) SPARE SPACES



2 (E) BASEMENT/UNDERGROUND POWER PLAN - DEMOLITION
1/8" = 1'-0"



1 (N) BASEMENT/UNDERGROUND POWER PLAN - NEW WORK
1/8" = 1'-0"

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ELECTRICAL PLANS

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E1.01

Scale 1/8" = 1'-0"

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