STUDENT HEALTH CENTER AHU REPLACEMENT

HUMBOLDT STATE UNIVERSITY

1 HARPST ST. ARCATA, CA 95521

MAY 23, 2018

STUDENT HEALTH CENTER

HSU BLDG #042, CSFM #: 18-12-11-0001-00111

OCCUPANCY CLASSIFICATION & USE:	B OFFICE & OUTPATIENT CLINIC
CONSTRUCTION TYPE:	TYPE VB
YEAR CONSTRUCTED, APPROX:	1959, MAJOR ADDITION 1974
NUMBER OF STORIES:	2 + BASEMENT
BUILDING HEIGHT:	± 28 FT
BASEMENT AREA:	860 SF
1st FLOOR AREA:	12,981 SF
2nd FLOOR AREA:	6,985 SF
BUILDING AREA (TOTAL):	20,826 SF, GROSS AREA PER METABIM
NON-SEPARATED USE:	NON-SEPARATED
ALLOWABLE AREA PER (CBC):	N/A (NO CHANGE)
AREA INCREASE:	N/A (NO CHANGE)
HEIGHT INCREASE:	N/A (NO CHANGE)
FIRE SPRINKLERS:	NO (NO CHANGE)
FIRE ALARM:	YES, AUTOMATIC (NO CHANGE)
OTHER FIRE PROTECTION SYSTEMS:	PORTABLE FIRE EXTINGUISHERS
BASEMENT OCCUPANT LOAD:	2 OCCUPANTS
1st FLOOR OCCUPANT LOAD:	64 OCCUPANTS
2nd FLOOR OCCUPANT LOAD:	100 OCCUPANTS
BUILDING OCCUPANT LOAD (TOTAL):	166 OCCUPANTS
(OCCUPANT LOADS CALCS PER 2016 CBC T1004.1.2)	
HIGH FIRE HAZARD SEVERITY ZONE:	NO
SEISMIC JOINTS:	NO
EMERGENCY RESPONDER RADIO:	N/A

APPLICABLE CODES & STANDARDS FOR PROJECT:

CODES

TITLE 19, CCR, PUBLIC SAFETY, STATE FIRE MARSHAL REGULATIONS
2016 CALIFORNIA ADMINISTRATIVE CODE Title 24, Pt 1
2016 CALIFORNIA BUILDING CODE (CBC) Title 24, Pt 2
2016 CALIFORNIA ELECTRICAL CODE (CEC) Title 24, Pt 3
2016 CALIFORNIA MECHANICAL CODE (CMC) Title 24, Pt 4
2016 CALIFORNIA PLUMBING CODE (CPC) Title 24, Pt 5
2016 CALIFORNIA ENERGY CODE CCR Title 24, Pt 6
2016 CALIFORNIA FIRE CODE (CFC) CCR Title 24, Pt 9
2016 CALIFORNIA GREEN BUILDING STANDARDS Title 24, Pt 11
2016 CALIFORNIA REFERENCED STANDARDS Title 24, Pt 12

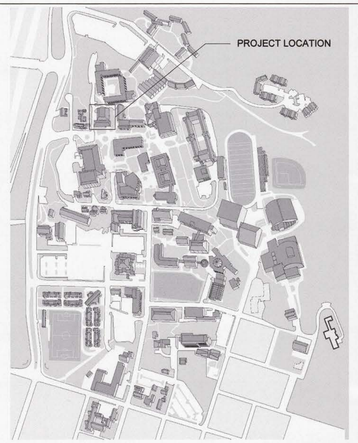
STANDARDS

2016 NFPA 13, SPRINKLER SYSTEMS (CA amended)
2013 NFPA 14, STANDPIPE & HOSE (CA amended)
2016 NFPA 20, PUMPS FOR FIRE PROTECTION (CA amended)
2016 NFPA 24, FIRE SERVICE MAINS (CA amended)
2016 NFPA 72, FIRE ALARM CODE (CA amended)

CALIFORNIA STATE FIRE MARSHAL APPROVED

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

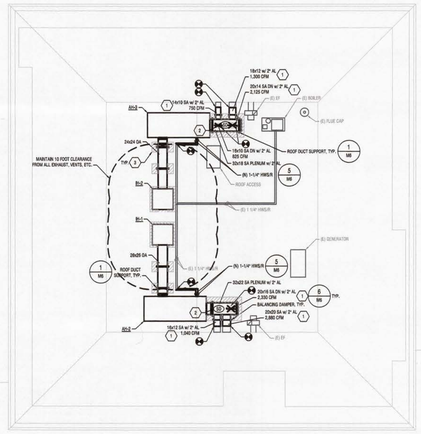
Reviewed by: Andrew McBarday 6/19/2018



HUMBOLDT STATE UNIVERSITY

NORTH

3 / G0 PROJECT LOCATION
NO SCALE



1 / G0 ROOF REFERENCE PLAN
1/16" = 1'-0"

N

PROJECT DESCRIPTION

THIS PROJECT INCLUDES THE FOLLOWING SCOPE OF WORK. THIS CONTRACTOR SHALL PROVIDE ALL ANCILLARY WORK REQUIRED TO COMPLETE THE SCOPE OF WORK DESCRIBED, WHETHER OR NOT SUCH WORK IS SPECIFICALLY INDICATED ON THESE DRAWINGS.

DEMOLITION

1. REMOVE EXISTING ROOFTOP HVAC UNITS AND DUCTWORK, AS SHOWN ON DEMOLITION PLANS.
2. REMOVE EXISTING ROOFING AS REQUIRED TO FACILITATE INSTALLATION OF NEW UNITS.

NEW WORK

1. PROVIDE NEW ROOFTOP UNITS WITH GAS HEATING AND MANUFACTURER'S CURB.
2. PROVIDE NEW SUPPLY AND RETURN DUCTWORK, AS INDICATED ON THE PLANS.
3. PROVIDE NEW ROOFING AROUND EACH NEW ROOFTOP UNIT TO TIE ROOFING INTO EXISTING ROOF SYSTEM.
4. PROVIDE NEW SMOKE DETECTORS IN EACH AIR HANDLING UNIT AND CONNECTION TO FIRE ALARM SYSTEM.

DEFERRED APPROVAL

1. FIRE ALARM MODIFICATIONS.

SHEET INDEX

SHEET	DESCRIPTION
G0	TITLE SHEET
M0	MECHANICAL SPECIFICATIONS
M1	MECHANICAL SPECIFICATIONS
M2	MECHANICAL SPECIFICATIONS
M3	MECHANICAL LEGEND AND SCHEDULES
M4	MECHANICAL ROOF PLANS AND SECTIONS
M5	MECHANICAL REFERENCE PLANS
M6	MECHANICAL DETAILS
E0	ELECTRICAL SPECIFICATIONS
E1	ELECTRICAL ONE-LINE DIAGRAM AND PLANS

PROJECT TEAM

OWNER:

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FACILITIES MANAGEMENT
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REGISTERED PROFESSIONAL ENGINEER
BEN P. ABRAHAMSEN
No. M35923
EXP. 3-31-2020
MECHANICAL
STATE OF CALIFORNIA

SHC AHU REPLACEMENT
AHU REPLACEMENT
STUDENT HEALTH CENTER (BLDG 42)

STATUS
PERMIT DOCUMENTS

BUILDING PERMIT APPROVAL:
This project has demonstrated conformance with applicable codes and standards established by statute and University policy. Based on this determination these documents are
'APPROVED FOR CONSTRUCTION'
Michael Fisher
Campus Deputy Building Official
Humboldt State University
The California State University
Date: 6/19/2018
Permit #: 2017-18-017

Other approvals, as applicable:
SFM Approval: 6/19/18
DSA Access Approval: N/A
Seismic Peer Review: N/A
Other: N/A

PROJECT #: XPL 226
W.O. #s:

ISSUE DATE: MAY 23, 2018
REV:

SHEET TITLE
TITLE SHEET

SHEET
G0

MECHANICAL SPECIFICATIONS

PART 1 - GENERAL

1.1 INCLUDED

A. THIS SECTION COVERS MECHANICAL WORK, COMPLETE. WORK INCLUDES FURNISHING, INSTALLING, CALIBRATING, ADJUSTING, TESTING, DOCUMENTING, AND STARTING UP EQUIPMENT IN ACCORDANCE WITH THESE SPECIFICATIONS, THE ACCOMPANYING PLANS, AND THE DIRECTIONS OF THE ENGINEER.

1.2 CODES AND STANDARDS

A. ALL WORK SHALL BE DONE IN CODE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL BUILDING SAFETY CODES, ORDINANCES, AND REGULATIONS. ADDITIONALLY, ALL WORK SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING STANDARDS:

1. NATIONAL FIRE PROTECTION ASSOCIATION.
2. CALIFORNIA MECHANICAL CODE.
3. CALIFORNIA PLUMBING CODE.
4. UNDERWRITERS LABORATORIES.
5. TITLES 8, 17, 19, 21, 24 OF THE CALIFORNIA CODE OF REGULATIONS.
6. CALIFORNIA ELECTRIC CODE.
7. SMACNA STANDARDS.
8. ASHRAE STANDARDS 55 AND 62.1.

B. WHEN THE CONTRACT DOCUMENTS CALL FOR MATERIALS OR CONSTRUCTION OF A HIGHER STANDARD THAN IS REQUIRED BY THE ABOVE, THE CONTRACT DOCUMENT REQUIREMENTS SHALL TAKE PRECEDENCE OVER THE REQUIREMENTS OF THE APPLICABLE LAWS, ORDINANCES, RULES, OR REGULATIONS. NOTHING IN THE CONTRACT DOCUMENTS SHALL BE INTERPRETED AS PERMITTING WORK IN VIOLATION OF SAID LAWS, RULES, AND/OR REGULATIONS.

C. THE CONTRACTOR FOR THIS WORK SHALL FURNISH, WITHOUT EXTRA CHARGE, ANY ADDITIONAL MATERIALS AND/OR LABOR AS MAY BE REQUIRED FOR COMPLIANCE WITH THESE LAWS, RULES, AND/OR REGULATIONS THOUGH SUCH MATERIALS AND/OR LABOR ARE NOT SPECIALLY SET FORTH IN THE CONTRACT DOCUMENTS.

1.3 LICENSING REQUIREMENTS

A. ALL WORK OF DIVISION 22 AND 23 SHALL BE PERFORMED BY AN APPROPRIATELY LICENSED CONTRACTOR. THE LICENSES SHALL BE CURRENT, VALID THROUGH THE TERM OF THE CONTRACT AND IN THE NAME OF THE CONTRACTOR.

1. ALL HVAC WORK, WHICH INCLUDES WARM AIR HEATING SYSTEMS AND WATER HEATING PUMPS, VENTILATING SYSTEMS, AIR CONDITIONING SYSTEMS, AND DUCTWORK, REGISTERS, FLUES, HUMIDITY, AND THERMOSTATIC CONTROLS IN CONNECTION WITH THESE SYSTEMS, SHALL BE PERFORMED BY A C-20 - WARM-AIR HEATING, VENTILATING AND AIR-CONDITIONING CONTRACTOR.
2. ALL HYDRONIC PIPING SYSTEMS SHALL BE PERFORMED BY A C-4 - BOILER, HOT WATER HEATING AND STEAM FITTING CONTRACTOR.
3. ALL HYDRONIC PIPING INSULATION SHALL BE PERFORMED BY A C-2 - INSULATION AND ACOUSTICAL CONTRACTOR.

1.4 COOPERATION WITH OTHER TRADES

A. COOPERATE FULLY WITH OTHER TRADES DOING WORK ON THE PROJECT AS MAY BE NECESSARY FOR THE PROPER COMPLETION OF THE PROJECT. REFER TO THE STRUCTURAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR DETAILS OF THE BUILDING STRUCTURE AND EQUIPMENT INSTALLATION THAT WILL TEND TO OVERLAP, CONFLICT WITH OR REQUIRE COORDINATION WITH THE WORK OF THIS SECTION, AND SCHEDULE THIS WORK ACCORDINGLY.

B. ANY WORK DONE WITHOUT REGARD FOR OTHER TRADES SHALL BE MOVED, REPLACED, OR REDONE AS REQUIRED, WITHOUT EXTRA CHARGES TO OWNER.

1.5 DIVISION OF WORK BETWEEN DIVISIONS 23 AND 26

A. CLOSE COORDINATION BETWEEN THE ELECTRICAL AND MECHANICAL TRADES IS A PART OF THE WORK THAT IS REQUIRED BY THIS CONTRACT. NO ALLOWANCE WILL BE MADE FOR OMISSIONS BASED ON INCORRECTLY ASSUMING ANOTHER TRADE WILL BE PERFORMING YOUR WORK. CONFIRM YOUR SCOPE OF WORK WITH THE GENERAL CONTRACTOR.

B. THE DIVISION OF RESPONSIBILITIES BETWEEN TRADES SUPPLYING EQUIPMENT IN OTHER DIVISIONS MAY BE DIFFERENT. FOR INSTANCE, DIVISION 26 CONTRACTOR MAY BE REQUIRED TO SUPPLY DISCONNECT SWITCHES AND STARTERS FOR NON-HVAC MECHANICAL EQUIPMENT SUPPLIED UNDER OTHER DIVISIONS.

C. DIVISION 23 RESPONSIBILITIES

1. ASSUME RESPONSIBILITY FOR THE PROPER FUNCTIONING OF THE HVAC SYSTEMS IN THEIR ENTIRETY.
2. FURNISH AND INSTALL ALL CONDUCTORS AND CONDUIT REQUIRED FOR CONTROL OF HVAC EQUIPMENT.
3. MAKE ALL TERMINATIONS WITH THE EXCEPTION OF POWER CONDUCTORS.
4. FURNISH AND INSTALL ALL CONTROL PANELS AND DEVICES TO PROVIDE A COMPLETE AND FUNCTIONAL CONTROLS SYSTEM, INCLUDING ALL CONTROLS TRANSFORMERS.
5. FURNISH AND INSTALL MOTOR STARTERS FOR ALL EQUIPMENT SPECIFIED IN DIVISION 23.
6. INSTALL DUCT SMOKE DETECTORS FURNISHED BY FIRE ALARM CONTRACTOR IN BUILDINGS WITH FIRE ALARM SYSTEMS.
7. FURNISH AND INSTALL DUCT SMOKE DETECTORS IN BUILDINGS WITHOUT FIRE ALARM SYSTEMS.
8. FURNISH AND INSTALL ALL CONTROL CONDUCTORS AND CONDUIT CONNECTING DUCT SMOKE DETECTORS TO SMOKE DAMPERS AND FAN START CONTROLS.
9. ALL ELECTRICAL WORK PERFORMED UNDER DIVISION 23 SHALL CONFORM TO THE REQUIREMENTS OF DIVISION 26.

D. DIVISION 26 RESPONSIBILITIES

1. FURNISH AND INSTALL ALL RACEWAYS, CONDUIT, DISCONNECT SWITCHES, AND CONDUCTORS NECESSARY FOR ELECTRICAL POWER SUPPLY.
2. MAKE ALL POWER SUPPLY TERMINATIONS TO MOTORS, STARTERS, DISCONNECT SWITCHES, CONTROL TRANSFORMERS, AND OTHER MECHANICAL DEVICES.
3. FIRE ALARM CONTRACTOR TO FURNISH DUCT SMOKE DETECTORS IN BUILDINGS WITH FIRE ALARM SYSTEMS.
4. PROVIDE POWER TO ALL DUCT SMOKE DETECTORS AND SMOKE DAMPERS.
5. COORDINATE ALL WORK WITH MECHANICAL CONTRACTORS.

1.6 AS-BUILT DRAWINGS

A. A COMPLETE SET OF CONTRACT DRAWINGS SHALL BE MAINTAINED AT THE WORK SITE, AND ALL CHANGES IN THE WORK SHALL BE RECORDED ON THIS SET, ON A DAILY BASIS. THE FINAL AS-BUILT DRAWINGS SHALL BE SUBMITTED TO THE ARCHITECT FOR APPROVAL.

1.7 DESIGN DRAWINGS

A. THE DRAWINGS INDICATE DIAGRAMMATICALLY THE GENERAL LAYOUT OF THE MECHANICAL SYSTEMS AND OTHER RELATED WORK. FIELD VERIFICATION OF SCALED DIMENSIONS TAKEN FROM THE DRAWINGS IS REQUIRED.

B. THE CONTRACTOR SHALL REVIEW AND COMPARE THE ARCHITECTURAL, STRUCTURAL, PLUMBING, MECHANICAL, AND ELECTRICAL DRAWINGS AND ALL OWNER SUPPLIED EQUIPMENT DRAWINGS, AND ADJUST THEIR WORK TO BE IN CONFORMITY WITH THE CONDITIONS INDICATED THEREON. DISCREPANCIES BETWEEN DRAWINGS, BETWEEN DRAWINGS AND ACTUAL FIELD CONDITIONS, OR BETWEEN DRAWINGS AND SPECIFICATIONS, SHALL PROMPTLY BE BROUGHT TO THE ATTENTION OF THE ARCHITECT FOR A DETERMINATION OF THE MODIFICATIONS TO BE EFFECTED. IN THE EVENT THAT A MAJOR MODIFICATION IS REQUIRED, A CHANGE ORDER WILL BE PREPARED.

1.8 VERIFICATION OF EXISTING CONDITIONS AND DEMOLITION

A. BEFORE INSTALLATION OF ANY NEW WORK, VERIFY THE LOCATION, SIZE, AND OTHER CONDITIONS AT ALL POINTS OF CONNECTION TO SERVICES OR OTHER EXISTING PIPING, AND AT ALL LOCATIONS WHERE NEW WORK WILL CROSS OR PASS NEAR EXISTING PIPING, ELECTRICAL, OR OTHER FACILITIES.

B. REMOVE DUCTWORK, PIPING, CONTROLS, FIXTURES, AND EQUIPMENT THAT IS NOT TO REMAIN IN SERVICE AS SHOWN ON THE DRAWINGS OR AS REQUIRED. THIS INCLUDED THE REMOVAL OF ASSOCIATED APPURTENANCES AND SUPPORTS.

C. PATCH, CAP, OR REPAIR EXISTING WORKS AFFECTED BY THIS DEMOLITION IN CONCEALED SPACES WITHIN SIX (6) INCHES OF A LIVE MAIN OR BRANCH.

D. DELIVER REMOVED MATERIAL TO THE OWNER AS DIRECTED BY THE ARCHITECT. DISPOSE OF ALL OTHER REMOVED MATERIAL OFFSITE.

E. INFORMATION SHOWN RELATIVE TO EXISTING SERVICES IS BASED UPON AVAILABLE RECORDS AND DATA DURING PREPARATION OF THE DRAWINGS, BUT SHALL BE VERIFIED. MAKE REASONABLE DEVIATIONS FOUND NECESSARY TO CONFORM TO ACTUAL LOCATIONS AND CONDITIONS, WITHOUT EXTRA CHARGE.

1.9 OPERATING AND MAINTENANCE INSTRUCTIONS

A. FURNISH THREE SETS OF TYPEWRITTEN INSTRUCTIONS COVERING MAINTENANCE, ADJUSTMENT, AND OPERATION OF EACH PIECE OF APPARATUS, BOUND IN A HARD COVER LOOSE-LEAF BINDER. NEATLY OBSCURE OR CROSS OUT INAPPLICABLE DATA FROM MANUFACTURER'S LITERATURE. SUBMIT DATA TO THE ARCHITECT.

B. OPERATING INSTRUCTIONS SHALL SHOW SEQUENCE OF OPERATIONS, LUBRICATION, CARE, AND MAINTENANCE REQUIREMENTS OF ALL EQUIPMENT. FINAL ACCEPTANCE OF THE WORK WILL NOT BE MADE UNTIL A SATISFACTORY SUBMISSION OF THIS MATERIAL IS RECEIVED AND APPROVED BY THE ARCHITECT.

C. THE OWNER'S AUTHORIZED REPRESENTATIVE SHALL BE INSTRUCTED IN THE OPERATION AND SERVICING OF ALL HVAC & PLUMBING SYSTEMS.

1.10 ACCURACY OF DATA

A. THE DATA GIVEN HEREIN AND ON THE DRAWINGS ARE AS EXACT AS COULD BE REASONABLY SECURED, BUT ABSOLUTE ACCURACY IS NOT GUARANTEED. EXACT LOCATIONS, DISTANCES, ELEVATIONS, ETC. WILL BE GOVERNED BY SHOP DRAWINGS, THE BUILDING ITSELF, AND ACTUAL FIELD CONDITIONS.

1.11 DELIVERY, STORAGE, AND HANDLING

A. CONTRACTOR SHALL BE RESPONSIBLE FOR DELIVERY, STORAGE, PROTECTION, AND PLACING OF ALL EQUIPMENT AND MATERIALS. CONTRACTOR SHALL PROTECT THE WORK AND MATERIALS FROM DAMAGE DURING CONSTRUCTION. EQUIPMENT STORED AT THE JOB SITE SHALL BE PROTECTED FROM DUST, WATER, OR OTHER DAMAGE, AND BE COVERED IF EQUIPMENT IS EXPOSED TO WEATHER. PROTECT INTERIORS OF NEW EQUIPMENT AND PIPING SYSTEMS AGAINST ENTRY OF FOREIGN MATTER. CLEAN BOTH INSIDE AND OUTSIDE BEFORE PAINTING OR PLACING EQUIPMENT IN OPERATION. ANY ITEMS DAMAGED SHALL BE REPAIRED OR REPLACED, AT NO ADDITIONAL COST TO THE OWNER.

1.12WARRANTIES

A. EQUIPMENT WARRANTIES SHALL BE PROVIDED FOR ALL EQUIPMENT, WITH ALL NECESSARY INFORMATION FILLED IN, EXCEPT PURCHASE DATE, IN FAVOR OF THE OWNER.

B. THE CONTRACTOR SHALL GUARANTEE THAT ALL WORK UNDER THIS SECTION IS FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF FILING THE NOTICE OF COMPLETION. REPLACEMENT OF DEFECTIVE WORK AND DAMAGE CAUSED TO WORK OF OTHER TRADES AS A RESULT OF SUCH DEFECTIVE WORK SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND SHALL BE MADE AT NO COST TO THE OWNER.

1.13 ALTERNATIVE MATERIALS AND METHODS

A. THESE PLANS AND SPECIFICATIONS DESCRIBE THE GENERAL SCOPE OF THE MECHANICAL SYSTEMS. THESE PLANS AND SPECIFICATIONS DO NOT PRECLUDE THE SUBMITTAL OF ALTERNATIVE METHODS OR MATERIALS. MANUFACTURER'S NAMES AND CATALOG NUMBERS ARE STATED TO IDENTIFY THE TYPE AND QUALITY OF THE EQUIPMENT OR MATERIALS REQUIRED FOR THE PROJECT.

B. THE CONTRACTOR MAY SUBMIT SHOP DRAWINGS AND/OR TECHNICAL INFORMATION ON ALTERNATIVE EQUIPMENT, MATERIALS OR INSTALLATION DETAILS TO ACCOMPLISH THE INTENT OF THE PLANS AND SPECIFICATIONS. APPROVAL OF THE ALTERNATIVE EQUIPMENT, MATERIALS OR INSTALLATION DETAILS SHALL NOT RELIEVE THE CONTRACTOR OF ANY RESPONSIBILITY FOR COMPLYING WITH THE INTENT OF THE PLANS AND SPECIFICATIONS. SUBMIT THE MANUFACTURERS' TECHNICAL INFORMATION, SHOP DRAWINGS, AND/OR WRITTEN DESCRIPTION OF ALTERNATIVE METHODS FOR EACH ITEM DESCRIBED BY MANUFACTURER'S NAME AND CATALOG NUMBER AND FOR EACH COMPONENT, EQUIPMENT, MATERIAL, OR INSTALLATION DETAIL REQUIRED.

PART 2 - PRODUCTS

2.1 GENERAL

A. ALL MATERIALS, APPLIANCES, AND EQUIPMENT SHALL BE NEW AND BEST OF THEIR RESPECTIVE KINDS, FREE FROM DEFECTS, AND OF THE MAKE, BRAND, OR QUALITY SPECIFIED OR AS ACCEPTED BY THE ARCHITECT.

B. WHEN TWO OR MORE UNITS OF MATERIALS OR EQUIPMENT OF THE SAME TYPE OR CLASS ARE REQUIRED, THESE UNITS SHALL BE PRODUCTS OF ONE MANUFACTURER.

C. APPLY AND INSTALL ALL ITEMS IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS. REFER CONFLICTS BETWEEN MANUFACTURER'S INSTRUCTIONS AND THE CONTRACT DRAWINGS AND SPECIFICATIONS TO THE ARCHITECT FOR RESOLUTION.

2.2 AIR HANDLING UNITS

A. GENERAL

1. UNIT LAYOUT AND CONFIGURATION SHALL BE AS DEFINED IN PROJECT PLANS AND SCHEDULE.

B. UNIT CASING

1. THE ENTIRE AIR HANDLER SHALL BE CONSTRUCTED OF GALVANIZED STEEL. CASING FINISHED TO MEET ASTM B117 250-HOUR SALT-SPRAY TEST. THE REMOVAL OF ACCESS PANELS OR ACCESS DOORS SHALL NOT AFFECT THE STRUCTURAL INTEGRITY OF THE UNIT. ALL REMOVABLE PANELS SHALL BE GASKETED. ALL DOORS SHALL HAVE GASKETING AROUND FULL PERIMETER TO PREVENT AIR LEAKAGE. CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE CONNECTION FLANGES AND ALL OTHER FRAMEWORK THAT IS NEEDED TO PROPERLY SUPPORT THE UNIT.
2. ALL PANELS SHALL BE 2-INCH DOUBLE WALL CONSTRUCTION TO FACILITATE CLEANING OF UNIT INTERIOR. CASING DEFLECTION SHALL NOT EXCEED .005-INCH DEFLECTION PER LINEAR FOOT UNDER NEGATIVE OR POSITIVE PRESSURE, UP TO UNIT CASINGS MAXIMUM DESIGN LIMIT OF PRESSURE.
3. UNIT FLOOR SHALL BE OF SUFFICIENT STRENGTH TO SUPPORT 300-LB LOAD DURING MAINTENANCE ACTIVITIES, AND SHALL DEFLECT NO MORE THAN .005-INCHES WHEN SITTING ON A SUPPORT STRUCTURE.
4. PANEL INSULATION SHALL PROVIDE A MINIMUM THERMAL RESISTANCE (R) VALUE OF 13 FT^2*H*F/BTU THROUGHOUT THE ENTIRE UNIT. INSULATION SHALL COMPLETELY FILL THE PANEL CAVITIES IN ALL DIRECTIONS SO THAT NO VOIDS EXIST AND SETTLING OF INSULATION IS PREVENTED. PANEL ASSEMBLY SHALL COMPLY WITH NFPA 90A.
5. ACCESS PANELS AND/OR ACCESS DOORS SHALL BE PROVIDED IN ALL SECTIONS TO ALLOW EASY ACCESS TO DRAIN PAN, COIL(S), MOTOR, DRIVE COMPONENTS AND BEARINGS FOR CLEANING, INSPECTION, AND MAINTENANCE.
6. ACCESS PANELS AND DOORS SHALL BE FULLY REMOVABLE WITHOUT THE USE OF SPECIALIZED TOOLS TO ALLOW COMPLETE ACCESS OF INTERIOR SURFACES.

C. OUTDOOR CASING

1. UNITS MOUNTED OUTDOORS SHALL INCLUDE A UNIT ROOF CONSISTING OF A 2-INCH R13 FOAM INJECTED INNER ROOF, WITH A STANDING SEAM EXTERIOR ROOF. ROOF SHALL BE STANDING SEAM TO ENSURE PANEL RIGIDITY AND PREVENT WATER INFILTRATION. EXTERIOR ROOF SHALL OVERHANG SIDE WALL PANELS OF UNIT BY 2.5-INCHES, MINIMUM.
2. EXTERIOR SURFACE OF UNIT CASING, HOOD(S) AND PIPE CABINET (IF ORDERED) SHALL BE FACTORY COATED WITH A MINIMUM OF 1.5 MILL ENAMEL FINISH, OR EQUAL. FACTORY COATING SHALL BE ABLE TO MEET OR EXCEED ASTM B117 500 SALT SPRAY TEST. CASING EXTERIOR COATING SHALL BE MANUFACTURERS STANDARD COLOR.
3. OUTSIDE AIR AND EXHAUST AIR (IF ORDERED) DAMPERS SHALL BE COVERED WITH A FACTORY SUPPLIED HOOD TO PROTECT THESE AIR PATHS FROM MOISTURE. OUTSIDE AIR INLET HOODS SHALL INCLUDE A HIGH PERFORMANCE MOISTURE ELIMINATOR TO PREVENT MOISTURE ENTRAINMENT OF WATER THROUGH THE OUTSIDE AIR PATH. ALL HOODS SHALL BE SIZED FOR 100 PERCENT OF NOMINAL DAMPER AIRFLOW. HOOD(S) SHALL BE PAINTED WITH THE SAME PAINT REQUIREMENTS AS OUTLINED IN SECTION 2.11.B. INLET HOODS MOUNTED PARALLEL TO AIRFLOW OF THE UNIT SHALL SHIP MOUNTED BY THE UNIT MANUFACTURER. INLET/EXHAUST HOODS MOUNTED PERPENDICULAR TO AIRFLOW SHALL SHIP SEPARATE TO FACILITATE JOBSITE RIGGING, AND SHALL BE MOUNTED IN THE FIELD BY THE INSTALLING CONTRACTOR.
4. UNITS SHALL EITHER BE <<MOUNTING_TYPE>> ON UNITS WITH FACTORY SUPPLIED PIPING CABINETS, THAT WILL BE CURB MOUNTED, EITHER THE FACTORY OR FIELD SUPPLIED CURB SHALL INCLUDE A FULL PERIMETER CURB SECTION TO SUPPORT THE PIPING CABINET.
5. A FACTORY SUPPLIED/FACTORY ASSEMBLED PIPING CABINET SHALL BE SUPPLIED BY THE UNIT MANUFACTURER, AS DEFINED BY THE SPECIFICATIONS. PIPING CABINET SHALL SHIP SEPARATE FROM THE MAIN UNIT IN ORDER TO FACILITATE PIPING OF THE COILS IN THE FIELD. CONSTRUCTION OF THE CABINET SHALL BE THE SAME AS THE MAIN UNIT CASING. CABINET SHALL BE PAINTED AS OUTLINED IN SECTION 2.11.B.
6. AS DEFINED IN THE PLANS AND SPECIFICATIONS, OUTDOOR UNITS WILL BE SUPPLIED WITH A RETURN FAN ECONOMIZER SECTION. SECTION SHALL INCLUDE
   a. 9-BLADE HIGH EFFICIENCY DIRECT DRIVE SINGLE WIDTH, SINGLE INLET ALUMINUM FAN WHEEL. MOTOR AND WHEEL SHALL BE DYNAMICALLY BALANCED AS AN ASSEMBLY. FAN SHALL BE BALANCED TO G6.3 PER AMCA 204. NO EXTERNAL VIBRATION ISOLATION SHALL BE REQUIRED.FAN SHALL BE MAINTENANCE FREE THROUGHOUT ITS OPERATING LIFE. AIR INLET INTO RETURN FAN SHALL EITHER BE HORIZONTAL, THROUGH THE BACK OF THE SECTION OR VERTICAL THROUGH THE BOTTOM OF THE SECTION AS DEFINED BY THE PLANS AN SPECIFICATIONS.
   b. FAN MOTOR SHALL INCLUDE AN INTEGRATED PID CONTROLLER THAT WILL ACCEPT A 0-10VFD SIGNAL IN ORDER TO VARY THE SPEED OF THE MOTOR. NO VFD REQUIRED TO VARY SPEED OF MOTOR.
   c. HINGED AND HANDLED ACCESS DOOR TO MOTOR AND FAN ASSEMBLY. ACCESS DOOR SHALL BE OF SUFFICIENT SIZE SO ENTIRE MOTOR AND FAN ASSEMBLY CAN BE REMOVED, IF REQUIRED.
   d. OUTSIDE, RETURN AND EXHAUST DAMPERS SHALL BE INTEGRAL TO ECONOMIZER SECTION. DAMPERS SHALL COMPLY WITH SECTION 2.09.
   e. INLET AND EXHAUST HOODS SHALL BE SUPPLIED BY THE UNIT MANUFACTURE TO COVER THE TWO EXPOSED AIR PATHS AND PREVENT MOISTURE ENTRAINMENT. HOODS SHALL BE CONSTRUCTED AS DEFINED IN SECTION 2.11.C.

D. ACCESS DOORS

1. ACCESS DOORS SHALL BE 2-INCH DOUBLE-WALL CONSTRUCTION. INTERIOR AND EXTERIOR SHALL BE OF THE SAME CONSTRUCTION AS THE INTERIOR AND EXTERIOR WALL PANELS.
2. GASKETING SHALL BE PROVIDED AROUND THE FULL PERIMETER OF THE DOORS TO PREVENT AIR LEAKAGE.
3. DOOR HARDWARE SHALL BE SURFACE-MOUNTED TO PREVENT THROUGH-CABINET PENETRATIONS THAT COULD LIKELY WEAKEN THE CASING LEAKAGE AND THERMAL PERFORMANCE.
4. HANDLE HARDWARE SHALL BE DESIGNED TO PREVENT UNINTENDED CLOSURE.
5. ACCESS DOORS SHALL BE HINGED AND REMOVABLE WITHOUT THE USE OF SPECIALIZED TOOLS TO ALLOW.

E. PRIMARY DRAIN PANS

1. THE DRAIN PAN SHALL BE DESIGNED IN ACCORDANCE WITH ASHRAE 62.1 BEING OF SUFFICIENT SIZE TO COLLECT ALL CONDENSATION PRODUCED FROM THE COIL AND SLOPED IN TWO PLANES, PITCHED TOWARD DRAIN CONNECTIONS, PROMOTING POSITIVE DRAINAGE TO ELIMINATE STAGNANT WATER CONDITIONS WHEN UNIT IS INSTALLED LEVEL AND TRAPPED PER MANUFACTURER'S REQUIREMENTS. THE OUTLET SHALL BE LOCATED AT THE LOWEST POINT OF THE PAN AND SHALL BE SUFFICIENT DIAMETER TO PRECLUDE DRAIN PAN OVERFLOW UNDER ANY NORMALLY EXPECTED OPERATING CONDITION. DRAINPAN SHALL BE <<UCCA_DRAINPAN_MATERIAL>>
2. ALL DRAIN PAN THREADED CONNECTIONS SHALL BE VISIBLE EXTERNAL TO THE UNIT. THREADED CONNECTIONS UNDER THE UNIT FLOOR SHALL NOT BE ACCEPTED.
3. DRAIN CONNECTIONS SHALL BE OF THE SAME MATERIAL AS THE PRIMARY DRAIN PAN AND SHALL EXTEND A MINIMUM 2-1/2-INCH BEYOND THE BASE TO ENSURE ADEQUATE ROOM FOR FIELD PIPING OF CONDENSATE TRAPS.
4. THE INSTALLING CONTRACTOR IS RESPONSIBLE TO ENSURE THE UNIT IS INSTALLED LEVEL, TRAPPED IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS, AND VISUALLY INSPECTED TO ENSURE PROPER DRAINAGE OF CONDENSATE

F. FANS

1. FAN SECTIONS SHALL HAVE A MINIMUM OF ONE HINGED AND LATCHED ACCESS DOOR LOCATED ON THE DRIVE SIDE OF THE UNIT TO ALLOW INSPECTION AND MAINTENANCE OF THE FAN, MOTOR, AND DRIVE COMPONENTS. CONSTRUCT DOOR(S) PER SECTION 2.04.
2. DIRECT DRIVE FANS PROVIDED WITH ECM MOTORS SHALL HAVE A WELDED-ALUMINUM IMPELLER THAT IS DYNAMICALLY BALANCED AS AN ASSEMBLY. FAN SHALL BE MAINTENANCE FREE THROUGHOUT ITS OPERATING LIFE. FANS SHALL BE BALANCED TO G6.3 PER AMCA 204. NO VIBRATION ISOLATION IS NECESSARY. MOTOR CONTAINS INTEGRATED PID CONTROLLER AND ACCEPTS 0-10VDC INPUT FOR VARIABLE SPEED CONTROL.
3. MOTORS AND DRIVES
   a. ALL MOTORS, AND DRIVES FOR BELT DRIVE FANS, SHALL BE FACTORY-INSTALLED AND RUN TESTED. MOTORS FOR BELT DRIVEN FANS SHALL BE INSTALLED ON A SLIDE BASE TO PERMIT ADJUSTMENT OF BELT TENSION. SLIDE BASE SHALL BE DESIGNED TO ACCEPT ALL MOTOR SIZES OFFERED BY THE AIR-HANDLER MANUFACTURER FOR THAT FAN SIZE TO ALLOW A MOTOR CHANGE IN THE FUTURE, SHOULD AIRFLOW REQUIREMENTS CHANGE. FAN SECTIONS WITHOUT FACTORY-INSTALLED MOTORS SHALL HAVE MOTORS FIELD INSTALLED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH INSTALLATION OF MOTOR AND DRIVE, ALIGNMENT OF SHEAVES AND BELTS, RUN TESTING OF THE MOTOR, AND BALANCING OF THE ASSEMBLY.
   b. INTEGRAL HORSEPOWER MOTORS SHALL MEET OR EXCEED ALL NEMA STANDARDS PUBLICATION MG 1 - 2006 REQUIREMENTS AND COMPLY WITH NEMA PREMIUM EFFICIENCY LEVELS WHEN APPLICABLE. MOTORS SHALL COMPLY WITH APPLICABLE REQUIREMENTS OF NEC AND SHALL BE UL LISTED.
   c. INTEGRAL HORSEPOWER FAN MOTORS SHALL BE HEAVY DUTY, OPEN DRIP-PROOF OPERABLE AT <<UCCA_MOTOR_VOLTAGE>> VOLTS, 60HZ, 3-PHASE. IF APPLICABLE, MOTOR EFFICIENCY SHALL MEET OR EXCEED NEMA PREMIUM EFFICIENCIES.
   d. ALL FAN TYPES UTILIZING INTEGRAL HORSEPOWER MOTORS, SHALL USE 4-POLE, 1800 RPM, MOTORS, NEMA B DESIGN, WITH CLASS B INSULATION, CAPABLE TO OPERATE CONTINUOUSLY AT 104 DEG F (40 DEG C) WITHOUT TRIPPING OVERLOADS.
   e. MOTORS SHALL HAVE A +/- 10 PERCENT VOLTAGE UTILIZATION RANGE TO PROTECT AGAINST VOLTAGE VARIATION.
   f. V-BELT DRIVES FOR HOUSED FANS SHALL BE FIXED PITCH RATED AT 1.5 TIMES THE MOTOR NAMEPLATE. DRIVES 20 HP AND LARGER OR ANY DRIVES ON UNITS EQUIPPED WITH VFDS AND HOUSED FANS SHALL BE FIXED PITCH.
   g. ALL HOUSED FANS WITH MOTORS 15 HP AND LARGER SHALL BE EQUIPPED WITH MULTIPLE BELT DRIVES.

G. COILS

1. COILS SECTION HEADER END PANEL SHALL BE REMOVABLE TO ALLOW FOR REMOVAL AND REPLACEMENT OF COILS WITHOUT IMPACTING THE STRUCTURAL INTEGRITY OF THE UNIT.
2. INSTALL COILS SUCH THAT HEADERS AND RETURN BENDS ARE ENCLOSED BY UNIT CASING TO ENSURE THAT IF CONDENSATE FORMS ON THE HEADER OR RETURN BENDS, IT IS CAPTURED BY THE DRAIN PAN UNDER THE COIL.
3. COILS SHALL BE MANUFACTURED WITH PLATE FINS TO MINIMIZE WATER CARRYOVER AND MAXIMIZE AIRSIDE THERMAL EFFICIENCY. FIN TUBE HOLES SHALL HAVE DRAWN AND BELLED COLLARS TO MAINTAIN CONSISTENT FIN SPACING TO ENSURE PERFORMANCE AND AIR PRESSURE DROP ACROSS THE COIL AS SCHEDULED. TUBES SHALL BE MECHANICALLY EXPANDED AND BONDED TO FIN COLLARS FOR MAXIMUM THERMAL CONDUCTIVITY. USE OF SOLDERING OR TINNING DURING THE FIN-TO-TUBE BONDING PROCESS IS NOT ACCEPTABLE DUE TO THE INHERENT THERMAL STRESS AND POSSIBLE LOSS OF BONDING AT THAT JOINT.
4. CONSTRUCT COIL CASINGS OF GALVANIZED STEEL [STAINLESS STEEL]. END SUPPORTS AND TUBE SHEETS SHALL HAVE BELLED TUBE HOLES TO MINIMIZE WEAR OF THE TUBE WALL DURING THERMAL EXPANSION AND CONTRACTION OF THE TUBE.
5. ALL COILS SHALL BE COMPLETELY CLEANED PRIOR TO INSTALLATION INTO THE AIR HANDLING UNIT. COMPLETE FIN BUNDLE IN DIRECTION OF AIRFLOW SHALL BE DEGREASED AND STEAM CLEANED TO REMOVE ANY LUBRICANTS USED IN THE MANUFACTURING OF THE FINS, OR DIRT THAT MAY HAVE ACCUMULATED, IN ORDER TO MINIMIZE THE CHANCE FOR WATER CARRYOVER.
6. HYDRONIC COILS
   a. SUPPLY AND RETURN HEADER CONNECTIONS SHALL BE SUCH THAT DIRECTION OF COIL WATER-FLOW IS COUNTER TO DIRECTION OF UNIT AIR-FLOW.
   b. COILS SHALL BE PROOF-TESTED TO 300 PSIG AND LEAK-TESTED TO 200 PSIG AIR PRESSURE UNDER WATER.
   c. HEADERS SHALL BE CONSTRUCTED OF ROUND COPPER PIPE.
   d. TUBES SHALL BE 1/2-INCH .016 COPPER, WITH ALUMINUM FINS.

H. FILTERS

1. PROVIDE FACTORY-FABRICATED FILTER SECTION OF THE SAME CONSTRUCTION AND FINISH AS UNIT CASINGS. FILTER SECTION SHALL HAVE SIDE ACCESS FILTER GUIDES AND ACCESS DOOR(S) EXTENDING THE FULL HEIGHT OF THE CASING TO FACILITATE FILTER REMOVAL. CONSTRUCT DOORS IN ACCORDANCE WITH SECTION 2.04. PROVIDE FIXED FILTER BLOCKOFFS AS REQUIRED TO PREVENT AIR BYPASS AROUND FILTERS. BLOCKOFFS SHALL NOT NEED TO BE REMOVED DURING FILTER REPLACEMENT. FILTERS TO BE OF SIZE, AND QUANTITY NEEDED TO MAXIMIZE FILTER FACE AREA OF EACH PARTICULAR UNIT SIZE.
2. FILTER TYPE, MERV RATING, AND ARRANGEMENT SHALL BE PROVIDED AS DEFINED IN PROJECT PLANS AND SCHEDULE

I. DAMPERS

1. ALL DAMPERS SHALL BE INTERNALLY MOUNTED. DAMPERS SHALL BE PREMIUM ULTRA LOW LEAK AND LOCATED AS INDICATED ON THE SCHEDULE AND PLANS. PARALLEL BLADE ARRANGEMENT SHALL BE PROVIDED AS INDICATED ON THE SCHEDULE AND DRAWINGS. DAMPERS SHALL BE RUSKIN CD60 DOUBLE-SKIN AIRFOIL DESIGN OR EQUIVALENT FOR MINIMAL AIR LEAKAGE AND PRESSURE DROP. LEAKAGE RATE SHALL NOT EXCEED 3 CFM/SQUARE FOOT AT ONE INCH WATER GAUGE COMPLYING WITH ASHRAE 90.1 MAXIMUM DAMPER LEAKAGE AND SHALL BE AMCA LICENSED FOR CLASS 1A. ALL LEAKAGE TESTING AND PRESSURE RATINGS SHALL BE BASED ON AMCA STANDARD 500-D. MANUFACTURER SHALL SUBMIT BRAND AND MODEL OF DAMPER(S) BEING FURNISHED, IF NOT RUSKIN CD60.

2.4 DUCTWORK

A. SHEET METAL DUCTWORK - RECTANGULAR

1. DUCTS AND PLENUMS SHALL BE FABRICATED AND INSTALLED IN CONFORMANCE WITH THE LATEST EDITIONS OF: NFPA PAMPHLET NO. 90A; CALIFORNIA BUILDING CODE; CALIFORNIA MECHANICAL CODE AND THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS (METAL AND FLEXIBLE). DUCTS AND PLENUMS SHALL BE CONSTRUCTED OF HOT DIPPED GALVANIZED MILD STEEL AND SHALL HAVE AIRTIGHT CLASS "B" SEALS AT ALL TRANSVERSE JOINTS AND LONGITUDINAL SEAMS. TABLES AND FIGURES HEREINAFTER REFERENCED ARE FROM THE 2005 EDITION OF THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS (METAL AND FLEXIBLE).
2. RECTANGULAR DUCT CONSTRUCTION SHALL CONFORM TO TABLE 2-3. ALL TRANSVERSE JOINTS SHALL BE FLANGED PER TABLE 2-32, WITH CORNER CLOSURES OR "DUCT MATE" FLANGED CONNECTIONS WITH CORNER CLOSURES PER FIGURE 2-17. ELBOWS SHALL BE STANDARD RADIUS (TYPE RE 1) OR SQUARE THROAT WITH VANES (TYPE RE 2) PER FIGURE 4-2, WITH DOUBLE THICKNESS TURNING VANES PER FIGURES 4-3 AND 4-4. OFFSETS AND TRANSITIONS SHALL BE PER FIGURE 4-7. SUPPLY, RETURN, AND EXHAUST BRANCH CONNECTIONS SHALL BE PER FIGURE 4-5 OR 4-6. SPLITTERS SHALL NOT BE USED.
3. LINED DUCTS SHALL BE FABRICATED SUCH THAT THE NET INSIDE DIMENSIONS EQUALS THE DUCT SIZES SHOWN ON THE DRAWINGS.

B. SUPPORTS - SUPPORTS FOR HORIZONTAL DUCTS AND PLENUMS SHALL BE FABRICATED PER FIGURES 5-5 AND 5-6 AND TABLES 5-1, 5-2, AND 5-3. THE MAXIMUM DISTANCE BETWEEN HANGERS SHALL BE EIGHT FEET FOR RECTANGULAR DUCTS AND TWELVE FEET FOR ROUND DUCTS. ATTACHMENTS TO THE STRUCTURE SHALL BE MADE WITH ADEQUATELY SIZED LAG BOLTS FOR STRAPHANGERS AND ADEQUATELY SIZED MACHINE BOLTS AND SIDE BEAM BRACKETS FOR ROD HANGERS. SUPPORTS FOR VERTICAL DUCTS SHALL BE BAND IRON STRAP OR ANGLE BRACKET TYPE PER FIGURE 5-8 AND 5-9.

C. DUCT ACCESS DOORS: INCLUDING THOSE FOR REMOVING FILTERS, DUCT ACCESS DOORS SHALL BE AS DETAILED IN FIGURE 7-2 WITH SASH LOCKS, PIANO HINGES, AND GASKETS. ACCESS DOORS SHALL HAVE AN UNOBSTRUCTED FULL SWING.

2.5 DUCTWORK ACCESSORIES

A. FLEXIBLE DUCT CONNECTIONS

1. DURO-DYNE "METAL-FAB" WITH DUROION, VENTFABRICS "VENTGLASS," OR APPROVED EQUAL.
2. INSTALL AT EACH POINT WHERE A BLOWER UNIT IS CONNECTED TO A DUCT. A MINIMUM CLEARANCE OF THREE INCHES BETWEEN THE DUCT AND THE SOURCE OF VIBRATION SHALL BE MAINTAINED. INSTALL PER FIGURE 2-17.

B. SCREENS - INSTALL REMOVABLE BIRD SCREENS AT ALL OUTSIDE INTAKES AND EXHAUST AIR DISCHARGES. SCREENS SHALL BE FABRICATED FROM ½" X 14 GAUGE MESH SECURED IN FULL FRAMES. SCREENS AND FRAMES SHALL BE CONSTRUCTED OF THE SAME MATERIAL AS THE DUCT, HOOD, OR EQUIPMENT TO WHICH ATTACHED.

C. JOINTS - TAPE ALL JOINTS AIRTIGHT USING HARDCAST TYPE "DT" PRESSURELESS TAPE AND "HD-20" ADHESIVE, PER MANUFACTURER'S DIRECTIONS.

D. DAMPERS - PROVIDE BUTTERFLY OR MULTI-BLADE DAMPERS WHERE INDICATED ON THE DRAWINGS OR AS REQUIRED FOR BALANCING AIR QUANTITIES TO VALUES SHOWN WITHOUT GENERATING EXCESSIVE NOISE. PROVIDE DURO-DYNE "KS-385," OR APPROVED EQUAL, LOCKING QUADRANTS ON EACH MANUAL DAMPER. LOCATE DAMPERS IN FURRED CEILINGS NEAR ACCESS PANELS WHERE POSSIBLE.

1. BUTTERFLY DAMPERS SHALL BE CONSTRUCTED AS PER FIGURE 7-4, FIGURE A, B, AND C IN THE DUCT MANUAL.
2. MULTI-BLADE DAMPERS SHALL CONFORM TO FIGURE 7-5.
3. BACK-DRAFT DAMPERS SHALL BE AIR BALANCE "AIR DYNAMIC" MODEL DY-1002-V, OR EQUAL.

2.6 INSULATION

A. EXTERIOR OF DUCTWORK:

1. UNLESS SPECIFIED TO BE LINED, ALL SHEET METAL SUPPLY AND RETURN DUCTS IN INDIRECTLY CONDITIONED SPACES SHALL BE INSULATED ON THE OUTSIDE WITH JOHNS MANVILLE "MICROLITE XG" FLEXIBLE FIBERGLASS BLANKET-TYPE DUCT WRAP, WITH FACTORY APPLIED FSK ALUMINUM FOIL FACING, WITH A COMPOSITE UL RATING OF 25/50, MINIMUM R-6 INSTALLED.
2. UNLESS SPECIFIED TO BE LINED, ALL SHEET METAL SUPPLY AND RETURN DUCTS IN UNCONDITIONED SPACES SHALL BE INSULATED ON THE OUTSIDE WITH JOHNS MANVILLE "MICROLITE XG" FLEXIBLE FIBERGLASS BLANKET-TYPE DUCT WRAP, WITH FACTORY APPLIED FSK ALUMINUM FOIL FACING, WITH A COMPOSITE UL RATING OF 25/50, MINIMUM R-8 INSTALLED.
3. ALL OUTSIDE AIR DUCTWORK BETWEEN BUILDING OUTSIDE AIR INLET AND HVAC UNIT OR HEAT/ENERGY RECOVERY VENTILATOR SHALL BE INSULATED ON THE OUTSIDE WITH JOHNS MANVILLE "MICROLITE XG" FLEXIBLE FIBERGLASS BLANKET-TYPE DUCT WRAP, WITH FACTORY APPLIED FSK ALUMINUM FOIL FACING, WITH A COMPOSITE UL RATING OF 25/50, MINIMUM R-4 INSTALLED.
4. EXHAUST DUCTWORK WITHIN 10 FEET OF TERMINATION POINT AND BETWEEN ANY HEAT/ENERGY RECOVERY VENTILATOR AND EXHAUST TERMINATION SHALL BE INSULATED ON THE OUTSIDE WITH JOHNS MANVILLE "MICROLITE XG" FLEXIBLE FIBERGLASS BLANKET-TYPE DUCT WRAP, WITH FACTORY APPLIED FSK ALUMINUM FOIL FACING, WITH A COMPOSITE UL RATING OF 25/50, MINIMUM R-4 INSTALLED.

B. INTERIOR OF DUCTWORK:

1. DUCT LINING SHALL BE INSTALLED IN SUPPLY AND RETURN DUCTS AND PLENUMS WHERE NOTED ON THE DRAWINGS. LINING SHALL BE JOHNS MANVILLE "PERMACOTELINACOUSTIC R" RIGID FIBERGLASS BOARD FOR PLENUMS AND "PERMACOTELINACOUSTIC HP" FIBERGLASS DUCT LINER FOR DUCTS, 1" THICK, UNLESS OTHERWISE NOTED, WITH FIRE RESISTANT COATING. DUCT LINER SHALL MEET ASTM C 1071, WITH AIR SURFACE COATED WITH ACRYLIC COATING TREATED WITH EPA REGISTERED ANTI-MICROBIAL AGENT PROVE TO RESIST MICROBIAL GROWTH AS DETERMINED BY ASTM G 21 AND G 22. INSULATION WITH TORN OR BROKEN COATING SHALL BE REMOVED AND REPLACED. LOOSE CORNERS, EDGES, AND BUTT JOINTS WILL NOT BE ACCEPTED.
2. ALL EXPOSED EXTERIOR SUPPLY AND RETURN DUCTWORK SHALL HAVE MINIMUM 2" INTERIOR INSULATION, AS SPECIFIED IN THIS SECTION.
3. MAXIMUM VELOCITY: 5,000 FT/MIN.
4. FASTENERS: DUCT LINER GALVANIZED STEEL PINS, WELDED OR MECHANICALLY FASTENED.
5. DEVELOPED SMOKE DENSITY SHALL NOT EXCEED 50. FLAME SPREAD RATING SHALL NOT EXCEED 25.

2.7 HYDRONIC PIPING ABOVE GRADE

A. ALL HYDRONIC PIPING 4" AND SMALLER SHALL BE TYPE L, HARD TEMPER, COPPER PIPE WITH WROUGHT COPPER OR CAST BRASS SOLDER JOINT FITTINGS.

2.8 HYDRONIC PIPNG INSULATION

A. INSULATE ALL SUPPLY AND RETURN PIPING WITH JOHNS MANVILLE "MICRO-LOK", OWENS CORNING "FIBERGLAS", CERTAINTEED, OR EQUAL, RIGID FIBERGLASS ONE-PIECE PIPE INSULATION WITH AN ALL PURPOSE VAPOR RETARDER JACKET. JACKETS SHALL BE CONSTRUCTED OF HIGH DENSITY, WHITE KRAFT BONDED TO ALUMINUM FOIL WITH FIBERGLASS YARN, WITH A PRESSURE SENSITIVE CLOSURE SYSTEM. ADHESIVES OR STAPLES WILL NOT BE REQUIRED TO SEAL THE JACKET AND BUTT STRIPS.

B. FITTINGS SHALL BE COVERED WITH JOHNS MANVILLE "ZESTON 2000 SERIES", INSULATED PVC FITTING COVERS.

C. INSULATION FOR ALL EXPOSED PIPING AND ALL PIPING IN MECHANICAL ROOMS AND SIMILAR SPACES SHALL BE COVERED WITH JOHNS MANVILLE ZESTON PVC JACKETING AND ZESTON PVC FITTING COVERS. PVC JACKETS SHALL BE 20 MILS THICK AND SHALL BE BONDED WITH ZESTON PERMA-WELD ADHESIVE. INSULATION THICKNESS SHALL BE 1 ½" FOR ALL HEATING HOT WATER PIPE SIZES.

D. ALL PIPING EXPOSED TO THE WEATHER SHALL BE FINISHED WITH ALUMINUM JACKETING WITH A LAMINATED MOISTURE RETARDER. ALUMINUM JACKETING SHALL BE OVERLAPPED 2 TO 3 INCHES AND HELD IN PLACE WITH STAINLESS STEEL BANDS TO FORM A WEATHER TIGHT SYSTEM. ELBOWS AND TEES SHALL BE FITTED WITH MATCHING ALUMINUM FITTING COVERS.

2.9 PRESSURE AND TEMPERATURE TEST STATIONS

A. "PETE'S PLUG", OR EQUAL, ¼" MPT FITTING TO RECEIVE EITHER A TEMPERATURE OR PRESSURE PROBE, 1/8" O.D. FITTINGS SHALL BE SOLID BRASS WITH TWO VALVE CORES OF NORDEL. ADDITIONALLY, THE CONTRACTOR SHALL SUPPLY TO THE OWNER ONE PRESSURE GAUGE ADAPTOR WITH 1/8" PROBE, AND ONE 5" STEM POCKET TESTING THERMOMETER (0-220°F).

2.10 THERMOMETERS

A. WEKSLER, WEISS, OR APPROVED EQUAL. ADJUSTABLE WITH SEPARABLE SOCKETS AND 6" MINIMUM SCALE READING OF 30-240°F. THE PROPER RANGE SHALL BE SELECTED SO THAT THE OPERATING TEMPERATURE OF THE MATERIAL BEING MEASURED WILL FALL APPROXIMATELY IN THE MIDDLE OF THE SCALE.

B. THERMOMETER FOR PIPELINE OR TANK MOUNTING SHALL HAVE (BRASS OR STAINLESS STEEL) SEPARABLE WELL. THERMOMETERS INSTALLED ON TANKS SHALL HAVE 6" MINIMUM STEM LENGTH.

C. WHERE INSULATION EXCEEDS 2", A LONGER STEM SHALL BE USED WITH AN EXTENSION NECK SEPARABLE WELL.

D. THERMOMETERS FOR MEASURING FLUID TEMPERATURES SHALL HAVE STEMS WITH INSERTION LENGTH ROUGHLY HALF OF THE PIPE DIAMETER; MINIMUM INSERTION LENGTH SHALL BE 2".

E. THERMOMETERS FOR MEASURING AIR TEMPERATURE SHALL HAVE DUCT FLANGE CONNECTIONS IN PLACE OF SEPARABLE WELL.

F. FOR APPLICATIONS WHERE THE PROCESS MEDIA MAY BE CORROSIVE OR CONTAINED UNDER PRESSURE, THE USE OF A THERMOWELL IS REQUIRED TO PREVENT DAMAGE TO THE THERMOMETER AND FACILITATE ITS REMOVAL FROM THE PROCESS.

2.11 PRESSURE GAUGES

A. PRESSURE GAUGES SHALL BE TRERICE NO. 600CB OR APPROVED EQUAL.

B. PRESSURE GAUGES SHALL BE OF THE 4 ½"DIAL SIZE WITH FLANGELESS CAST ALUMINUM CASE, STAINLESS STEEL FRICTION RING AND GLASS WINDOW. MOVEMENT SHALL BE BRASS WITH A BOURDON TUBE AND BRASS SOCKET. DIAL FACE SHALL BE WHITE WITH BLACK GRADUATIONS AND MARKINGS. POINTER SHALL BE FRICTION ADJUSTABLE TYPE. ACCURACY SHALL BE + 1% OF SCALE RANGE, ASME B40.100 GRADE 1A.

C. RANGE OF GAUGES SHALL BE NOT MORE THAN THE OPERATING RANGE X 1.5. THE PROPER RANGE WILL BE SELECTED SO THAT THE AVERAGE OPERATING PRESSURE FALLS APPROXIMATELY IN THE MIDDLE OF THE SCALE SELECTED.

D. A GAUGE COCK SHALL BE SUPPLIED AT EACH GAUGE CONNECTION.

E. GAUGES ON ANY SERVICE WHERE PRESSURE SURGES OR PULSATIONS ARE POSSIBLE SHALL BE PROVIDED WITH PRESSURE SNUBBERS.

2.12 VALVES, SPECIALTIES

A. FLEXIBLE CONNECTORS: AT ALL AIR HANDLING UNITS WITH SPRING ISOLATORS, PROVIDE MASON MN FLEXIBLE CONNECTORS WITH BRAIDED 304 SS HOSE.

B. BALL VALVES: NIBCO T/S-585-70, BRONZE BODY, REINFORCED PTFE SEAT RING, FULL PORT, TWO PIECE, LEVER HANDLE, 125 LB, THREADED OR SOLDERED END CONNECTIONS. SUBSTITUTIONS ARE NOT ACCEPTABLE. JAIL MAINTENANCE PERSONNEL KEEP NIBCO VALVES IN STOCK. NEW VALVES MUST MATCH EXISTING VALVES USED IN SYSTEM.

C. CHECK VALVES, HORIZONTAL: NIBCO T/S-413, BRONZE BODY, SWING CHECK VALVE, Y-PATTERN DESIGN, RENEWABLE BUNA-N SEAT DISC, 125 LB, THREADED OR SOLDERED END CONNECTIONS.

D. RELIEF VALVES: WATER HEATER TEMPERATURE/PRESSURE RELIEF VALVE, WATTS, M&M, OR EQUAL WITH ASME RATING, AND AGA CERTIFIED DESIGN. SET AT 125 PSI AND 210°F.

E. AIR ELIMINATORS: AIR VENTS SHALL BE INSTALLED AT ALL HIGH POINTS IN ALL WATER PIPING SYSTEMS.

1. AUTOMATIC AIR VENTS: BELL & GOSSETT NUMBER 400, FLOAT TYPE, BRASS CONSTRUCTION, 1/8" NPT CONNECTION OR APPROVED ARMSTRONG EQUIVALENT.
2. MANUAL AIR VENTS: 1 INCH IPS X 2 INCHES LONG AIR CHAMBERS WITH READILY ACCESSIBLE DONE NO. 10 VENT VALVE AND 1/8 INCH COPPER TUBING.

F. BALANCE VALVES: BELL AND GOSSETT CIRCUIT SETTER PLUS OR APPROVED ARMSTONG EQUIVALENT. LEAD-FREE BRASS DESIGN, MANUAL BALANCE VALVE.

G. ALL VALVES, EXCEPT PRESSURE REDUCING AND CONTROL VALVES, SHALL BE THE SAME SIZE AS THE PIPE TO WHICH THEY ARE INSTALLED.

H. PROVIDE A UNION IMMEDIATELY DOWNSTREAM FROM EACH VALVE, UNLESS THE VALVE IS FLANGED.

I. ALL VALVES SHALL BE INSTALLED WITH THE STEM 45 DEGREES ABOVE HORIZONTAL, IF POSSIBLE. IN NO CASE SHALL THE STEM BE INSTALLED BELOW HORIZONTAL.

PART 3 - EXECUTION

3.1 EQUIPMENT STARTUP

A. NOTIFY THE OWNER'S REPRESENTATIVE A MINIMUM OF TWO WEEKS PRIOR TO EQUIPMENT STARTUP DATE TO ALLOW FOR OWNER'S PERSONNEL TO BE PRESENT DURING STARTUP.

B. MANUFACTURER MUST PROVIDE A SERVICE TECHNICIAN TO SUPERVISE RIGGING OF THE UNITS TO ENSURE PROPER FIT.

C. UNIT MUST BE CHECKED OUT, TESTED AND PLACED INTO OPERATION BY THE INSTALLING CONTRACTOR UNDER THE SUPERVISION OF AN AUTHORIZED REPRESENTATIVE OF THE FACTORY.

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Andrew McSorley, DSFM
JUN 19 2018
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

HUMBOLDT STATE UNIVERSITY
FACILITIES MANAGEMENT
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REGISTERED PROFESSIONAL ENGINEER
B. R. ABRAHAMS
No. M35923
EXP. 3-31-2020
MECHANICAL
STATE OF CALIFORNIA

SHC AHU REPLACEMENT

AHU REPLACEMENT
STUDENT HEALTH CENTER (BLDG 42)

STATUS
PERMIT DOCUMENTS

BUILDING PERMIT APPROVAL:
This project has demonstrated conformance with applicable codes and standards established by statute and University policy. Based on this determination these documents are
'APPROVED FOR CONSTRUCTION'
Michael Fisher
Campus Deputy Building Official
Humboldt State University
The California State University
Date: 6/19/18
Permit #: 2017/18-017

Other approvals, as applicable:
SFM Approval: 6/19/18
DSA Access Approval: N/A
Seismic Peer Review: N/A
Other: N/A

PROJECT #: XPL 226
W.O. #s:

ISSUE DATE: MAY 23, 2018
REV:

SHEET TITLE
MECHANICAL SPECIFICATIONS

SHEET
M0

MECHANICAL SPECIFICATIONS

D. DURING STARTUP, THE FULL FUNCTIONALITY OF THE EQUIPMENT SHALL BE DEMONSTRATED TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE, INCLUDING HEATING, MECHANICAL COOLING, ECONOMIZER COOLING, ZONE MODULATION, AND ALL EMERGENCY SHUTDOWN FEATURES.

3.2 EQUIPMENT, GENERAL REQUIREMENTS

A. EQUIPMENT SHALL OPERATE QUIETLY AND WITHOUT OBJECTIONABLE VIBRATION. SUCH PROBLEMS, OTHER THAN FROM EQUIPMENT OPERATING AT OPTIMUM CONDITIONS, SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE ELIMINATED AT THE DIRECTION OF THE ARCHITECT.

B. INSTALL EQUIPMENT TO PROVIDE GOOD APPEARANCE, EASY ACCESS, AND ADEQUATE SPACE TO ALLOW REPLACEMENT AND MAINTENANCE. PROVIDE BASES, SUPPORTS, ANCHOR BOLTS, AND OTHER ITEMS REQUIRED TO ACHIEVE THIS. INSTALLATION SHALL BE LEVEL, ABOVE MOISTURE LEVEL, AND ADEQUATELY BRACED.

C. THOROUGHLY LUBRICATE EQUIPMENT BEFORE OPERATING. REPAIR OF DAMAGE RESULTING FROM FAILURE TO COMPLY WITH THIS REQUIREMENT SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

D. CONNECTIONS TO PIPING SHALL BE SECURED AND PROPERLY ALIGNED AND ALL UTILITY AND CONTROL CONNECTIONS SHALL BE PROPERLY ISOLATED FROM THE BUILDING STRUCTURE BY MEANS OF VIBRATION ISOLATORS AND FLEXIBLE CONNECTIONS. ANY EQUIPMENT NOT MEETING THIS REQUIREMENT WILL BE MODIFIED AND REINSTALLED AT NO EXPENSE TO THE OWNER.

E. MOVE EQUIPMENT INTO BUILDING THROUGH AVAILABLE OPENINGS. DISMANTLE EQUIPMENT WHERE NECESSARY TO ACCOMPLISH THIS. AFTER REASSEMBLY, TEST EQUIPMENT TO VERIFY ITS SATISFACTORY OPERATING CONDITION.

3.3 DUCTWORK

A. ALL DUCTWORK SHALL BE INSTALLED WITHIN SPACES PROVIDED WHERE POSSIBLE. DUCTS SHALL BE INSTALLED TRUE TO LINE AND GRADE, FULLY SECURED TO STRUCTURAL FAMING WITH SPECIFIED HANGERS AND SUPPORTS, INSULATED, AND VIBRATION ISOLATED, WHERE REQUIRED.

B. EACH SECTION OF SUPPLY AIR DUCTWORK SHALL BE CLEANED AT THE SHOP, DUST AND OIL FREE, USING A DEGREASING AGENT AND DETERGENT AND SEALED AIRTIGHT AT BOTH ENDS WITH VISQUEEN AND TAPE. SUPPLY DUCTS SHALL BE ADDITIONALLY CLEANED WITH A DISINFECTING SOLUTION. ENDS OF ALL SUPPLY AND INTERNALLY INSULATED EXHAUST DUSTS SHALL BE KEPT SEALED UNTIL THE TIME THEY ARE JOINTED. WHEN DUCT SECTIONS ARE JOINED, WIPE DOWN ALL INTERIOR SURFACES WITH A CLEAN TACK CLOTH. IF TACK CLOTH SHOWS ANY DUST, THEN RE-CLEAN DUCT AS DESCRIBED ABOVE. THE INTENT IS THAT NO FOREIGN MATTER BE ALLOWED TO ENTER THE DUCTWORK AT ANY TIME AFTER FACTORY CLEANING AND DURING CONSTRUCTION.

3.4 CONTROLS

A. THIS CONTRACTOR SHALL PROVIDE ALL REQUIRED CONTROL COMPONENTS, INCLUDING BUT NOT LIMITED TO THERMOSTATS, TEMPERATURE SENSORS, STATIC PRESSURE SENSORS, HUMIDITY SENSORS, DAMPER ACTUATORS, VALVE ACTUATORS, UNITARY CONTROLLERS, RELAYS, AND LOW-VOLTAGE WIRING, SUCH THAT THE OWNER IS PROVIDED WITH A FULLY FUNCTIONAL CONTROL SYSTEM.

B. WHERE WORK IS PERFORMED IN AN EXISTING BUILDING, THIS CONTRACTOR SHALL INTEGRATE ALL CONTROL MODIFICATIONS INTO THE EXISTING BUILDING CONTROL SYSTEM, IF APPLICABLE. SPECIFIC REQUIREMENTS SHALL BE COORDINATED WITH OWNER AND APPROVED BY ARCHITECT PRIOR TO INSTALLATION.

C. INSTALLATION OF THE SYSTEM SHALL BE MADE UNDER THE SUPERVISION OF THE MANUFACTURER OF THE EQUIPMENT, OR HIS FACTORY AUTHORIZED REPRESENTATIVE.

D. ROOM THERMOSTATS SHALL BE INSTALLED IN THE LOCATIONS INDICATED ON THE CONTRACT DRAWINGS. FINAL LOCATIONS SHALL BE COORDINATED WITH OWNER'S MAINTENANCE PERSONNEL AND SHALL BE INSTALLED IN LOCATIONS WHICH SHALL PROVIDE REPRESENTATIVE TEMPERATURES FOR THE ADJACENT AREAS.

E. LOW VOLTAGE CONTROL WIRING AND CONDUIT SHALL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF DIVISION 26.

3.5 INSULATION

A. EXTERIOR DUCTWORK:

1. THE INSULATION SHALL BE CUT LONGER THAN THE PERIMETER OF THE DUCT TO PROVIDE 2" STAPLE LAP AND MINIMUM COMPRESSION AT THE CORNERS. ALL JOINTS SHALL BE LAPPED 2' AND STAPLED WITH OUTWARD CLINCHING STAPLES 2" ON CENTER. THE INSULATION SHALL BE MECHANICALLY FASTENED TO THE UNDERSIDE OF ALL DUCTS 24" WIDE OR MORE USING CUP-HEAD PINS, WELD PINS, OR STICK PINS WITH SPEED CLIPS 18" ON CENTER. ALL JOINTS AND PENETRATIONS OF THE VAPOR BARRIER JACKET SHALL BE SEALED WITH A MINIMUM 3" WIDE MATCHING PRESSURE SENSITIVE TAPE. PRESSURE-SENSITIVE TAPE SHALL BE FIRMLY RUBBED IN PLACE IMMEDIATELY AFTER APPLICATION USING A "SQUEEGEE" TYPE TOOL.
2. WHEN A VAPOR SEAL IS REQUIRED, TWO COATS OF VAPOR RETARDER MASTIC REINFORCED WITH ONE LAYER OF 4" WIDE, OPEN WEAVE GLASS FABRIC MAY BE USED IN LIEU OF PRESSURE-SENSITIVE TAPE. MASTIC SHALL BE BRUSHED ONTO JOINT AND GLASS FABRIC UNTIL THE FABRIC IS FILLED. MASTICS SHALL BE APPLIED IN ACCORDANCE WITH APPLICATION INSTRUCTIONS ON THE CONTAINER.

B. INTERIOR DUCT LINER

1. APPLY TO THE INSIDE FACE OF DUCTS, COATED SIDE FACING AIR STREAM, FASTEN USING FIRE RETARDANT ADHESIVE MEETING ASTM C 9169, AND SECURE WITH MECHANICAL LINER FASTENERS AT 24" MAXIMUM O.C., BOTH DIRECTIONS. PIN LENGTH SHOULD BE SUCH AS TO LIMIT COMPRESSION OF LINER.
2. EXPOSED EDGES MUST BE FACTORY OR FIELD COATED. FOR SYSTEMS OPERATING AT 4000 FPM OR HIGHER, A METAL NOSING MUST BE INSTALLED ON ALL LINER LEADING EDGES. INSULATION WITH TORN OR BROKEN COATINGS SHALL BE REMOVED OR REPLACED. LOOSE CORNERS, EDGES, AND BUTT JOINTS WILL NOT BE ACCEPTED.

3.6 TEST, INSPECTIONS

A. MAKE ALL NECESSARY CONTROL ADJUSTMENTS AND BALANCING OF AIR AND WATER FLOWS. OPERATE THE ENTIRE SYSTEM FOR A PERIOD OF TIME NOT LESS THAN THREE (3) WORKING DAYS FOR THE PURPOSE OF PROVING SATISFACTORY PERFORMANCE. DURING THIS PERIOD, INSTRUCT SUCH PERSONS AS THE OWNER AND/OR ARCHITECT MAY DESIGNATE IN THE PROPER OPERATION OF THE SYSTEMS. SHOULD FURTHER ADJUSTMENT PROVE NECESSARY, OPERATING TESTS SHALL BE REPEATED UNTIL A SATISFACTORY TEST IS OBTAINED.

B. THIS CONTRACTOR SHALL NOT ALLOW OR CAUSE ANY WORK OF THIS SECTION TO BE COVERED OR ENCLOSED UNTIL IT HAS BEEN INSPECTED, TESTED, AND APPROVED BY THE ARCHITECT AND THE AUTHORITIES HAVING JURISDICTION OVER THE WORK. SHOULD ANY OF THIS WORK BE ENCLOSED OR COVERED UP BEFORE SUCH INSPECTION, TESTING, AND APPROVAL, THIS CONTRACTOR SHALL UNCOVER THE WORK, HAVE THE NECESSARY INSPECTIONS, TESTS, AND APPROVALS MADE AND, AT NO EXPENSE TO THE OWNER, MAKE ALL REPAIRS NECESSARY TO RESTORE BOTH HIS WORK AND THAT OF OTHER CONTRACTORS WHICH MAY HAVE BEEN DAMAGED TO BE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

END OF SECTION

TESTING, ADJUSTING, AND BALANCING SPECIFICATIONS

PART 1 GENERAL

1.1 SCOPE

A. PROVIDE ALL SUPERVISION, PERSONNEL, INSTRUMENTS, CALIBRATION, EQUIPMENT, AND ALL OTHER MATERIALS NECESSARY TO PERFORM BALANCING AND TESTING, AND COMPILE TEST DATA INCLUDING CALCULATIONS AND SERVICES NECESSARY FOR THE HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS FOR THIS PROJECT, ALL IN ACCORDANCE WITH THE PROJECT DRAWINGS AND SPECIFICATIONS AND AS SPECIFIED HEREIN.

1.2 GENERAL

A. MECHANICAL CONTRACTOR WILL EMPLOY A TESTING, ADJUSTING, AND BALANCING (TAB) AGENCY THAT IS CERTIFIED BY ASSOCIATED AIR BALANCING COUNCIL (AABC), NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB), OR TESTING, ADJUSTING, AND BALANCING BUREAU (TABB).

B. THE TAB AGENCY SHALL BE RESPONSIBLE FOR INSPECTING, BALANCING, ADJUSTING, TESTING, AND LOGGING THE DATA OF THE PERFORMANCE OF FANS, ALL DAMPERS IN THE DUCT SYSTEMS, ALL AIR DISTRIBUTION DEVICES, AND THE FLOWS OF WATER THROUGH ALL COILS.

C. EXISTING EQUIPMENT, UNLESS SPECIFICALLY MENTIONED OTHERWISE, SHALL NOT IN THE SCOPE OF THE TAB WORK.

D. A COMPLETELY OPERABLE SYSTEM SHALL BE PLACED INTO OPERATION EACH DAY DURING TESTING AND BALANCING.

E. THE TAB AGENCY SHALL UTILIZE INSTRUMENTATION WHICH MEETS THE REQUIREMENTS OF ASHRAE 111, SECTION 5, "INSTRUMENTATION".

F. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR CERTIFYING IN WRITING THAT THE SYSTEM, AS SCHEDULED FOR BALANCING, IS OPERATIONAL AND COMPLETE. COMPLETENESS SHALL INCLUDE NOT ONLY THE PHYSICAL INSTALLATION, BUT THE MECHANICAL CONTRACTOR'S CERTIFICATION THAT THE PRIME MOVERS ARE INSTALLED IN GOOD WORKING ORDER, AND THAT FULL LOAD PERFORMANCE HAS BEEN PRELIMINARY TESTED UNDER THE CERTIFICATION OF THE MECHANICAL CONTRACTOR. BEFORE ANY TESTING AND BALANCING IS STARTED, A COMPLETE REPORT SHALL BE SENT TO THE TAB AGENCY BY THE MECHANICAL CONTRACTOR.

G. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING ALL MODIFICATIONS TO RECERTIFY DISCREPANCIES REPORTED BY THE TAB CONTRACTOR AS INDICATING NON-COMPLIANCE WITH THE CONTRACT DOCUMENTS. BY COMPLETING THE WORK ON TIME, THE MECHANICAL CONTRACTOR SHALL PROVIDE SUFFICIENT TIME BEFORE THE COMPLETION DATE SO THAT BALANCING CAN BE ACCOMPLISHED.

H. IF CONSTRUCTION DEFICIENCIES ARE ENCOUNTERED WHICH PRECLUDE OBTAINING OPTIMUM CONDITIONS, THE DEFICIENCIES WILL BE RECORDED AND GIVEN TO THE OWNER'S REPRESENTATIVE. THE TAB AGENCY IS ADVISED THAT DEFICIENCIES IN THE HVAC CONSTRUCTION ARE OFTEN ENCOUNTERED DURING FINAL TAB SERVICES, AND SHOULD INCLUDE IN THE BID AN AMOUNT DEEMED ADVISABLE TO COMPENSATE FOR TIME IN IDENTIFYING THE DEFICIENCIES.

1.3 SERVICES

A. THE TAB AGENCY WILL BALANCE, TEST, AND ADJUST THE SYSTEMIC COMPONENTS TO OBTAIN OPTIMUM CONDITIONS IN EACH CONDITIONED SPACE IN THE BUILDING. IF CONSTRUCTION DEFICIENCIES ARE ENCOUNTERED WHICH PRECLUDE OBTAINING OPTIMUM CONDITIONS, THE DEFICIENCIES WILL BE RECORDED AND GIVEN TO THE OWNER'S REPRESENTATIVE. THE TAB AGENCY IS ADVISED THAT DEFICIENCIES IN THE HVAC CONSTRUCTION ARE OFTEN ENCOUNTERED DURING FINAL TAB SERVICES, AND SHOULD INCLUDE IN THE BID AN AMOUNT DEEMED ADVISABLE TO COMPENSATE FOR TIME IN IDENTIFYING THE DEFICIENCIES.

B. THE REPORT SHALL BE COMPLETE WITH LOGS, DATA, AND RECORDS AS REQUIRED HEREIN AND ALL LOGS, DATA, AND RECORDS SHALL BE TYPED, PRODUCED, ON WHITE BOND PAPER, AND BOUND. TRANSMIT FOUR COPIES DIRECTLY TO THE OWNER'S REPRESENTATIVE TO BE DISTRIBUTED TO THE MECHANICAL CONTRACTOR, CONTROLS CONTRACTOR, ENGINEER, AND RECORD FILE.

C. THE REPORT SHALL CONTAIN THE FOLLOWING GENERAL DATA IN A FORMAT SELECTED BY THE TAB AGENCY FOR CLARITY AND EASE OF REFERENCE.

1. PROJECT TITLE.
2. PROJECT LOCATION.
3. PROJECT ARCHITECT (FIRM NAME AND ADDRESS).
4. PROJECT MECHANICAL ENGINEER (NAME).
5. TAB FIELD TEST ENGINEER (NAME).
6. TAB AGENCY (FIRM NAME AND ADDRESS).
7. INCLUSIVE DATES TESTS WERE PERFORMED AND DATE OF REPORT.
8. CALIBRATION CERTIFICATES OF EACH INSTRUMENT USED ALONG WITH SPECIFIC ID NUMBERS (I.E., SERIAL NUMBERS).

1.4 SUBMITTALS

A. SUBMITTAL NO. 15950 (1) - TAB AGENDA

1. THE TAB CONTRACTOR SHALL SUBMIT A COMPLETE AGENDA, WHICH SHALL OUTLINE IN FULL THE TESTING METHODS AND LOCATIONS FOR EACH HVAC SYSTEM AND/OR DEVICE THAT IS WITHIN THE SCOPE OF THE TAB WORK. THE AGENDA SHALL REPRESENT THE TOTAL SYSTEM BALANCE REPORT, LESS FIELD TEST DATA. AREAS OF INTENDED FIELD TEST INPUTS SHALL BE REPRESENTED BY FULLY LABELED BLANK SPACES.
2. THE TAB AGENDA SHALL ALSO INDICATE THE PROPOSED TEST METHODS, INSTRUMENTATION DEVICES AND ALL APPLICABLE CALIBRATION CERTIFICATES.

B. SUBMITTAL NO 15950 (2) - TAB REPORT

1. PROVIDE TEST AND BALANCE REPORT AS INDICATED HEREIN.

1.5 AIR SYSTEMS REQUIREMENTS

A. IN ADDITION TO THE ABOVE DATA IN ITS APPROPRIATE FORMAT, THE TEST AND BALANCE REPORT SHALL INCLUDE THE FOLLOWING DATA:

1. AIR HANDLING UNITS

a. MANUFACTURER AND MODEL.
b. SIZE.
c. MOTOR HP, VOLTAGE, PHASE, CYCLES, FULL LOAD AMPS.
d. LOCATION AND LOCAL IDENTIFICATION DATA.
e. IDENTIFICATION TAG LISTED IN SCHEDULES ON DRAWINGS AND SPECIFICATIONS.
f. SUPPLY AIRFLOW (CFM) AND EXHAUST AIRFLOW (CFM), WHERE APPLICABLE.
g. FAN RPM.
h. MOTOR CURRENT READINGS AT EACH FAN.
i. INLET AND OUTLET STATIC PRESSURE FROM SUPPLY FAN AND EXHAUST FAN (IF APPLICABLE). THESE READINGS SHALL BE RELATED TO THE FAN CURVE.
j. STATIC PRESSURE DIFFERENTIAL ACROSS EACH COIL AND FILTER SECTION.
k. ENTERING AIR AND LEAVING AIR TEMPERATURES (DB/WB) IN 100% COOLING MODE.
l. ENTERING AIR AND LEAVING AIR TEMPERATURES (DB) IN 100% HEATING MODE.
m. OUTDOOR AIR PERCENTAGE SETTING.
n. OUTDOOR AIRFLOW IN ECONOMIZER MODE (IF APPLICABLE).
o. OUTDOOR AIRFLOW IN DEMAND CONTROL VENTILATION MODE (IF APPLICABLE).

2. EXISTING HOT WATER CIRCULATING PUMPS

a. MANUFACTURER AND MODEL.
b. SIZE.
c. MOTOR HP, VOLTAGE, PHASE, CYCLES, FULL LOAD AMPS.
d. LOCATION AND LOCAL IDENTIFICATION DATA.
e. IDENTIFICATION TAG LISTED IN SCHEDULES ON DRAWINGS AND SPECIFICATIONS.
f. SUCTION PRESSURE (PSI).
g. DISCHARGE PRESSURE (PSI).
h. MOTOR RPM.
i. MOTOR CURRENT READINGS AT EACH PUMP.
j. WATER FLOW (GPM).

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES

A. DURING THE BALANCING, THE TEMPERATURE REGULATION SHALL BE ADJUSTED FOR PROPER RELATIONSHIP BETWEEN CONTROLLING INSTRUMENTS AND CALIBRATED. THE CORRECTNESS OF THE FINAL SETTING SHALL BE PROVED BY TAKING HOURLY READINGS FOR A PERIOD OF ONE SUCCESSIVE 8-HOUR DAY, IN A TYPICAL ROOM ON EACH SEPARATELY CONTROLLED ZONE, AFTER TENANT MOVES IN. THE TOTAL VARIATION SHALL NOT EXCEED 2 DEGREES FROM THE PRESET MEDIUM TEMPERATURE DURING THE TEMPERATURE SURVEY PERIOD. (THIS WILL BE DONE ONLY ON SYSTEMS THAT ARE TOTALLY OPERATIONAL).

3.2 AIR SYSTEMS PROCEDURES

A. THE TAB AGENCY SHALL PERFORM THE FOLLOWING TESTS AND BALANCE THE AIR SYSTEMS IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS:

1. TEST AND ADJUST BLOWER AND MOTOR RPM TO DESIGN REQUIREMENTS.
2. TEST AND RECORD MOTOR FULL LOAD AMPERES AND CORRESPONDING VOLTAGE.
3. MAKE PITOT TUBE TRAVERSE OF MAIN SUPPLY DUCTS AND OBTAIN DESIGN CFM AT FANS.
4. TEST AND RECORD SYSTEM STATIC PRESSURES, SUCTION AND DISCHARGE.
5. TEST AND ADJUST SYSTEM FOR DESIGN CFM OF OUTSIDE AIR.
6. TEST AND RECORD ENTERING AND LEAVING AIR DRY BULB TEMPERATURES OF ALL HEATING AND COOLING COILS.
7. TEST AND RECORD ENTERING AND LEAVING WET BULB TEMPERATURES OF ALL COOLING COILS.
8. ADJUST ALL MAIN SUPPLY AND RETURN AIR DUCTS TO PROPER DESIGN CFM. SYSTEM SUPPLY AIRFLOW, SYSTEM RETURN AIRFLOW, AND SYSTEM OUTDOOR AIRFLOW SHALL BE BALANCED TO WITHIN 5% OF THE DESIGN REQUIREMENT.
9. ADJUST ALL ZONES TO PROPER DESIGN CFM, SUPPLY AND RETURN.
10. TEST AND ADJUST EACH DIFFUSER, GRILLE, AND REGISTER TO WITHIN 10% OF DESIGN REQUIREMENT.
11. EACH GRILLE, DIFFUSER, AND REGISTER SHALL BE IDENTIFIED AS TO LOCATION AND AREA.
12. SIZE, TYPE, AND MANUFACTURER OF DIFFUSERS, GRILLES, REGISTERS, AND ALL TESTED EQUIPMENT SHALL BE IDENTIFIED AND LISTED. MANUFACTURER'S RATINGS ON ALL EQUIPMENT SHALL BE USED TO MAKE REQUIRED CALCULATIONS.
13. READINGS AND TEST OF DIFFUSERS, GRILLES, AND REGISTERS SHALL INCLUDE REQUIRED FPM VELOCITY AND TEST RESULTANT VELOCITY, REQUIRED CFM AND TEST RESULTANT CFM AFTER ADJUSTMENTS.
14. TAB AGENCY SHALL CHECK ALL CONTROLS TO ENSURE THEY ARE OPERATING AS SPECIFIED. PROVIDE THE CONTROL CONTRACTOR WITH SPECIFIC SET POINTS.

3.3 TEMPERATURE CONTROL SYSTEM

A. IN THE PROGRESS OF PERFORMING THE TAB WORK, THE TAB AGENCY SHALL:

1. WORK WITH THE CONTROLS CONTRACTOR TO ENSURE THE MOST EFFECTIVE TOTAL SYSTEM OPERATION WITHIN THE DESIGN LIMITATIONS, AND TO OBTAIN MUTUAL UNDERSTANDING OF INTENDED CONTROL PERFORMANCE.
2. VERIFY THAT ALL CONTROL DEVICES ARE PROPERLY CONNECTED.
3. VERIFY THAT ALL DAMPERS, VALVES, AND OTHER CONTROLLED DEVICES ARE OPERATED BY THE INTENDED CONTROLLER.
4. VERIFY THAT ALL DAMPERS AND VALVES ARE IN THE POSITION INDICATED BY THE CONTROLLER (OPEN, CLOSED, OR MODULATING).
5. VERIFY THAT THE INTEGRITY OF VALVES AND DAMPERS IN TERMS OF TIGHTNESS OF CLOSE-OFF AND FULL-OPEN POSITION. THIS INCLUDES DAMPERS IN MULTI-ZONE UNITS.
6. CHECK THAT ALL VALVES ARE PROPERLY INSTALLED IN THE PIPING SYSTEM IN RELATION TO DIRECTION OF FLOW AND LOCATION.
7. VERIFY THE CALIBRATION OF ALL CONTROLLERS.
8. VERIFY THE PROPER APPLICATION OF ALL NORMALLY OPEN AND NORMALLY CLOSED VALVES.
9. CHECK THE LOCATIONS OF ALL THERMOSTATS AND HUMIDISTATS FOR POTENTIAL ERRATIC OPERATION FROM OUTSIDE INFLUENCES SUCH AS SUNLIGHT, DRAFTS, OR COLD WALLS.
10. CHECK THE LOCATIONS OF ALL SENSORS TO DETERMINE WHETHER THEIR POSITION WILL ALLOW THEM TO SENSE ONLY THE INTENDED TEMPERATURES OR PRESSURES OF THE MEDIA. CONTROLS CONTRACTOR WILL RELOCATE AS DEEMED NECESSARY BY THE TAB AGENCY.
11. CHECK THE SEQUENCE OF OPERATION FOR ANY CONTROL MODE IS IN ACCORDANCE WITH APPROVED SHOP DRAWINGS. VERIFY THAT ONLY MINIMUM SIMULTANEOUS HEATING AND COOLING OCCURS. OBSERVE THAT HEATING CANNOT TAKE PLACE UNTIL THE COOLING ZONE OF VALVE IS COMPLETELY CLOSED.
12. VERIFY THAT ALL CONTROLLER SET POINTS MEET THE DESIGN INTENT.
13. CHECK ALL DAMPERS FOR FREE TRAVEL.
14. VERIFY THE OPERATION OF ALL INTERLOCK SYSTEMS.
15. PERFORM ALL SYSTEM VERIFICATION TO ASSURE THE SAFETY OF THE SYSTEM AND ITS COMPONENTS.

B. A SYSTEMATIC CHECK OF THE ABOVE REQUIREMENTS SHALL BE INCLUDED IN THE FINAL TAB REPORT.

3.4 WATER PROCEDURES

A. THE VARIOUS CIRCULATING SYSTEMS SHALL BE FLUSHED, CLEANED, FILLED, PURGED OF AIR, AND PUT INTO OPERATION BY THE MECHANICAL CONTRACTOR BEFORE NOTIFYING THE TAB AGENCY IN WRITING TO DO THE HYDRONIC BALANCING.

B. THE FLOW OF WATER THROUGH ALL COILS SHALL BE ADJUSTED BY MANIPULATING VALVES UNTIL THE RATED PRESSURE DROP ACROSS EACH COILS OBTAINED. ON THOSE WITH THREE-WAY VALVES, THE RATED PRESSURE DROP SHALL FIRST BE ADJUSTED WITH THE 3-WAY VALVES SET SO THAT ALL WATER FLOWS THROUGH THE COILS IN EACH OF THE SEVERAL SYSTEMS AND THE TEMPERATURE DIFFERENTIAL BETWEEN INLET AND OUTLET SHALL BE DETERMINED TO BE IN ACCORDANCE WITH IT RATING. THE BYPASS VALVES SHALL THEN BE ADJUSTED ON EACH COIL UNTIL AN EQUAL PRESSURE DROP BETWEEN SUPPLY AND RETURN CONNECTIONS IS OBTAINED WITH THE THREE-WAY VALVES SET TO BYPASS ALL COILS IN EACH OF THE SEVERAL SYSTEMS.

1. <u>PHASE ONE:</u> THE BALANCE ENGINEER OR TECHNICIAN SHALL PREPARE THE WATER SYSTEMS FOR BALANCING IN THE FOLLOWING MANNER:

a. OPEN ALL VALVES TO FULL OPEN POSITION. CLOSE COIL BYPASS STOP VALVES. SET MIXING VALVE TO FULL COIL FLOW.
b. REQUEST REMOVAL AND CLEANING OF ALL STRAINERS BY CONTRACTOR, IF NOT DONE.
c. EXAMINE WATER IN SYSTEM AND DETERMINE IF WATER HAS BEEN TREATED AND CLEANED.
d. CHECK PUMP ROTATION.
e. CHECK ALL AIR VENTS AT HIGH POINTS OR WATER SYSTEMS AND DETERMINE ALL ARE INSTALLED AND OPERATING FREELY.
f. SET ALL TEMPERATURE CONTROLS SO ALL COOLING ARE CALLING FOR FULL COOLING. THIS SHOULD CLOSE ALL AUTOMATIC BYPASS VALVES. FOLLOW SAME PROCEDURE WHEN BALANCING HOT WATER COILS. SET SO SOILS ARE CALLING FOR FULL HEATING.
g. CHECK OPERATION OF AUTOMATIC BYPASS VALVES.
h. COMPLETE AIR BALANCE MUST HAVE BEEN ACCOMPLISHED BEFORE ACTUAL WATER BALANCE BEGINS.

2. <u>PHASE TWO:</u> THE BALANCE ENGINEER OR TECHNICIAN SHALL PROCEED WITH SECOND PHASE OF WATER BALANCE AS FOLLOWS:

a. SET CHILLED WATER AND HOT WATER PUMPS TO PROPER DELIVERY.
b. VERIFY WATER FLOW OF CHILLED WATER FROM CENTRAL PLANT.
c. VERIFY WATER FLOW OF HOT WATER FROM CENTRAL PLANT.
d. VERIFY SUPPLY WATER TEMPERATURES AND RETURN WATER TEMPERATURES OF CENTRAL SYSTEM AND COORDINATE WITH CENTRAL PLANT TO RESET TO CORRECT DESIGN TEMPERATURES.
e. CHECK WATER TEMPERATURE AT INLET SIDE OF COOLING AND HEATING COILS. NOTE RISE OR DROP OF TEMPERATURES FROM SOURCE.
f. PROCEED TO BALANCE EACH HOT WATER COIL.
g. UPON COMPLETION OF FLOW READINGS AND ADJUSTMENTS AT COILS, MARK PERMANENTLY ALL SETTINGS AND RECORD DATA.

3. <u>PHASE THREE:</u> UPON COMPLETION OF PHASE 1 AND 2, THE BALANCE TECHNICIAN SHALL PROCEED WITH PHASE 3 AS FOLLOWS:

a. AFTER ADJUSTMENTS TO COILS ARE MADE, RECHECK SETTINGS AT THE PUMPS AND CENTRAL SUPPLY AND READJUST, IF REQUIRED.
b. INSERT PRESSURE GAUGES, READ PRESSURE DROP THROUGH COIL AT SET FLOW RATE ON CALL FOR FULL COOLING AND FULL HEATING. SET PRESSURE DROP ACROSS BYPASS VALVE TO MATCH COIL FULL FLOW PRESSURE DROP. THIS PREVENTS UNBALANCED FLOW CONDITIONS WITH COILS ARE ON FULL BYPASS (WITH 3-WAY VALVES).
c. RECORD AND CHECK THE FOLLOWING ITEMS AT EACH COOLING AND HEATING COIL:

i. INLET WATER TEMPERATURES.
ii. LEAVING WATER TEMPERATURES.
iii. PRESSURE DROP AT EACH COIL.
iv. PRESSURE DROP ACROSS BYPASS VALVE.

d. RECORD AND CHECK THE FOLLOWING ITEMS AT EACH PUMP:

i. PUMP OPERATING SUCTION AND DISCHARGE PRESSURE AND FINAL TDH.
ii. RATED AND ACTUAL RUNNING AMPERAGE OF PUMP MOTOR AND CORRESPONDING VOLTAGE.

3.5 TEST AND BALANCE REPORT

A. THE REPORT SHALL CONTAIN THE FOLLOWING DATA:

1. A LISTING OF THE MEASURED AIR QUANTITIES AT EACH OUTLET CORRESPONDING TO THE TEMPERATURE TABULATION SPECIFIED ABOVE.
2. AIR QUANTITIES AT EACH RETURN AND EXHAUST AIR HANDLING DEVICE (ONLY IF DUCTED RETURN SYSTEMS).
3. STATIC PRESSURE READINGS ENTERING AND LEAVING EACH SUPPLY, RETURN AND EXHAUST FAN, FILTER, AND COIL OF THE SYSTEM. THESE READINGS SHALL BE RELATED TO FAN CURVES IN TERMS OF CFM HANDLED.
4. WATER PRESSURE READINGS AT GAUGE CONNECTIONS. PRESSURE READINGS AT COILS AND PUMPS SHALL BE RELATED TO COILS AND PUMP CURVES IN TERMS OF GPM HANDLED.
5. MOTOR CURRENT READINGS AT EACH FAN AND PUMP. THE VOLTAGES AT THE TIME OF THE READINGS SHALL BE LISTED.

3.6 FINAL ACCEPTANCE

A. AT THE TIME OF FINAL INSPECTION, THE BALANCING AGENCY SHALL RECHECK, IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE, SPECIFIC AND RANDOM SELECTIONS OF DATA, I.E., WATER AND AIR QUANTITIES, RECORDED IN THE CERTIFIED REPORT.

B. POINTS AND AREAS FOR RECHECK SHALL BE SELECTED BY THE OWNER'S REPRESENTATIVE.

C. MEASUREMENT AND TEST PROCEDURES SHALL BE THE SAME AS APPROVED FOR WORK FORMING BASIS OF CERTIFIED REPORT.

D. SELECTIONS FOR RECHECK, SPECIFIC PLUS RANDOM, WILL NOT NORMALLY EXCEED 25% OF THE TOTAL NUMBER TABULATED IN THE REPORT, EXCEPT THAT SPECIAL AIR SYSTEMS MAY REQUIRE A COMPLETE RECHECK FOR SAFETY REASONS.

E. IF RANDOM TESTS ELICIT A MEASURED FLOW DEVIATION OF 10% OR MORE FROM THAT RECORDED IN THE CERTIFIED REPORT ON 10% OR MORE OF THE SELECTED RECHECK STATIONS, THE REPORT SHALL BE AUTOMATICALLY REJECTED. IN THE EVENT THE REPORT IS REJECTED, ALL SYSTEMS SHALL BE READJUSTED AND TESTED, NEW DATA RECORDED, NEW CERTIFIED REPORT SUBMITTED, AND NEW INSPECTION TESTS MADE, ALL AT NO ADDITIONAL COST TO THE OWNER.

F. FOLLOWING FINAL ACCEPTANCE OF THE CERTIFIED REPORT BY THE OWNER'S REPRESENTATIVE, THE SETTINGS OF ALL VALVES, SPLITTER, DAMPERS, AND OTHER ADJUSTMENT DEVICES SHALL BE PERMANENTLY MARKED BY THE TAB AGENCY, SO THAT ADJUSTMENT CAN BE RESTORED IF DISTURBED AT ANY TIME. DEVICES SHALL NOT BE MARKED UNTIL AFTER FINAL ACCEPTANCE.

END OF SECTION

CONTROLS SPECIFICATIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICE NECESSARY TO MODIFY THE EXISTING ENERGY MANAGEMENT SYSTEM (EMS) FOR A COMPLETE AND OPERATIVE NEW EMS SYSTEM, UTILIZING DIRECT DIGITAL ELECTRONIC CONTROLS AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.

B. ALL LABOR, MATERIAL, EQUIPMENT, AND SOFTWARE NECESSARY TO MEET THE LISTED FUNCTIONS OF THE EMS AS SPECIFIED HEREIN AND AS SHOWN ON THE DRAWINGS SHALL BE INCLUDED.

C. REFER TO SECTION 26 FOR POWER WIRING TO LINE VOLTAGE DEVICES.

D. CONTROL WIRING, EXCEPT FOR POWER WIRING, NECESSARY FOR TEMPERATURE CONTROL SYSTEMS IS COVERED IN THIS SECTION.

1.2 SUBMITTALS REQUIRED FOR THIS SECTION

A. SUBMITTAL REQUIREMENTS ARE SET FORTH IN SECTION 26, ELECTRICAL.

B. THE REQUIREMENTS COVERED IN THIS SECTION ARE IN ADDITION TO REQUIREMENTS OF SECTION 26.

C. SUBMITTALS SHALL BE CONFIGURED TO MEET OR EXCEED THE REQUIREMENTS OF BOTH SECTIONS.

D. SUBMITTAL PACKAGES SHALL BE ASSEMBLED AS LISTED BELOW:

1. INITIAL SUBMITTAL.
2. TESTING SUBMITTALS.
3. OPERATION AND MAINTENANCE MANUALS.

E. INITIAL SUBMITTAL:

1. PRIOR TO FABRICATING OR SHIPPING ANY MATERIAL, SUBMIT THE FOLLOWING INFORMATION AND DOCUMENTATION. THIS PACKAGE SHALL BE STAND-ALONE AND SHALL BE SUITABLE FOR FORWARDING BY THE CONTRACTOR TO THE FIRE MARSHAL FOLLOWING APPROVAL BY THE ENGINEER. INCLUDE THE FOLLOWING:

a. TABLE OF CONTENTS.
b. DESCRIPTION OF PROJECT. INCLUDE LOCATION/ADDRESS; OWNER'S NAME AND TELEPHONE NUMBER; AND CONTRACTOR'S NAME, ADDRESS, AND TELEPHONE NUMBER.
c. COMPLETE COMPONENTS LIST SHOWING QUANTITIES, DESCRIPTIONS, MANUFACTURERS, MODEL NUMBERS, AND CHOSE OPTIONS.
d. MANUFACTURER'S SPECIFICATION SHEETS ON ALL EQUIPMENT.
e. BUILDING FLOOR PLAN(S) SHOWING ALL DEVICES, ZONING, AND ROOM IDENTIFICATION.
f. INTERCONNECTION DIAGRAM WHICH SHOWS ALL COMPONENTS AND INTERCONNECTING WIRE AND CONDUIT, INCLUDING LINKS TO LOCAL AREA ETWORKS AND TELEPHONE CONNECTIONS. IF THE SUBMITTED CONFIGURATION DEPARTS FROM THE CONDUIT AND WIRE LAYOUT ON THE PLANS, REVIEW OF THE CONFIGURATION SHALL NOT OBLIGATE THE OWNER TO ADDITIONAL COSTS.
g. POINT-TO-POINT WIRING DIAGRAM FOR ALL ITEMS WITHIN PANEL(S).
h. PANEL LAYOUT DRAWINGS.
i. SYMBOL LEGEND FOR DEVICES SHOWN ON SUBMITTED DRAWINGS.
j. IDENTIFICATION OF TYPE OF WIRING USED.
k. DETAILS ON SUPPORT AND ANCHORAGE OF EQUIPMENT.
l. DETAILS ON INSTALLATION OF TEMPERATURE CONTROL DEVICES.
m. DETAILED DRAWING(S) SHOWING CONDUIT PENETRATIONS OF FIRE WALLS, IF ANY.
n. MANUFACTURER'S INSTALLATION INSTRUCTIONS.

F. TESTING SUBMITTALS:

1. TESTING SUBMITTALS ARE REQUIRED, AS SPECIFIED LATER IN THIS SECTION.

G. OPERATION AND MAINTENANCE MANUALS

1. OPERATION AND MAINTENANCE MANUAL SUBMITTALS ARE REQUIRED, AS SPECIFIED LATER IN THIS SECTION.

H. SHOULD ANY ITEM BE INCLUDED WHICH DEVIATES FROM THESE SPECIFICATIONS, THE DEVIATION SHALL BE CLEARLY INDICATED AND EXPLAINED AT THE TIME OF SUBMITTAL.

I. SUBMITTALS SHALL BE COMPLETE, NEAT, ORDERLY, AND INDEXED. THE CONTRACTOR SHALL CHECK SUBMITTALS FOR NUMBER OF COPIES, ADEQUATE IDENTIFICATION, CORRECTNESS, AND COMPLIANCE WITH THE DRAWINGS AND SPECIFICATIONS, AND SHALL INITIAL ALL COPIES.

J. REVISE AND RESUBMIT ALL SUBMITTAL INFORMATION UNTIL ACCEPTABLE TO THE ENGINEER.

1.3 STARTUP, OPERATING, AND MAINTENANCE SERVICE

A. THE MANUFACTURER'S FIELD SERVICES REPRESENTATIVE SHALL FURNISH TECHNICAL DIRECTION AS REQUIRED TO ENSURE PROPER STARTUP, OPERATION, AND MAINTENANCE OF THE EQUIPMENT.

B. OPERATION AND MAINTENANCE TRAINING OF THE OWNER'S STAFF SHALL BE PROVIDED. NOT LESS THAN 4 HOURS OF TRAINING SHALL BE PROVIDED AT TIMES CONVENIENT TO THE OWNER.

1.4 SPARE PARTS

A. PROVIDE THE FOLLOWING SPARE EQUIPMENT:

1. TEN FUSES OF EACH TYPE USED.

1.5 OPERATION AND MAINTENANCE MANUALS

A. OPERATION AND MAINTENANCE MANUALS SHALL MEET THE REQUIREMENTS OF SECTION 26, IN ADDITION TO THE REQUIREMENTS BELOW:

1. PROVIDE FIVE COPIES OF OPERATION AND MAINTENANCE MANUALS. INCLUDING THE FOLLOWING:

a. CORRECTED SUBMITTALS AS REQUIRED HEREIN.

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Andrew McSorley, DSFM
JUN 19 2018
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

HUMBOLDT STATE UNIVERSITY
FACILITIES MANAGEMENT
1 HARPST STREET, ARCATA, CA 95521 | 707 826-3646

REGISTERED PROFESSIONAL ENGINEER
B. R. ABRAHAMS
No. M35923
EXP. 3-31-2020
MECHANICAL
STATE OF CALIFORNIA

SHC AHU REPLACEMENT

AHU REPLACEMENT
STUDENT HEALTH CENTER (BLDG 42)

STATUS
PERMIT DOCUMENTS

BUILDING PERMIT APPROVAL:
This project has demonstrated conformance with applicable codes and standards established by statute and University policy. Based on this determination these documents are
'APPROVED FOR CONSTRUCTION'
Michael Fisher
Campus Deputy Building Official
Humboldt State University
The California State University
Date: 6/19/2018
Permit #: 2017/18-017

Other approvals, as applicable:
SFM Approval: 6/19/18
DSA Access Approval: N/A
Seismic Peer Review: N/A
Other: N/A

PROJECT #: XPL 226
W.O. #s:

ISSUE DATE: MAY 23, 2018
REV:

SHEET TITLE
MECHANICAL SPECIFICATIONS

SHEET
M1

MECHANICAL SPECIFICATIONS

b. RECORD (AS-BUILT) WIRING DIAGRAMS AND EQUIPMENT DRAWINGS.
c. FOR ALL EQUIPMENT SUPPLIERS, LIST OF CURRENT NAMES, ADDRESSES, TELEPHONE NUMBERS OF THOSE WHO SHOULD BE CONTACTED FOR SERVICE, INFORMATION, AND ASSISTANCE.
d. RECORD (AS-BUILT) CONTRACT DRAWINGS MARKED WITH RED PENCIL TO SHOW WORK REVISIONS AND ALSO RACEWAY AND CABLE WHERE DIFFERENT FROM THE ORIGINAL DRAWINGS. PREPARE BY OBTAINING NEW, CLEAN SETS OF CONTRACT DRAWINGS FROM THE ENGINEER, AND PAY ALL COSTS FOR SAME. EACH MANUAL SET SHALL HAVE ORIGINAL RED PENCIL MARKS (NOT COPIES).
e. TEST REPORTS.

B. MATERIAL SHALL BE CLEAN AND FILED UNDER DIVIDERS WITH HEADINGS IN ACCORDANCE WITH THE SPECIFICATION ITEM TITLE.

1.6 WARRANTY

A. THE WORK AND MATERIALS COVERED IN THIS SECTION SHALL BE GUARANTEED FOR A PERIOD OF 1 YEAR FROM THE DATE OF ACCEPTANCE THEREOF AGAINST DEFECTIVE MATERIAL, DESIGN, AND WORKMANSHIP.

PART 2 - PRODUCTS

2.1 SYSTEM, GENERAL

A. ALL COMPONENTS USED SHALL BE SERVICEABLE, REPAIRABLE, AND REPLACEABLE BY QUALIFIED TEMPERATURE CONTROL TECHNICIANS USING NONPROPRIETARY PARTS, TOOLS, AND INSTRUMENTS.

2.2 TEMPERATURE CONTROL MATERIAL

A. ELECTRIC DAMPER ACTUATORS

1. ELECTRIC DAMPER ACTUATORS SHALL BE GEAR OR HYDRAULIC TYPE AS SCHEDULED.
2. ACTUATORS SHALL BE PROPERLY SIZED TO PROVIDE SUFFICIENT TORQUE TO POSITION THE DAMPER THROUGHOUT ITS OPERATING RANGE.
3. SPRING RETURN ACTUATORS SHALL BE USED WITH OUTSIDE AIR AND RELIEF AIR DAMPERS.

B. MOTORIZED CONTROL DAMPERS

1. MOTORIZED CONTROL DAMPERS SHALL BE PARALLEL BLADE FOR TWO-POSITION CONTROL AND OPPOSED BLADE FOR PROPORTIONAL CONTROL APPLICATIONS.
2. DAMPERS SHALL BE BLACK ENAMEL FINISH, GALVANIZED, WITH NYLON BEARINGS.
3. BLADE EDGE AND TIP SEALS SHALL BE INCLUDED FOR ALL DAMPERS.
4. BLADES SHALL BE 16 GAUGE, MINIMUM, AND 10 INCHES WIDE, MAXIMUM THE FRAME SHALL BE WELDED CHANNEL IRON.
5. DAMPERS WITH BOTH DIMENSIONS UNDER 18 INCHES MAY HAVE STRAP IRON FRAMES.

C. CONTROL VALVES

1. SHALL BE TWO-WAY OR THREE-WAY PATTERN AS SHOWN.
2. CONSTRUCTED FOR TIGHT SHUTOFF.
3. SHALL OPERATE SATISFACTORILY AGAINST SYSTEM PRESSURES AND DIFFERENTIALS.
4. VALVES WITH SIZES UP TO AND INCLUDING 2 INCHES SHALL BE SCREWED.
5. 2 ½ INCH, AND LARGER VALVES SHALL BE FLANGED CONFIGURATION.
6. CONTROL VALVES SHALL BE SIZED FOR A MAXIMUM PRESSURE DROP OF 4.0 PSIG AT RATED FLOW (EXCEPT AS NOTED).

D. TEMPERATURE CONTROL PANELS (TCP)

1. FURNISH NEMA 1 (INTERIOR) OR NEMA 4 (EXTERIOR) TEMPERATURE CONTROL PANEL OF CODE GAUGE STEEL, WITH LOCKING DOORS, FOR MOUNTING AND DEVICES AS SHOWN.
2. THEY SHALL MEET ALL APPLICABLE REQUIREMENTS OF TITLE 24, CALIFORNIA ADMINISTRATIVE CODE.
3. ALL CONTROLLERS, RELAYS, SWITCHES, ETC., FOR EQUIPMENT LOCATED IN MECHANICAL EQUIPMENT ROOMS SHALL BE MOUNTED IN A TCP, AS SHOWN ON THE DRAWINGS.
4. TEMPERATURE SETTINGS, ADJUSTMENTS, AND CALIBRATION SHALL BE DONE AT THE TCP.
5. ALL ELECTRIC DEVICES WITHIN A CONTROL PANEL SHALL BE FACTORY WIRED.
6. PROVIDE ENGRAVED, LAMINATED PLASTIC NAMEPLATES IDENTIFYING ALL DEVICES MOUNTED ON THE FACE OF THE CONTROL PANEL.
7. A COMPLETE SET OF RELATED "AS-BUILT" CONTROL DRAWINGS SHALL BE FURNISHED IN EACH CONTROL PANEL.

E. ELECTRONIC THERMOMETERS

1. SHALL HAVE 2 PERCENT ACCURACY AND 1 ½ DEGREES REPEATABILITY.
2. SHALL BE MOUNTED ON THE TEMPERATURE CONTROL PANELS AS SHOWN ON THE TEMPERATURE CONTROL DIAGRAMS.

2.5 STAND-ALONE DDC PANELS

A. GENERAL

1. STAND-ALONE DDC PANELS SHALL BE MICROPROCESSOR-BASED, MULTITASKING, MULTIUSER, REAL-TIME, DIGITAL CONTROL PROCESSORS.
2. EACH STAND-ALONE DDC PANEL SHALL CONSIST OF MODULAR HARDWARE, WITH PLUG0IN ENCLOSED PROCESSORS, COMMUNICATION CONTROLLERS, POWER SUPPLIES, AND INPUT/OUTPUT MODULES.
3. A SUFFICIENT NUMBER OF CONTROLLERS SHALL BE SUPPLIED TO FULLY MEET THE REQUIREMENTS OF THIS SPECIFICATION AND THE ATTACHED POINT LIST.

B. MEMORY

1. EACH DDC PANEL SHALL HAVE SUFFICIENT MEMORY TO SUPPORT ITS OWN OPERATING SYSTEM AND DATABASES, INCLUDING THE FOLLOWING:
   a. CONTROL PROCESSES
   b. ENERGY MANAGEMENT APPLICATIONS
   c. ALARM MANAGEMENT
   d. HISTORICAL/TREND DATA FOR ALL POINTS
   e. MAINTENANCE SUPPORT APPLICATIONS
   f. CUSTOM PROCESSES
   g. OPERATOR I/O
   h. DIAL-UP COMMUNICATIONS
   i. MANUAL OVERRIDE MONITORING

C. POINT TYPES

1. EACH DDC PANEL SHALL SUPPORT THE FOLLOWING TYPES OF POINT INPUTS AND OUTPUTS:
   a. DIGITAL INPUTS FOR STATUS/ALARM CONTACTS.
   b. DIGITAL OUTPUTS FOR ON/OFF EQUIPMENT CONTROL.
   c. ANALOG INPUTS FOR TEMPERATURE, PRESSURE, HUMIDITY, FLOW, AND POSITION MEASUREMENTS.
   d. ANALOG OUTPUTS FOR VALVE AND DAMPER POSITION CONTROL, AND CAPACITY CONTROL OF PRIMARY EQUIPMENT.
   e. PULSE INPUTS FOR PULSED CONTACT MONITORING.

D. EXPANDABILITY

1. THE SYSTEM SHALL BE MODULAR IN NATURE AND SHALL PERMIT EASY EXPANSION THROUGH THE ADDITION OF SOFTWARE APPLICATIONS, WORKSTATION HARDWARE, FIELD CONTROLLERS SENSORS, AND ACTUATORS.
2. THE SYSTEM ARCHITECTURE SHALL SUPPORT 25 PERCENT EXPANSION CAPACITY OF ALL TYPES OF DDC PANELS AND ALL POINT TYPES INCLUDED IN THE INITIAL INSTALLATION.

E. SERIAL COMMUNICATION PORTS

1. STAND -ALONE DDC PANELS SHALL PROVIDE AT LEAST TWO RS-232C SERIAL DATA COMMUNICATION PORTS FOR SIMULTANEOUS OPERATION OF MULTIPLE-OPERATOR I/O DEVICES, SUCH AS INDUSTRY STANDARD PRINTERS, LAPTOP WORKSTATIONS, PC WORKSTATIONS, AND PANEL-MOUNTED OR PORTABLE DDC PANEL OPERATOR'S TERMINALS.
2. STAND-ALONE DDC PANELS SHALL ALLOW TEMPORARY USE OF PORTABLE DEVICES WITHOUT INTERRUPTING THE NORMAL OPERATION OF PERMANENTLY CONNECTED MODEMS, PRINTERS, OR NETWORKS TERMINALS.

F. HARDWARE OVERRIDE SWITCHES

1. AS INDICATED IN THE POINT SCHEDULE, THE OPERATOR SHALL HAVE THE ABILITY TO MANUALLY OVERRIDE AUTOMATIC OR CENTRALLY EXECUTED COMMANDS AT THE DDC PANEL VIA LOCAL, POINT DISCRETE, ONBOARD HARD/OFF/AUTO OPERATOR OVERRIDE SWITCHES FOR BINARY CONTROL POINTS AND GRADUAL SWITCHES FOR ANALOG CONTROL-TYPE POINTS.
2. THESE OVERRIDE SWITCHES SHALL BE OPERABLE WHETHER THE PANEL IS POWERED OR NOT.

G. HARDWARE OVERRIDE MONITORING

1. DDC PANELS SHALL MONITOR THE STATUS OF POSITION OF ALL OVERRIDES.
2. THIS INFORMATION SHALL BE INCLUDED IN LOGS AND SUMMARIES TO INFORM THE OPERATOR THAT AUTOMATIC CONTROL HAS BEEN INHIBITED.
3. DDC PANELS SHALL ALSO COLLECT OVERRIDE ACTIVITY INFORMATION FOR DAILY AND MONTHLY REPORTS.

H. LOCAL STATUS INDICATOR LAMPS

1. THE DDC PANEL SHALL PROVIDE STATUS INDICATION FOR EACH BINARY INPUT AND OUTPUT FOR CONSTANT, UP-TO-DATE VERIFICATION OF ALL POINT CONDITIONS, WITHOUT THE NEED FOR AN OPERATOR I/O DEVICE.

I. INTEGRATED ONLINE DIAGNOSTICS

1. EACH DDC PANEL SHALL CONTINUOUSLY PERFORM SELF-DIAGNOSTICS, COMMUNICATION DIAGNOSIS, AND DIAGNOSIS OF ALL SUBSIDIARY EQUIPMENT.
2. THE DDC PANEL SHALL PROVIDE BOTH LOCAL AND REMOTE ANNUNCIATION OF ANY DETECTED COMPONENT FAILURES OR REPEATED FAILURE TO ESTABLISH COMMUNICATION.
3. INDICATION OF THE DIAGNOSTIC RESULTS SHALL BE PROVIDED AT EACH DDC PANEL AND SHALL NOT REQUIRE THE CONNECTION OF AN OPERATOR I/O DEVICE.

J. SURGE AND TRANSIENT PROTECTION

1. ISOLATION SHALL BE PROVIDED AT ALL NETWORK TERMINATIONS, AS WELL AS ALL FIELD POINT TERMINATIONS TO SUPPRESS INDUCED-VOLTAGE TRANSIENTS CONSISTENT WITH IEEE STANDARD 587-1980.
2. ISOLATION LEVELS SHALL BE SUFFICIENTLY HIGH AS TO ALLOW ALL SIGNAL WIRING TO BE RUN IN THE SAME CONDUIT AS HIGH-VOLTAGE WIRING WHERE ACCEPTABLE BY ELECTRICAL CODE.

K. POWER FAIL RESTART

1. IN THE EVENT OF THE LOSS OF NORMAL POWER, THERE SHALL BE AN ORDERLY SHUTDOWN OF ALL STAND-ALONE DDC PANELS TO PREVENT THE LOSS OF DATABASE OR OPERATING SYSTEM SOFTWARE.
2. NONVOLATILE MEMORY SHALL BE INCORPORATED FOR ALL CRITICAL CONTROLLER CONFIGURATION DATA, AND BATTERY BACKUP SHALL BE PROVIDED TO SUPPORT THE REAL-TIME CLOCK AND ALL VOLATILE MEMORY FOR A MINIMUM OF 72 HOURS.
3. UPON RESTORATION OF NORMAL POWER, THE DDC PANEL SHALL AUTOMATICALLY RESUME FULL OPERATION WITHOUT MANUAL INTERVENTION.
4. SHOULD DDC PANEL MEMORY BE LOST FOR ANY REASON, THE USER SHALL HAVE THE CAPABILITY OF RELOADING THE DDC PANEL VIA THE LOCAL AREA NETWORK VIA THE LOCAL RD-232C PORT OR VIA TELEPHONE LINE DIAL-IN.

2.7 APPLICATIONS-SPECIFIC CONTROLLERS, HVAC APPLCIATIONS

A. EACH STAND-ALONE DDC CONTROLLER SHALL BE ABLE TO EXTEND ITS PERFORMANCE AND CAPACITY THROUGH THE USE OF REMOTE APPLICATION-SPECIFIC CONTROLLERS (ASCS).

B. EACH ASC SHALL OPERATE AS A STAND-ALONE CONTROLLER, CAPABLE OF PERFORMING ITS SPECIFIED CONTROL RESPONSIBILITIES INDEPENDENTLY OF OTHER CONTROLLERS IN THE NETWORK.

C. EACH ASC SHALL BE A MICROPROCESSOR-BASED, MULTITASKING, REAL-TIME DIGITAL CONTROL PROCESSOR.

D. EACH ASC SHALL HAVE SUFFICIENT MEMORY TO SUPPORT ITS OWN OPERATING SYSTEM AND DATABASE, INCLUDING THE FOLLOWING:

1. CONTROL PROCESSES.
2. ENERGY MANAGEMENT APPLICATIONS
3. OPERATOR I/O (PORTABLE SERVICE TERMINAL)

E. THE OPERATOR INTERFACE TO ANY ASC POINT DATA OR PROGRAMS SHALL BE THROUGH ANY NETWORK-RESIDENT PC WORKSTATION OR ANY PC OR PORTABLE OPERATOR'S TERMINAL THAT IS CONNECTED TO ANY DDC PANEL IN THE NETWORK.

F. APPLICATION-SPECIFIC CONTROLLERS SHALL DIRECTLY SUPPORT THE TEMPORARY USE OF A PORTABLE SERVICE TERMINAL.

G. THE CAPABILITIES OF THE PORTABLE SERVICE TERMINAL SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:

1. DISPLAY TEMPERATURES.
2. DISPLAY STATUS.
3. DISPLAY SET POINTS.
4. DISPLAY CONTROL PARAMETERS.
5. OVERRIDE BINARY OUTPUT CONTROL.
6. OVERRIDE ANALOG SET POINTS.
7. MODIFICATION OF GAIN AND OFFSET CONSTANTS.

H. POWER FAIL PROTECTION

1. ALL SYSTEM SET POINTS, PROPORTIONAL BANDS, CONTROL ALGORITHMS, AND ANY OTHER PROGRAMMABLE PARAMETERS SHALL BE STORED SUCH THAT A POWER FAILURE OF ANY DURATION DOES NOT NECESSITATE REPROGRAMMING THE CONTROLLER.

I. APPLICATION DESCRIPTION

1. AHU CONTROLLERS
   a. AHU CONTROLLERS SHALL SUPPORT, BUT NOT BE LIMITED TO, THE FOLLOWING CONFIGURATIONS OF SYSTEMS TO ADDRESS CURRENT REQUIREMENTS, AS DESCRIBED IN THE EXECUTION PORTION OF THIS SPECIFICATION, AND FOR FUTURE EXPANSION:
      i. LARGE AIR HANDLING UNITS
      1. MIXED AIR - SINGLE PATH
      2. MIXED AIR - DUAL PATH
      3. 100-PERCENT SINGLE PATH
      4. 100-PERCENT DUAL PATH
   b. AHU CONTROLLERS SHALL SUPPORT ALL OF THE NECESSARY POINT INPUTS AND OUTPUTS TO PERFORM THE SPECIFIED CONTROL SEQUENCES IN A TOTALLY STAND-ALONE FASHION.
   c. AHU CONTROLLERS SHALL HAVE A LIBRARY OF CONTROL ROUTINES AND PROGRAM LOGIC TO PERFORM THE SEQUENCES OF OPERATION, AS SPECIFIED IN THE EXECUTION PORTION OF THIS SPECIFICATION.
   d. OCCUPANCY-BASED STANDBY/COMFORT MODE CONTROL
      i. EACH AHU CONTROLLER SHALL HAVE A PROVISION FOR OCCUPANCY-SENSING OVERRIDES.
      ii. BASED UPON THE CONTACT STATUS OF EITHER A MANUAL WALL SWITCH OR AN OCCUPANCY-SENSING DEVICE, THE AHU CONTROLLER SHALL AUTOMATICALLY SELECT EITHER STANDBY OR COMFORT MODE TO MINIMIZE THE HEATING AND COOLING REQUIREMENTS, WHILE SATISFYING COMFORT CONDITIONS.
   e. CONTINUOUS ZONE TEMPERATURE HISTORIES
      i. EACH AHU CONTROLLER SHALL AUTOMATICALLY AND CONTINUOUSLY MAINTAIN A HISTORY OF THE ASSOCIATED ZONE TEMPERATURE TO ALLOW USERS TO QUICKLY ANALYZE SPACE COMFORT AND EQUIPMENT PERFORMANCE FOR THE PAST 24 HOURS.
      ii. A MINIMUM OF TWO SAMPLES PER HOUR SHALL BE STORE.
   f. ALARM MANAGEMENT
      i. EACH AHU CONTROLLER SHALL PERFORM ITS OWN LIMIT AND STATUS MONITORING AND ANALYSIS TO MAXIMIZE NETWORK PERFORMANCE BY REDUCING UNNECESSARY COMMUNICATIONS.

PART 3 - EXECUTION

3.1 GENERAL

A. ELECTRICAL WORK SHALL BE EXECUTED IN ACCORDANCE WITH SECTION 16000, ELECTRICAL.

B. WORK SHALL BE PERFORMED IN A WORKMANLIKE MANNER BY CRAFTSMAN SKILLED IN THE PARTICULAR TRADE. WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS, MANUFACTURER'S RECOMMENDATIONS, AND THE BEST PRACTICE IN THE TRADE. COMPLETED WORK SHALL PRESENT A NEAT AND FINISHED APPEARANCE.

C. COORDINATE WORK WITH THE OWNER AND THE WORK OF OTHER TRADES TO AVOID CONFLICTS, ERRORS, DELAYS, AND UNNECESSARY INTERFERENCE DURING CONSTRUCTION.

D. ALL THERMOSTATS OR TEMPERATURE SENSORS IN THE CONDITIONED SPACE SHALL HAVE BLANK LOCKING COVERS. FURNISH CAST ALUMINUM GUARDS WHERE SHOWN ON THE PLANS.

E. IDENTIFY EACH ITEM MOUNTED ON THE FACE OF A CONTROL PANEL WITH AN ENGRAVED, PHENOLIC LABEL (1/4 -INCH HIGH ENGRAVED LETTERS, MINIMUM). IDENTIFY EACH ITEM OF CONTROL EQUIPMENT (EXCEPT ROOM SENSORS AND THERMOSTATS) WITH STAMPED TAPE FIRMLY ATTACHED TO EQUIPMENT.

F. ALL CONTROL ADJUSTMENTS SHALL BE ACCESSIBLE WITHOUT USE OF A LADDER.

G. THERMOSTATS OR SENSORS MOUNTED ON OUTSIDE WALLS SHALL BE MOUNTED ON 1-INCH MINIMUM THICKNESS RIGID FIBERGLASS INSULATING BASE (OR EQUAL).

H. ALL THERMAL SENSORS IN WATER LINES HALL BE THE DIRECT-IMMERSION TYPE, INSTALLED THROUGH A "DIRECT-IMMERSION FITTING" CONSISTING OF AN ISOLATION VALVE AND TEFLON PACKING.

3.2 PROTECTION DURING CONSTRUCTION

A. THROUGHOUT THE CONTRACT, PROVIDE PROTECTION FOR MATERIALS AND EQUIPMENT AGAINST LOSS OR DAMAGE AND FROM THE EFFECTS OF WEATHER.

B. PRIOR TO INSTALLATION, STORE ITEMS TO BE INSTALLED IN INDOOR LOCATIONS.

C. ITEMS SUBJECT TO CORROSION UNDER DAMP CONDITIONS AND ITEMS CONTAINING INSULATION, SUCH AS TRANSFORMERS, MOTORS, AND CONTROLS, SHALL BE STORED IN INDOOR, HEATED, DRY LOCATIONS.

D. FOLLOWING INSTALLATION, PROTECT MATERIALS, EQUIPMENT, AND INSULATION FROM CORROSION, PHYSICAL DAMAGE, AND MOISTURE.

E. CAP CONDUIT RUNS DURING CONSTRUCTION WITH MANUFACTURED SEALS.

F. KEEP OPENINGS IN BOXES OR EQUIPMENT CLOSED DURING CONSTRUCTION.

G. PROVIDE TEMPORARY HEATING SOURCE FOR ELECTRICAL EQUIPMENT IN DAMP LOCATIONS OR LOCATIONS SUBJECT TO CONDENSATION, INCLUDING TRANSFORMERS, MOTORS, AND CONTROLS, UNTIL CONSTRUCTION IS COMPLETE AND EQUIPMENT IS ENERGIZED.

3.3 MATERIAL AND EQUIPMENT INSTALLATION

A. FOLLOW THE MANUFACTURER'S INSTALLATION RECOMMENDATIONS UNLESS OTHERWISE INDICATED.

B. FOLLOW THE ENGINEER'S DECISION, AT NO ADDITIONAL COST TO THE OWNER, WHEREVER ANY CONFLICT ARISES BETWEEN THE MANUFACTURER'S INSTRUCTION, STATE, OR OTHER CODES AND REGULATIONS, AND THESE CONTRACT DOCUMENTS.

C. KEEP COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AVAILABLE ON THE JOBSITE FOR REVIEW AT ALL TIMES.

D. INSTALL FREESTANDING EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. UNLESS NOTED OTHERWISE, MOUNT FREESTANDING EQUIPMENT ON A 3 ½ INCH CONCRETE PAD.

E. SECURE MOTOR CONTROL CENTERS (MCCS) AND OTHER FREESTANDING EQUIPMENT RIGIDLY TO FLOORS TO MOUNTING PADS WITH ANCHOR BOLTS, EXPANSION SHIELDS, OR OTHER APPROVED MEANS.

F. GROUT MOUNTING CHANNELS PROVIDED WITH MCCS INTO THE FLOOR OR MOUNTING PADS, UNLESS THE MCCS ARE FIRMLY ANCHORED WITH THE SPECIFIED CONCRETE ANCHORS, IN WHICH CASE THE CHANNELS ARE NOT REQUIRED.

3.4 CUTTING AND PATCHING

A. DO NOT CUT OR NOTCH ANY STRUCTURAL MEMBER OR BUILDING SURFACE WITHOUT SPECIFIC APPROVAL OF THE ENGINEER.

B. WHERE POSSIBLE, AVOID ANY CUTTING, CHANNELING, CHASING, OR DRILLING OF FLOORS, WALLS, PARTITIONS, CEILINGS, PAVING, OR OTHER SURFACES.

C. USE CLAMPS AND CHANNEL WHERE REQUIRED FOR THE INSTALLATION, SUPPORT, OR ANCHORAGE OF CONDUIT, RACEWAYS, OR OTHER ELECTRICAL MATERIALS AND EQUIPMENT.

D. FOLLOWING SUCH WORK, RESTORE SURFACES NEATLY TO NEW CONDITION USING SKILLED CRAFTSMEN OF THE TRADES INVOLVED, AT NO ADDITIONAL COST TO THE OWNER.

3.5 CLEANING AND TOUCHUP PAINTING

A. KEEP THE PREMISES FREE FROM ACCUMULATION OF WASTE MATERIAL OR RUBBISH.

B. UPON COMPLETION OF WORK, REMOVE MATERIALS, SCRAPS, AND DEBRIS FROM THE PREMISES AND FROM THE INTERIOR AND EXTERIOR OF ALL DEVICES AND EQUIPMENT.

C. REFINISH DAMAGED SURFACES TO NEW CONDITION USING SKILLED CRAFTSMEN OF THE TRADES INVOLVED, AT NO ADDITIONAL COST TO THE OWNER.

3.6 INSTALLATION

A. ELECTRICAL WORK

1. ALL TEMPERATURE CONTROL AND INTERLOCK WIRING SHALL BE PLENUM-RATED CABLE.
2. POWER OR INTERLOCK WIRING SHALL BE RUN IN SEPARATE CONDUIT FORM SENSOR WIRING.
3. WIRING SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE.
4. ALL WIRING OF ANY NATURE IN CONNECTION WITH TEMPERATURE CONTROL SYSTEM, REGARDLESS OF VOLTAGE, INCLUDING TEMPERATURE CONTROL WIRING, INTERLOCKING, AND THE LIKE, SHALL BE INCLUDED IN THE AIR CONDITIONING WORK.

END OF SECTION

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Andrew McSorley, OSFM
JUN 19 2018

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

HUMBOLDT STATE UNIVERSITY
FACILITIES MANAGEMENT
1 HARPST STREET, ARCATA, CA 95521 | 707 826-3646

REGISTERED PROFESSIONAL ENGINEER
ABRAHAMSEN
No. M35923
EXP. 3-31-2020
MECHANICAL
STATE OF CALIFORNIA

SHC AHU REPLACEMENT
AHU REPLACEMENT
STUDENT HEALTH CENTER (BLDG 42)

STATUS
PERMIT DOCUMENTS

BUILDING PERMIT APPROVAL:
This project has demonstrated conformance with applicable codes and standards established by statute and University policy. Based on this determination these documents are
'APPROVED FOR CONSTRUCTION'
Michael Fisher
Campus Deputy Building Official
Humboldt State University
The California State University
Date
Permit #:

Other approvals, as applicable:
SFM Approval:
DSA Access Approval: N/A
Seismic Peer Review: N/A
Other: N/A

PROJECT #:
W.O. #s:

ISSUE DATE: MAY 23, 2018
REV:

SHEET TITLE
MECHANICAL SPECIFICATIONS

SHEET
M2

MECHANICAL LEGEND

SYMBOLS	ABBREVIATIONS	
AD	AD	ACCESS DOOR
	AH	AIR HANDLER
12/8	AL	ACOUSTIC LINED DUCT (DIM IS INTERNAL)
	AC	AIR CONDITIONING
	BHP	BRAKE HORSE POWER
	BD	BYPASS DAMPER
	COP	COEFFICIENT OF PERFORMANCE
	CFM	CUBIC FEET PER MINUTE
A / 123		DIFFUSER TAG
	D	DEMO
	DB	DRY BULB
12/8		DUCT (RECTANGULAR DUCT, DIMENSIONS IN INCHES)
12Ø		DUCT (ROUND DUCT, DIAMETER IN INCHES)
D		DUCT DROP IN DIRECTION OF ARROW
R		DUCT RISE IN DIRECTION OF ARROW
	EER	ENERGY EFFICIENCY RATIO
	EAT	ENTERING AIR TEMPERATURE
EA	EA	EXHAUST AIR DUCT
	EF	EXHAUST FAN
		EXHAUST GRILLE
	(E), EX	EXISTING
	ESP	EXTERNAL STATIC PRESSURE
		FLEXIBLE DUCT
	FLA	FULL LOAD AMPS
	GPM	GALLONS PER MINUTE
H		HUMIDISTAT
	HWS/R	HOT WATER SUPPLY/RETURN
	IH	INTAKE HOOD
	LAT	LEAVING AIR TEMPERATURE
	MOCP	MAXIMUM OVER CURRENT PROTECTION
	MCA	MINIMUM CIRCUIT AMPACITY
	N	NEW
		NEW CONNECTION TO EXISTING
	OA	OUTSIDE AIR
		REMOVE TO THIS POINT
RA	RA	RETURN AIR DUCT
		RETURN GRILLE
	SEER	SEASONAL ENERGY EFFICIENCY RATIO
SA	SA	SUPPLY AIR DUCT
		SUPPLY DIFFUSER
T	TSTAT	THERMOSTAT
	TSP	TOTAL STATIC PRESSURE
		TURNING VANES
	TYP	TYPICAL
	VAV	VARIABLE AIR VOLUME
	VFD	VARIABLE FREQUENCY DRIVE
	VIF	VERIFY IN FIELD
		VOLUME DAMPER - MANUAL OPERATION
	WB	WET BULB

AIR HANDLING UNIT SCHEDULE

No.	Manufacturer	Model	Service	Location	Supply Fan						Return Fan					Heating Coil					Electrical Service #1				Electrical Service #2				Weight (lbs)	Dimensions	Notes
					Type	CFM	Min. OA CFM	ESP (in)	TSP (in)	Fan HP	Type	CFM	ESP (in)	TSP (in)	Fan HP	Total MBh	EAT/LAT	EWT/LWT	Fluid Flow (GPM)	Fluid	P.D. (ft.)	Service	FLA	MCA	MOCP	Service	FLA	MCA	MOCP			
AH-2	TRANE	CSAA012	CORE SPACES	ROOF	F.C.	6,250	1,220	3.0	4.44	6.21	F.C.	6,250	1.0	2.62	3.94	135	60/80	140/120	13.5	WATER	3.0	208/3/60	16.5	20.63	35	208/3/60	16.5	20.63	35	2,600	47.7" H x 66.5" W x 168.1" L	1 - 8
AH-3	TRANE	CSAA012	PERIMETER SPACES	ROOF	F.C.	5,000	700	3.0	4.52	5.17	F.C.	5,000	1.0	2.04	2.35	173	60/92	140/120	17.3	WATER	3.0	208/3/60	16.5	20.63	35	208/3/60	16.5	20.63	35	2,600	47.7" H x 66.5" W x 168.1" L	1 - 8

NOTES:
1. PROVIDE FACTORY MOUNTED, NEMA 3R RATING, BACNET COMPATIBLE VFD.
2. PROVIDE WITH 115 V 15A GFCI PROTECTED CONVENIENCE OUTLET.
3. 6" INTEGRAL BASE FRAME.
4. 2" DOUBLE WALL UNIT CASING.
5. 0 - 100% ECONOMIZER COOLING.
6. 2" SPRING ISOLATORS FOR SUPPLY FAN AND RETURN FAN.
7. SUPPLY AIR SMOKE DETECTOR FOR UNIT SHUTDOWN PER CMC 608, 2016 NFPA 72 (CA AMENDED).
8. FACTORY STARTUP SERVICE.
9. UNIT CONTROLLER WITH BACNET IP INTERFACE.

EXISTING VAV BOX SCHEDULE (FOR REFERENCE ONLY)

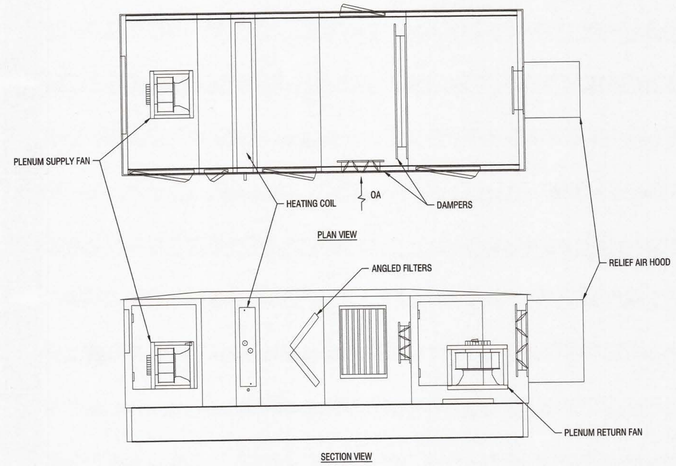
Tag	System	Manufacturer	Model	Inlet Size	CFM RANGE		Reheat Coil				Valve Type	Notes
					Min.	Max.	Type	EAT/LAT	EWT/LWT	GPM		
1CC	AH-2	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
1NC	AH-2	TITUS	DESV	12	--	--	1-ROW	--	--	--	--	--
2SP	AH-2	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
2EC	AH-2	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
2WC	AH-2	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
2SEC	AH-2	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
1EP	AH-3	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
1NP	AH-3	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
1WP	AH-3	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
1NE	AH-3	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
2EP	AH-3	TITUS	DESV	12	--	--	1-ROW	--	--	--	--	--
2NP	AH-3	TITUS	DESV	12	--	--	1-ROW	--	--	--	--	--
2WP	AH-3	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--
2SW	AH-3	TITUS	DESV	8	--	--	1-ROW	--	--	--	--	--

INTAKE HOOD SCHEDULE

ID	Service	Manufacturer	Model No.	Overall Size	Throat Size	CFM	Service	Weight (lbs)	Remarks
IH-1	AH-2	GREENHECK	WIH	56" x 56"	42" x 42"	6,250	INTAKE AIR	110	--
IH-2	AH-3	GREENHECK	WIH	56" x 56"	42" x 42"	5,000	INTAKE AIR	110	--

OUTSIDE AIR VENTILATION CALCULATION

System	Zone	Occupancy Category	Area (sqft)	2016 CMC OA (cfm/person)	No. of People	2016 CMC OA (cfm/sqft)	2016 CMC Min. OA Rate (cfm)	2016 CEC Table 120.1A (cfm/sqft)	2016 CEC Table 120.1A Min. OA Rate (cfm)	2016 CEC 120.1(b)2B (cfm/person)	2016 CEC 120.1(b)2B Min. OA Rate (cfm)	Design OA Rate (cfm)
AH-2	CORE SPACES	OFFICE	8100	5	35	0.06	661	0.15	1215	15	525	1,220
AH-3	PERIMETER SPACES	OFFICE	4200	5	35	0.06	427	0.15	630	15	525	700



1 / M3 AHU CONFIGURATION DIAGRAM
NO SCALE

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Andrew McSorley, OSFM
JUN 19 2018
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HUMBOLDT STATE UNIVERSITY
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REGISTERED PROFESSIONAL ENGINEER
ABRAHAMSON
No. M35923
EXP. 3-31-2020
MECHANICAL
STATE OF CALIFORNIA

SHC AHU REPLACEMENT
AHU REPLACEMENT
STUDENT HEALTH CENTER (BLDG 42)

STATUS
PERMIT DOCUMENTS

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Michael Fisher
Campus Deputy Building Official
Humboldt State University
The California State University
Date: 6/19/18
Permit #: 2017/18-017

Other approvals, as applicable:
SFM Approval: 6/19/18
DSA Access Approval: N/A
Seismic Peer Review: N/A
Other: N/A

PROJECT #: XPL 226
W.O. #s:

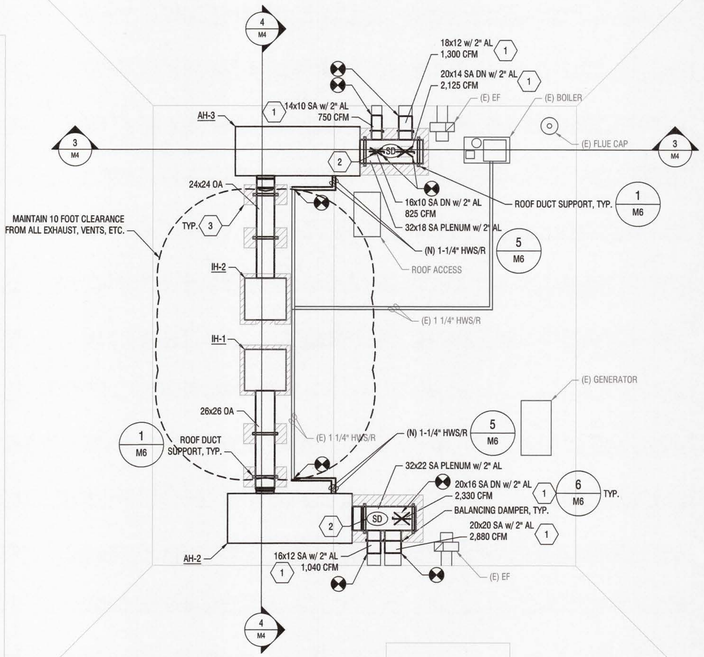
ISSUE DATE: MAY 23, 2018
REV:

SHEET TITLE
MECHANICAL LEGEND AND SCHEDULES

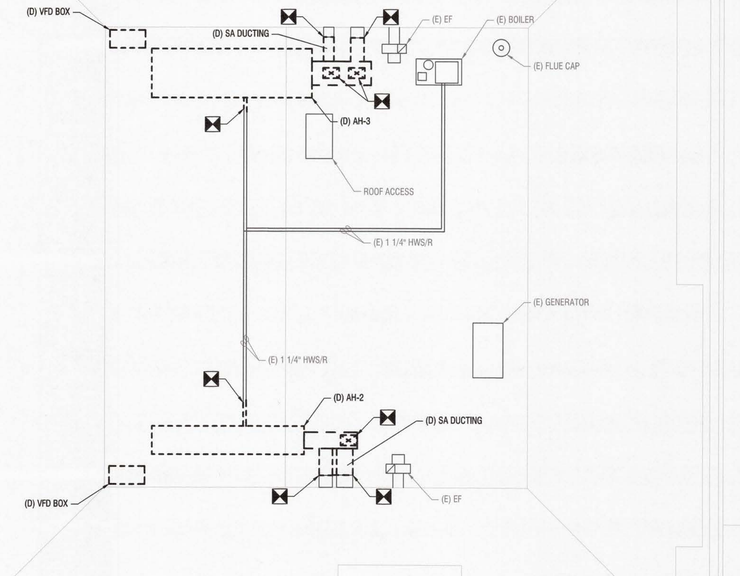
SHEET
M3

KEYED NOTES

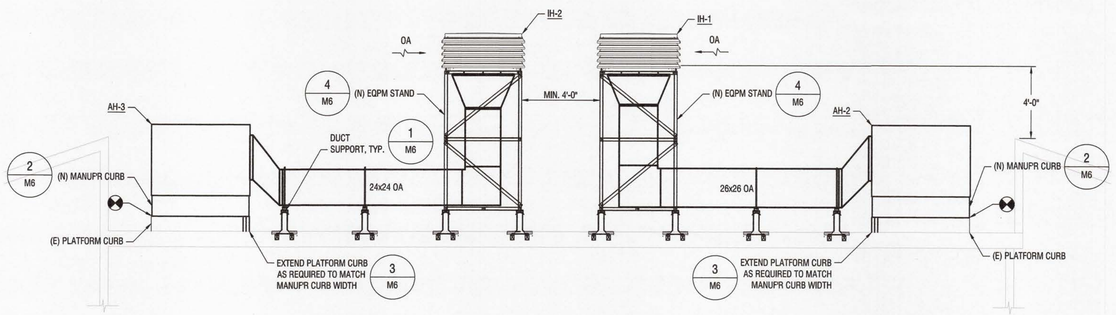
1. CONTRACTOR TO FIELD-VERIFY EXISTING DUCT SIZES AND PROVIDE NEW BRANCH DUCTS TO MATCH EXISTING SIZES.
2. CONTRACTOR TO CONNECT FACTORY SUPPLIED SMOKE DETECTOR TO BUILDING FIRE ALARM SYSTEM. PROVIDE FIRE ALARM DESIGN AS DEFERRED APPROVAL.
3. REMOVE EXISTING ROOFING AS REQUIRED TO INSTALL ROOF DUCT SUPPORTS. PATCH ROOFING AS REQUIRED TO MATCH EXISTING.



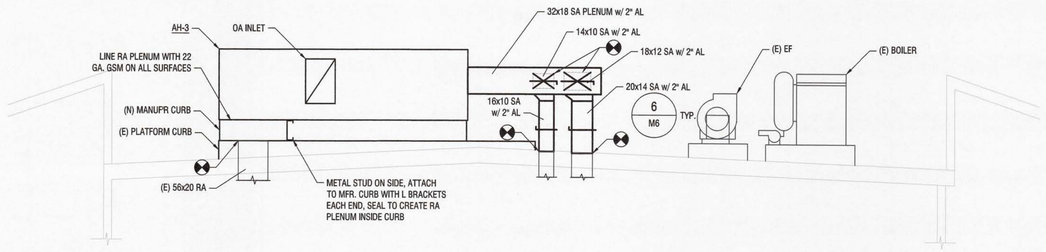
2 M4 MECHANICAL ROOF PLAN
1/8" = 1'-0"



1 M4 MECHANICAL ROOF DEMOLITION PLAN
1/8" = 1'-0"



4 M4 MECHANICAL ROOF SECTION 2
1/4" = 1'-0"



3 M4 MECHANICAL ROOF SECTION 1
1/4" = 1'-0"

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R. ABRAHAMS
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EXP. 3-31-2020
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W.O. #s:

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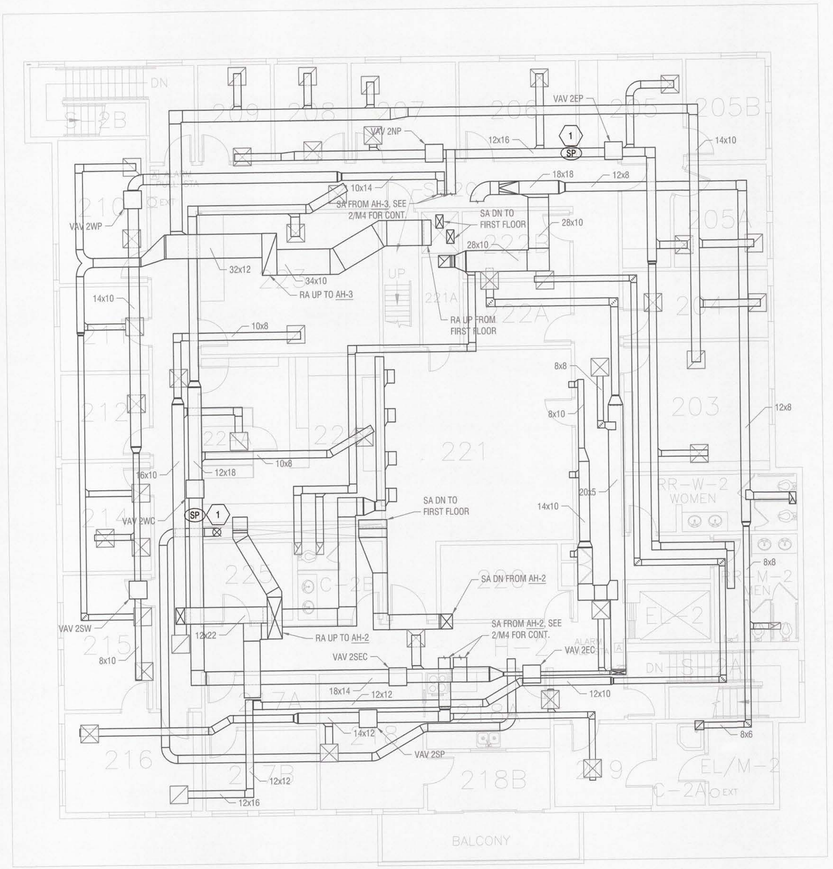
REV:

SHEET TITLE
MECHANICAL ROOF PLANS AND SECTIONS

SHEET
M4

KEYED NOTES

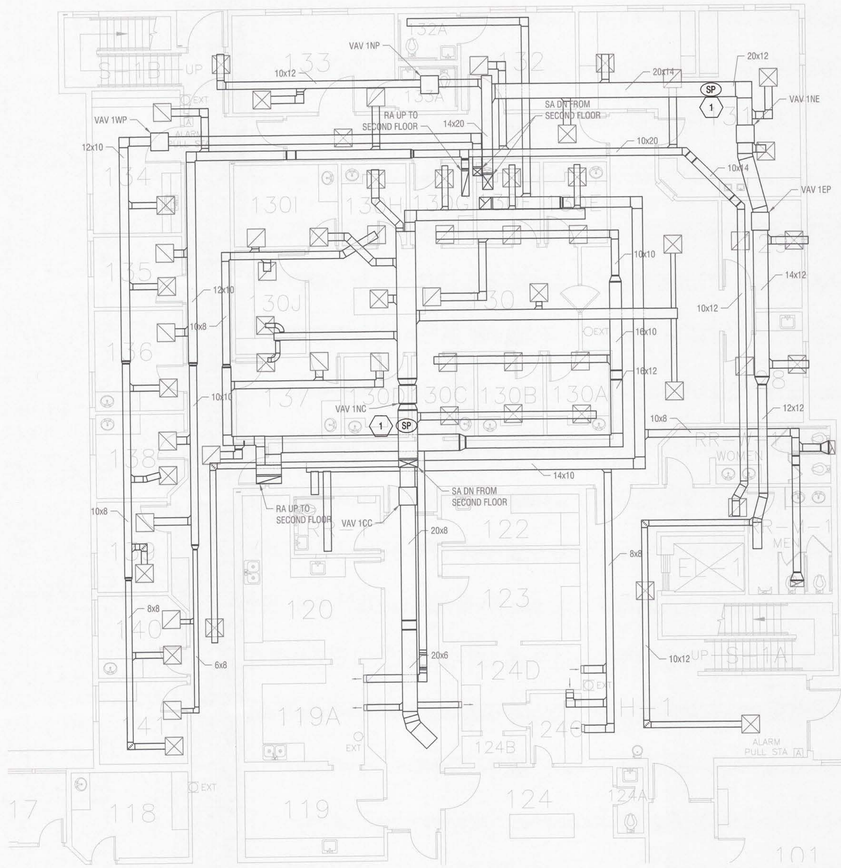
1. PROVIDE DUCT STATIC PRESSURE SENSOR AND ALL REQUIRED CONTROL WIRING BACK TO UNIT CONTROLLER. CONTRACTOR TO CONFIRM EXACT LOCATION IN FIELD. STATIC PRESSURE SENSOR SHALL BE UPSTREAM OF ALL EXISTING VAV BOXES.



1 M5 MECHANICAL SECOND FLOOR REFERENCE PLAN

1/8" = 1'-0"

N



1 M5 MECHANICAL FIRST FLOOR REFERENCE PLAN

1/8" = 1'-0"

N

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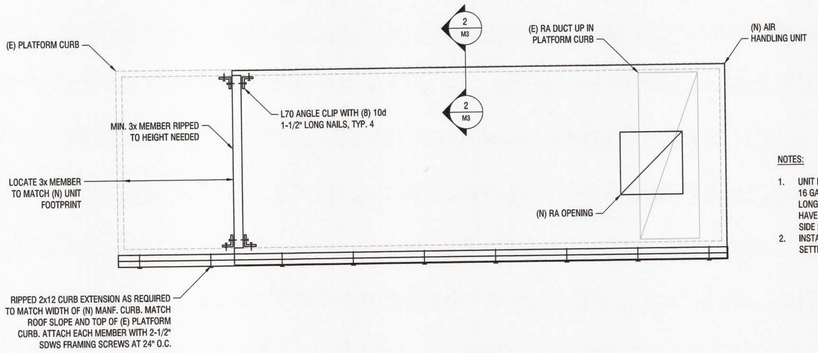
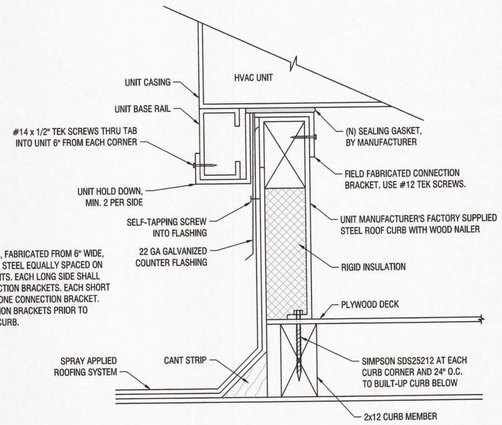
SHEET TITLE
MECHANICAL REFERENCE PLANS

SHEET
M5



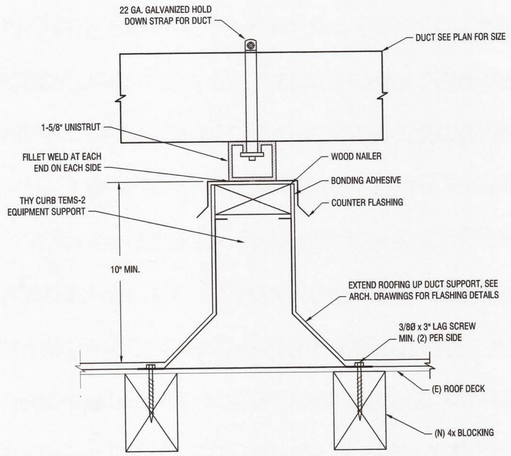
3 M6 PARTIAL ROOF CURB PLAN
NO SCALE



NOTES:

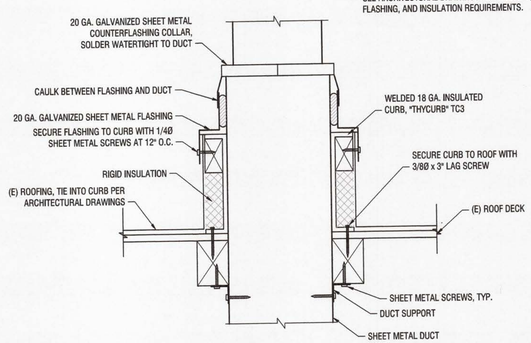
1. UNIT HOLD DOWNS, FABRICATED FROM 6" WIDE, 16 GA GALVANIZED STEEL EQUALLY SPACED ON LONG SIDES OF UNITS. EACH LONG SIDE SHALL HAVE TWO CONNECTION BRACKETS. EACH SHORT SIDE SHALL HAVE ONE CONNECTION BRACKET.
2. INSTALL CONNECTION BRACKETS PRIOR TO SETTING UNIT ON CURB.

2 M6 ROOF CURB DETAIL
NO SCALE

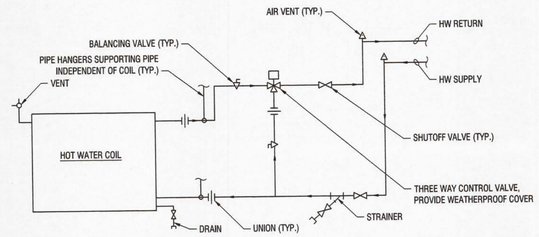


1 M6 ROOFTOP DUCT SUPPORT DETAIL
NO SCALE

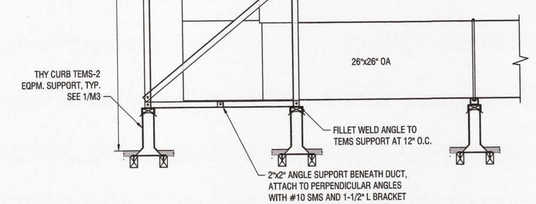
NOTE:
SEE ARCHITECTURAL DRAWINGS FOR ROOFING, FLASHING, AND INSULATION REQUIREMENTS.



6 M6 DUCT PENETRATION DETAIL
NO SCALE



5 M6 COIL PIPING DETAIL
NO SCALE



4 M6 INTAKE HOOD SUPPORT DETAIL
NO SCALE

AH-1, AH-2

OCCUPIED / UNOCCUPIED MODE: OCCUPIED / UNOCCUPIED MODE SHALL BE SCHEDULED BY THE BAS SYSTEM. IN THE UNOCCUPIED MODE THE OUTSIDE AIR DAMPERS SHALL CLOSE, THE SPACE COOLING AND HEATING SETPOINTS SHALL BE RESET TO 85°F (ADJ.) AND 55°F (ADJ.) RESPECTIVELY.

SUPPLY FAN CONTROL: THE SUPPLY FAN SHALL RUN CONTINUOUSLY DURING THE OCCUPIED MODE. THE BAS SHALL MODULATE THE SUPPLY FAN SPEED TO MAINTAIN DUCT STATIC PRESSURE SETPOINT OF 1.5" W.C. (ADJ.).

RETURN FAN CONTROL: THE RETURN FAN SHALL OPERATE CONTINUOUSLY WHENEVER THE SUPPLY FAN OPERATES. MODULATE THE RETURN FAN SPEED TO MATCH THE SUPPLY FAN.

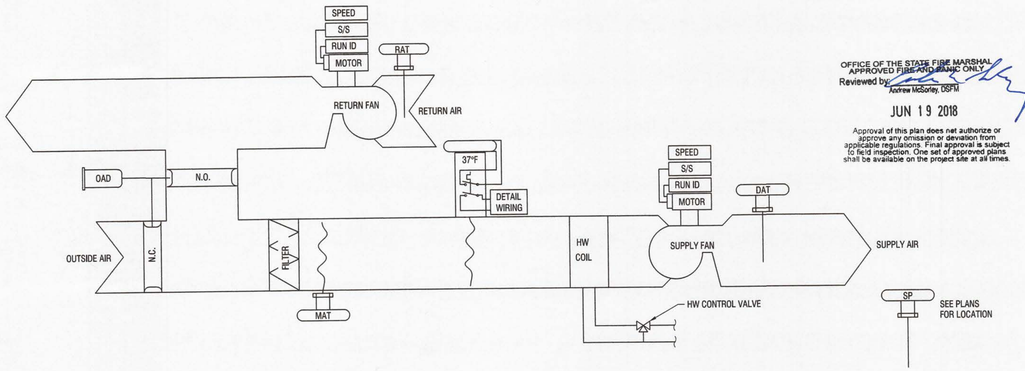
ECONOMIZER MODE: DURING THE OCCUPIED MODE, WHEN THERE IS A CALL FOR COOLING AT THE ZONE LEVEL, MODULATE THE OUTSIDE AIR AND RETURN AIR DAMPERS TO MAINTAIN A DISCHARGE AIR SETPOINT OF 60°F (ADJ.).

MIXED AIR DAMPER CONTROL: WHEN THE SUPPLY FAN IS OFF, THE OUTSIDE AIR DAMPER SHALL BE CLOSED AND THE RETURN DAMPER SHALL BE FULLY OPEN. DURING OCCUPIED MODE, WHEN THE SUPPLY FAN IS ON, THE OUTSIDE AND RETURN DAMPERS SHALL INITIALLY BE POSITIONED AT THE MINIMUM SETTING REQUIRED FOR VENTILATION.

HOT WATER VALVE CONTROL: WHEN IN THE OCCUPIED MODE, MODULATE THE HOT WATER COIL CONTROL VALVE TO MAINTAIN A DISCHARGE AIR TEMPERATURE AT 55°F ADJUSTABLE.

DX COOLING CONTROL: WHEN IN THE OCCUPIED MODE, MODULATE THE COMPRESSOR OUTPUT TO MAINTAIN A DISCHARGE AIR TEMPERATURE AT 70°F ADJUSTABLE.

SAFETIES / ALARMS: IF THE DISCHARGE AIR TEMPERATURE FALLS BELOW 40°F (ADJ.), OR THE FREEZE STAT ACTIVATES, THE UNIT SHALL BE COMMANDED INTO THE UNOCCUPIED MODE AND AN ALARM SHALL BE GENERATED BY THE FMS SYSTEM. WHEN ANY CONTROL POINT DEVIATES FROM SET-POINT BY MORE THAN 5°F (ADJ.), AN ALARM SHALL BE GENERATED BY THE FMS SYSTEM. WHEN ANY SENSED OUTPUT DIFFERS FROM ITS COMMANDED STATE, AN ALARM SHALL BE GENERATED BY THE FMS SYSTEM.



7 M6 AIR HANDLING UNIT CONTROL SCHEMATIC
NO SCALE

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JUN 19 2018
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REGISTERED PROFESSIONAL ENGINEER
No. M35923
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SHEET TITLE
MECHANICAL DETAILS

SHEET
M6

ELECTRICAL SPECIFICATIONS

PART 1 - GENERAL

1.1 GENERAL

A. ELECTRICAL PLAN DRAWINGS SHOW ONLY GENERAL LOCATIONS OF EQUIPMENT, DEVICES, AND RACEWAY UNLESS SPECIFICALLY DIMENSIONED. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER ROUTING OF RACEWAY, SUBJECT TO THE APPROVAL OF THE ENGINEER. MAKE ADJUSTMENTS AS NECESSARY TO WIRING, CONDUIT, DISCONNECTS, BRANCH CIRCUIT PROTECTION, AND OTHER AFFECTED MATERIAL OR EQUIPMENT TO ACCOMMODATE ACTUAL EQUIPMENT SUPPLIED FOR THIS PROJECT.

1.2 CODES, PERMITS, AND REGULATIONS

A. DO ALL WORK AND INSTALL ALL MATERIALS AND EQUIPMENT IN ACCORDANCE WITH THE REQUIREMENTS OF THE CALIFORNIA ELECTRICAL CODE (CEC), APPLICABLE STATE AND LOCAL LAWS AND ORDINANCES, AND THE POWER COMPANY. CONFLICTS, IF ANY, WILL BE RESOLVED AT THE DISCRETION OF THE ENGINEER.

1.3 COORDINATION

A. CLOSE COORDINATION BETWEEN THE ELECTRICAL AND MECHANICAL TRADES IS A PART OF THE WORK THAT IS REQUIRED BY THIS CONTRACT. NO ALLOWANCE WILL BE MADE FOR OMISSIONS BASED ON INCORRECTLY ASSUMING ANOTHER TRADE WILL BE PERFORMING YOUR WORK.

PART 2 - PRODUCTS

2.1 GENERAL

A. UNLESS OTHERWISE INDICATED, PROVIDE ALL FIRST-QUALITY NEW MATERIALS, FREE FROM ANY DEFECTS, AND SUITABLE FOR THE INTENDED USE AND THE SPACE PROVIDED. PROVIDE MATERIALS APPROVED BY UL WHEREVER STANDARDS HAVE ITEMS NOT SPECIFICALLY SHOWN OR SPECIFIED WHICH ARE REQUIRED TO PROVIDE THE COMPLETE SYSTEMS SPECIFIED HEREIN. WHERE TWO OR MORE UNITS OF THE SAME CLASS OF MATERIAL OR EQUIPMENT ARE REQUIRED, PROVIDE PRODUCTS OF A SINGLE MANUFACTURER. COMPONENT PARTS OF MATERIALS OR EQUIPMENT NEED NOT BE PRODUCTS OF THE SAME MANUFACTURER.

2.2 EQUIPMENT FINISH

A. UNLESS OTHERWISE INDICATED, FINISH FOR ELECTRICAL EQUIPMENT AND ENCLOSURES SHALL BE MANUFACTURER'S STANDARD GRAY OR ANSI 61 GRAY OVER A PRIMER AND RUST INHIBITOR.

2.3 JUNCTION AND PULLBOXES

A. LARGE WEATHERPROOF: NEMA 3R.

1. BOX: GALVANIZED STEEL.
2. COVER: SCREW WITH PROVISIONS FOR PAD LOCKING.
3. EMBOSSED MOUNTING HOLES ON BACK OF ENCLOSURE.
4. NO GASKETING.

2.4 CONDUIT AND TUBING

A. ELECTRIC METALLIC TUBING (EMT):
1. MEET REQUIREMENTS OF ANSI C80.3 AND UL 797.
2. MATERIAL: HOT-DIP GALVANIZED, WITH CHROMATED AND LACQUERED PROTECTIVE LAYER.

B. FLEXIBLE METAL, LIQUID-TIGHT CONDUIT:

1. UL 360 LISTED FOR 105°C INSULATED CONDUCTORS.
2. MATERIAL: GALVANIZED STEEL, WITH AN EXTRUDED PVC JACKET.

2.5 FITTINGS

A. ELECTRIC METALLIC TUBING:

1. MEET REQUIREMENTS OF UL 514B.
2. TYPE: STEEL BODY AND LOCK NUTS WITH STEEL OR MALLEABLE IRON COMPRESSION NUTS.

B. FLEXIBLE METAL, LIQUID-TIGHT CONDUIT: INSULATED THROAT AND SEALING O-RINGS.

2.6 CONDUCTORS

A. ALL CONDUCTORS SHOWN SHALL BE NEW UNLESS OTHERWISE INDICATED.

B. CONDUCTOR TYPE: STRANDED COPPER.

C. INSULATION: TYPE THHN/THWN, 90°C DRY OR 75°C WET.

2.7 CONDUCTOR ACCESSORIES

A. TAPE:

1. GENERAL PURPOSE, FLAME RETARDANT: 7 MIL, VINYL PLASTIC, RATED FOR 90°C MINIMUM MEETING REQUIREMENTS OF UL 510.
2. FLAME RETARDANT, COLD AND WEATHER RESISTANT: 8.5 MIL, VINYL PLASTIC.

B. CABLE TIES:

1. NYLON, ADJUSTABLE, AND SELF-LOCKING.

2.8 DISCONNECT SWITCH, INDIVIDUAL, 0 TO 600 VOLTS:

A. NEMA KS 1.

B. QUICK-MAKE, QUICK-BREAK, MOTOR RATED, LOAD-BREAK, HEAVY-DUTY (HD) TYPE WITH EXTERNAL MARKINGS CLEARLY INDICATING ON/OFF POSITIONS.

C. ENCLOSURE: NEMA 12, INDUSTRIAL USE, NEMA 3R, DENOTED BY WP, UNLESS OTHERWISE SHOWN.

D. INTERLOCK: ENCLOSURE AND SWITCH TO PREVENT OPENING COVER WITH SWITCH IN THE ON POSITION.

E. LOCKABLE TO THE OPEN POSITION. PROVIDE TAG READING "DO NOT OPEN UNDER LOAD."

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES

A. COORDINATE ELECTRICAL WORK WITH THE OWNER AND WORK OF OTHER TRADES TO AVOID CONFLICTS, ERRORS, DELAYS, AND UNNECESSARY INTERFERENCE DURING CONSTRUCTION.

3.2 PROTECTION DURING CONSTRUCTION

A. FOLLOWING INSTALLATION, PROTECT MATERIALS, EQUIPMENT, AND INSULATION FROM CORROSION, PHYSICAL DAMAGE, AND MOISTURE. CAP CONDUIT RUNS DURING CONSTRUCTION WITH MANUFACTURED SEALS. KEEP OPENINGS IN BOXES OR EQUIPMENT CLOSED DURING CONSTRUCTION.

3.3 MATERIAL AND EQUIPMENT INSTALLATION

A. FOLLOW THE MANUFACTURER'S INSTALLATION RECOMMENDATIONS UNLESS OTHERWISE INDICATED. FOLLOW THE ENGINEER'S DECISION, WHEREVER ANY CONFLICT ARISES. KEEP COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AVAILABLE ON THE JOBSITE FOR REVIEW AT ALL TIMES.

3.4 CUTTING AND PATCHING

A. DO NOT CUT OR NOTCH ANY STRUCTURAL MEMBER OR BUILDING SURFACE WITHOUT SPECIFIC APPROVAL OF THE ENGINEER. FOLLOWING SUCH WORK, RESTORE SURFACES NEATLY TO NEW CONDITION USING SKILLED CRAFTSMEN OF THE TRADES INVOLVED.

3.5 CLEANING AND TOUCH-UP PAINTING

A. KEEP THE PREMISES FREE FROM ACCUMULATION OF WASTE MATERIAL OR RUBBISH. UPON COMPLETION OF WORK, REMOVE MATERIALS, SCRAPS, AND DEBRIS FROM THE PREMISES AND FROM THE INTERIOR AND EXTERIOR OF ALL DEVICES AND EQUIPMENT. REFINISH DAMAGED SURFACES TO NEW CONDITION USING SKILLED CRAFTSMEN OF THE TRADES INVOLVED.

3.6 RACEWAY SYSTEM

A. UNLESS OTHERWISE SPECIFIED OR INDICATED, WIRING SHALL CONSIST OF INSULATED CONDUCTORS INSTALLED IN RACEWAYS OF THE TYPES INDICATED.

B. EXTERIOR, EXPOSED: ELECTRIC METALLIC TUBING.

C. FOR EQUIPMENT WHERE FLEXIBLE CONNECTION IS REQUIRED TO MINIMIZE VIBRATION:

1. FLEXIBLE METAL, LIQUID-TIGHT CONDUIT.
2. LENGTH: 18-INCH MINIMUM, 60-INCH MAXIMUM OF SUFFICIENT LENGTH TO ALLOW MOVEMENT OR ADJUSTMENT OF EQUIPMENT.

D. BOX TYPE (ALL RACEWAY SYSTEMS)

1. EXTERIOR LOCATIONS: WEATHERPROOF TYPE 3R.

E. INSTALL PULL BOXES WHERE SHOWN AND WHERE NECESSARY TO TERMINATE, TAP-OFF, OR REDIRECT MULTIPLE CONDUIT RUNS. INSTALL PULL BOXES WHERE NECESSARY IN RACEWAY SYSTEM TO FACILITATE CONDUCTOR INSTALLATION. INSTALL PULL BOXES IN CONDUIT RUNS AT LEAST EVERY 150 FEET OR AFTER THE EQUIVALENT OF THREE RIGHT-ANGLE BENDS. USE OUTLET BOXES AS JUNCTION AND PULL BOXES WHEREVER POSSIBLE AND ALLOWED BY APPLICABLE CODES. INSTALL PULL BOXES IN UNDERGROUND CONDUIT RUNS WITH LARGE CHANGES IN ELEVATION TO RELIEVE HYDRAULIC PRESSURE IN CONDUIT.

F. SUPPORT BOXES INDEPENDENTLY OF CONDUIT BY ATTACHMENT TO BUILDING STRUCTURE OR STRUCTURAL MEMBER. INSTALL BAR HANGERS IN FRAME CONSTRUCTION, OR FASTEN BOXES DIRECTLY WITH WOOD SCREWS ON WOOD, BOLTS AND EXPANSION SHIELDS ON CONCRETE OR BRICK, TOGGLE BOLTS ON HOLLOW MASONRY UNITS, AND MACHINE SCREWS OR WELDED THREADED STUDS ON STEELWORK.

3.7 RACEWAY INSTALLATION

A. CONDUIT AND TUBING SIZES SHOWN ARE BASED ON THE USE OF COPPER CONDUCTORS.

B. MAINTAIN RACEWAY ENTIRELY FREE OF OBSTRUCTIONS AND MOISTURE.

C. GROUP RACEWAYS INSTALLED IN SAME AREA.

D. FOLLOW STRUCTURAL SURFACE CONTOURS WHEN INSTALLING EXPOSED RACEWAYS. AVOID OBSTRUCTION OF PASSAGEWAYS. RUN EXPOSED RACEWAYS PARALLEL OR PERPENDICULAR TO WALLS, STRUCTURAL MEMBERS, OR INTERSECTIONS OF VERTICAL PLANES.

E. ALL METAL CONDUIT TO BE REAMED, BURRS REMOVED, AND CLEANED BEFORE INSTALLATION OF CONDUCTORS, WIRES, OR CABLES.

3.8 RACEWAY PENETRATIONS

A. MAKE AT RIGHT ANGLES, UNLESS OTHERWISE SHOWN.

B. NOTCHING OR PENETRATION OF STRUCTURAL MEMBERS, INCLUDING FOOTING AND BEAMS, NOT PERMITTED.

C. FIRE-RATED WALLS, FLOORS, OR CEILINGS: FIRE-STOP OPENINGS AROUND PENETRATIONS TO MAINTAIN FIRE-RESISTANCE RATING.

3.9 RACEWAY SUPPORT

A. SUPPORT FROM STRUCTURAL MEMBERS ONLY, AT INTERVALS NOT EXCEEDING CEC REQUIREMENTS, AND IN ANY CASE NOT EXCEEDING 10 FEET. DO NOT SUPPORT FROM PIPING, PIPE SUPPORTS, OR OTHER RACEWAYS.

B. WALL BRACKETS AND ASSOCIATED HARDWARE IN CONTACT WITH CONCRETE OR MASONRY SHALL BE STAINLESS STEEL. PROVIDE GALVANIZED STEEL AT ALL OTHER LOCATIONS. STRAP HANGERS, AND CEILING TRAPEZE INCLUDING HARDWARE, SHALL BE GALVANIZED STEEL.

C. NAILS OR WOODEN PLUGS INSERTED IN CONCRETE OR MASONRY FOR ATTACHING RACEWAY NOT PERMITTED. DO NOT WELD RACEWAYS OR PIPE STRAPS TO STEEL STRUCTURES. DO NOT USE WIRE IN LIEU OF STRAPS OR HANGERS.

3.10 RACEWAY BENDS

A. INSTALL CONCEALED RACEWAYS WITH A MINIMUM OF BENDS IN THE SHORTEST PRACTICAL DISTANCE.

B. AVOID FIELD-MADE BENDS AND OFFSETS, BUT WHERE NECESSARY, MAKE WITH ACCEPTABLE HICKEY OR BENDING MACHINE. DO NOT HEAT METAL RACEWAYS TO FACILITATE BENDING.

C. FLEXIBLE CONDUIT: DO NOT MAKE BENDS THAT EXCEED ALLOWABLE CONDUCTOR BENDING RADIUS OF CABLE TO BE INSTALLED OR THAT SIGNIFICANTLY RESTRICTS CONDUIT FLEXIBILITY.

3.11 TERMINATION AT ENCLOSURES

A. SHEET METAL BOXES, CABINETS, AND ENCLOSURES:

1. ELECTRIC METALLIC TUBING: PROVIDE GLAND COMPRESSION, INSULATED CONNECTORS.
2. FLEXIBLE METAL CONDUIT: PROVIDE TWO SCREW TYPE, INSULATED, MALLEABLE IRON CONNECTORS.

3.12 CONDUCTORS

A. CONNECTIONS AND TERMINATIONS:

1. INSTALL WIRE NUTS ONLY ON SOLID CONDUCTORS.
2. INSTALL NYLON SELF-INSULATED CRIMP CONNECTORS AND TERMINATORS FOR CIRCUIT CONDUCTORS NO. 6 AWG AND SMALLER.

B. DO NOT USE SOLDERED MECHANICAL JOINTS.

C. SPLICES AND TERMINATIONS:

1. INDOORS: USE GENERAL PURPOSE, FLAME RETARDANT TAPE.
2. OUTDOORS: USE FLAME RETARDANT, COLD- AND WEATHER-RESISTANT TAPE.

D. CABINETS AND PANELS:

1. REMOVE SURPLUS WIRE, BRIDLE AND SECURE.
2. WHERE CONDUCTORS PASS THROUGH OPENINGS OR OVER EDGES IN SHEET METAL, REMOVE BURRS CHAMFER EDGES, AND INSTALL BUSHINGS AND PROTECTIVE STRIPS OF INSULATING MATERIAL TO PROTECT THE CONDUCTORS.

3.13 GROUNDING

A. UNLESS OTHERWISE INDICATED, GROUND ALL EXPOSED NONCURRENT-CARRYING METALLIC PARTS OF ELECTRICAL EQUIPMENT, RACEWAY SYSTEMS, AND THE NEUTRAL OF ALL WIRING SYSTEMS IN ACCORDANCE WITH THE CEC, STATE, AND OTHER APPLICABLE LAWS AND REGULATIONS.

END OF SECTION

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Andrew McSorley, DSFM
JUN 19 2018

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

HUMBOLDT STATE UNIVERSITY
FACILITIES MANAGEMENT
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REGISTERED PROFESSIONAL ENGINEER
R. ABRAHAM
No. M35923
EXP. 3-31-2020
MECHANICAL
STATE OF CALIFORNIA

SHC AHU REPLACEMENT

AHU REPLACEMENT
STUDENT HEALTH CENTER (BLDG 42)

STATUS
PERMIT DOCUMENTS

BUILDING PERMIT APPROVAL:
This project has demonstrated conformance with applicable codes and standards established by statute and University policy. Based on this determination these documents are

'APPROVED FOR CONSTRUCTION'

Michael Fisher
Campus Deputy Building Official
Humboldt State University
The California State University

Date: 6/19/2018
Permit #: 2017/18-017

Other approvals, as applicable:
SFM Approval: 6/19/18
DSA Access Approval: N/A
Seismic Peer Review: N/A
Other: N/A

PROJECT #: XPL 226
W.O. #s:

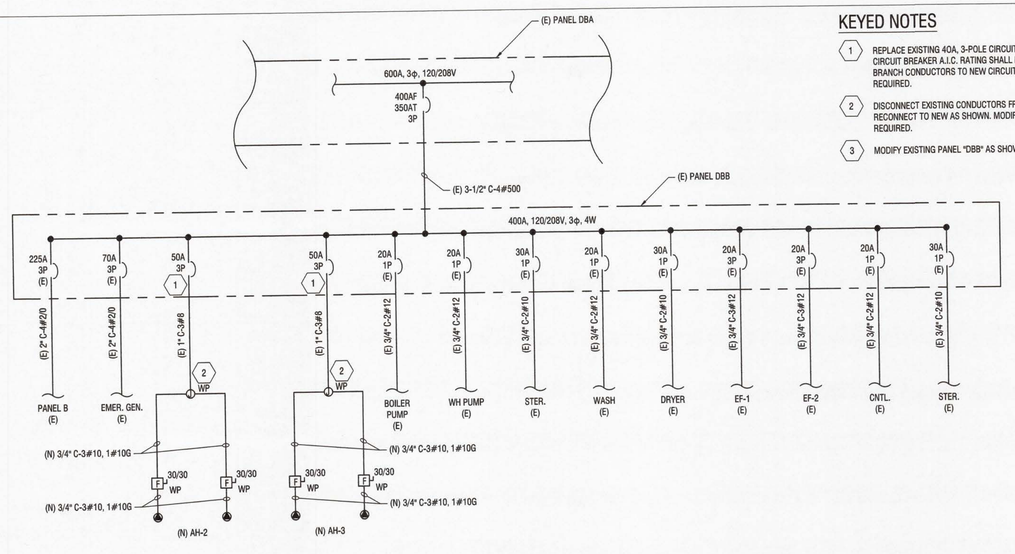
ISSUE DATE: MAY 23, 2018
REV:

SHEET TITLE
ELECTRICAL SPECIFICATIONS

SHEET
E0

ELECTRICAL LEGEND

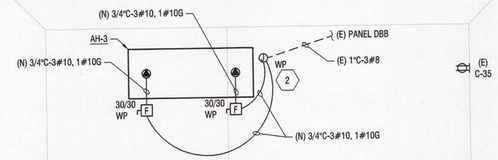
SYMBOLS	ABBREVIATIONS	
- - - - - - - -		CONCEALED CONDUIT
———		EXPOSED CONDUIT
□ xx		NON - FUSED DISCONNECT WITH RATING SHOWN
F xx/xx		FUSED DISCONNECT WITH RATING AND FUSES
▬		PANEL BOARD
◍		JUNCTION BOX
◭		EQUIPMENT CONNECTION POINT
xxA		CIRCUIT BREAKER WITH RATING SHOWN
	A	AMPS
	AF	AMP FRAME RATING
	AT	AMP TRIP ELEMENT RATING
	(E)	EXISTING
	(N)	NEW
	P	CIRCUIT BREAKER POLES
	PNL	PANEL BOARD
	V	VOLTS
	W	WATTS / WIRE
	WP	WEATHERPROOF - NEMA 3R

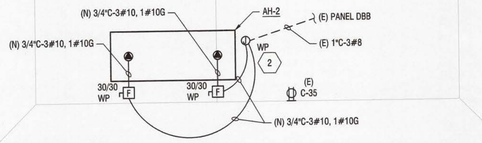


1 / E1 ONE LINE DIAGRAM
NO SCALE

KEYED NOTES

1. REPLACE EXISTING 40A, 3-POLE CIRCUIT BREAKER WITH NEW AS SHOWN. NEW CIRCUIT BREAKER A.I.C. RATING SHALL MATCH EXISTING. RECONNECT EXISTING BRANCH CONDUCTORS TO NEW CIRCUIT BREAKER. MODIFY EXISTING PANEL AS REQUIRED.
2. DISCONNECT EXISTING CONDUCTORS FROM EXISTING EQUIPMENT AND RECONNECT TO NEW AS SHOWN. MODIFY EXISTING CONDUIT/CONDUCTORS AS REQUIRED.
3. MODIFY EXISTING PANEL "DBB" AS SHOWN.





3 / E1 ELECTRICAL ROOF PLAN
1/8" = 1'-0"

2 / E1 ELECTRICAL FIRST FLOOR PLAN
1/8" = 1'-0"

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SHEET TITLE
ELECTRICAL ONE-LINE DIAGRAM AND PLANS

SHEET
E1