#### 3.8 PIPING AND HYDRONIC EQUIPMENT INSULATION

A. ALL WATER PIPING SHALL BE INSULATED. INSULATION SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS. ALL HOT WATER PIPING INSULATION SHALL BE MOLDED FIBERGLASS WITH FACTORY APPLIED VAPOR BARRIER JACKET. INSULATION SHALL HAVE SMOKE DEVELOPED RATING OF 25 OR LESS AND A FLAME SPREAD AND FUEL CONTRIBUTED RATING OF 50 OR LESS. FOR COLD WATER PIPING MAINTAIN INSULATION VAPOR BARRIER USING VAPOR BARRIER ADHESIVES AT JOINTS AND MASTIC AT END JOINTS AS RECOMMENDED BY MANUFACTURER. INSULATION THICKNESS SHALL BE AS FOLLOWS:

#### B. SCHEDULE

SIZE	THICKNESS
1-1/2" & SMALLER	1-1/2"
	SIZE 1-1/2" & SMALLER

C. PROVIDE PREINSULATED PROTECTION SHIELDS AT PIPE HANGERS. PIPING SHALL NOT BE IN DIRECT CONTACT WITH HANGER FOR INSULATED PIPING.

#### 3.9 PIPING SYSTEMS HANGERS, ANCHORS AND SUPPORTS

- A. ATTACHMENTS TO STRUCTURE FOR ALL NEW AND MODIFIED PIPING TO BE SUPPORTED BY SUPPLEMENTARY STRUCTURAL STEEL CONNECTED TO STRUCTURAL BEAMS. PROVIDE ALL REQUIRED SUPPLEMENTARY STEEL.
- B. ATTACHMENTS FOR PIPING 2" AND SMALLER WITH LOADS ONLY UP TO 250 LBS. IS TO BE ACCOMPLISHED BY DRILLED-IN EXPANSION SHIELD TYPE
- C. HANGERS FOR COPPER PIPING SHALL BE COPPER PLATED.
- D. BUILDING FIRE PROOFING SHALL BE RESTORED WHERE DISTURBED
- E. DO NOT HANG PIPING FROM HANGERS FOR OTHER TRADES.
- F. PIPE HANGERS SHALL BE OF THE CLEVIS TYPE, EXCEPT WHERE OTHERWISE
- G. HANGER RODS SHALL BE GALVANIZED STEEL. HANGER ROD SHALL BE GALVANIZED AND NOT EXCEED 6 FEET IN LENGTH. SUPPLEMENTARY STEEL SHALL BE PROVIDED AS NECESSARY. PROVIDE HANGERS PER DRAWING
- H. BEAM CLAMPS HANGERS SUPPORTED FROM STEEL SHALL BE APPROVED I BEAM CLAMPS FOR HANGERS SUPPORTING PIPING 2 INCHES AND SMALLER SHALL BE GRINNELL FIG. 2L7. FOR PIPING 2-L/2 INCHES AND LARGER, I BEAM CLAMPS SHALL BE FORGED STEEL. GRINNELL FIG. NO. 228. "C" CLAMPS ARE NOT TO BE USED.
- I. WHERE PIPING IS RUN NEAR THE FLOOR AND NOT HUNG FROM THE CEILING CONSTRUCTION, BUT IS SUPPORTED FROM THE FLOOR OR IN A TRENCH, SUCH SUPPORTS SHALL BE OF PIPE STANDARDS WITH BASE FLANGE AND ADJUSTABLE TOP YOKE.
- J. WHERE PIPING IS RUN ABOVE THE FLOOR, AND IS NOT HUNG FROM THE CEILING CONSTRUCTION OR NOT SUPPORTED FROM THE FLOOR, SUCH PIPING SHALL BE SUPPORTED FROM THE WALL WITH BRACKET HANGERS, EXPANSION BOLTED TO THE WALL.

#### 3.10 PIPING SYSTEMS VIBRATION ISOLATION

A. PROVIDE VIBRATION ISOLATION FOR ALL MOTORIZED EQUIPMENT. ALL SPRING TYPE ISOLATORS SHALL BE SEISMICALLY STABLE AND SHALL HAVE AN ADDITIONAL TRAVEL TO SOLID OF 50%. ALL COMPONENTS OF EXPOSED ISOLATORS INCLUDING FASTENERS SHALL BE CORROSION PROTECTED BY ZINC OR GALVANIZED PLATING, POWDER COATING OR OTHER METHODS ACCEPTABLE TO THE ENGINEER.

#### 4.0 IDENTIFICATION

- A. PROVIDE IDENTIFICATION OF PIPING USING SPRAY PAINT AND TEMPLATES OR WITH PLASTIC STRAP ON MARKERS AS MANUFACTURED BY SETON NAME PLATE COMPANY. COLORS AND LETTERING SHALL MATCH EXISTING. PIPING SHALL BE LABELED A MINIMUM OF EVERY 30 FEET AND WHERE PIPING PASSES THROUGH WALLS.
- B. PROVIDE IDENTIFICATION OF ALL EQUIPMENT (RTU, VAV's, ETC.) VFDS, STARTERS AND OTHER EQUIPMENT USING SPRAY PAINT AND TEMPLATES OR E. OTHER APPROVED METHOD.
- C. ALL EQUIPMENT MUST HAVE THE MANUFACTURER'S NAMEPLATE VISIBLE AND SHALL NOT BE PAINTED OVER, INSULATED OR LOCATED WHERE DIFFICULT TO VIEW.
- 5.0 MOTORS, MOTOR STARTERS & VARIABLE SPEED DRIVES

#### 5.1 GENERAL

- A. MOTORS, MOTORS STARTERS AND VARIABLE SPEED DRIVES SHALL BE PROVIDED BY THIS CONTRACTOR AND INSTALLED/CONNECTED BY THE ELECTRICAL CONTRACTOR.
- B. ENCLOSURES SHALL BE NEMA 1 FOR INDOOR APPLICATIONS AND NEMA 3R FOR OUTDOOR OR LOCATIONS SUBJECT TO MOISTURE.

#### 5.1 MOTORS

- A. MOTOR ELECTRICAL CARACHETERISTICS ARE IDENTIFIED ON DRAWINGS. COORDINATE REQUIREMENTS WITH ELECTRICAL CONTRACTOR. ALL THREE PHASE MOTORS SHALL NEMA MG-1 PREMIUM EFFICIENCY. MOTORS USED WITH VARIABLE SPEED DRIVES SHALL BE NEMA MG-1 INVERTER-DUTY TYPE. SINGLE PHASE MOTORS SHALL BE PSC UNLESS SPECIFIED OTHERWISE [ECM].
- B. UNLESS NOTED OTHERWISE MOTORS TO BE ODP FOR INDOORS AND TEFC FOR OUTDOOR OR LOCATIONS SUBJECT TO MOISTURE.

#### 5.2 MOTOR STARTERS

EXCEPT AS NOTED OTHERWISE, ALL MOTORS SHALL BE PROVIDED WITH MOTORS STARTERS TO BE INSTALLED BY THE ELECTRICAL CONTRACTOR. STARTERS TO BE COMBINATION FUSED DISCONNECT AND ACROSS-THE-LINE MAGNETIC TYPE WITH: HAND-OFF-AUTOMATIC SWITCH, OVERLOADS MATCHED TO THE MOTOR, OPERATING INDICATOR LIGHT, AUXILIARY CONTACTS (MINIMUM OF 2 OR AS NEEDED FOR CONTROL) AND CONTROL TRANSFORMER.

Revisions & Issue

Do not scale drawings. Each Contractor shall be responsible for all field measurements

#### 5.3 VARIABLE SPEED DRIVES

- VARIABLE SPEED DRIVES (VSD'S) SHALL BE SOLID STATE PWM INVERTER TYPE, 3 PHASE, 460V, 60 HZ INPUT, RATED FOR CONTINUOUS DUTY, AND HOUSED IN A NEMA 3 ENCLOSURE. VSD SHALL HAVE THE FOLLOWING LIGHT INDICATORS: POWER ON AND PROBLEM, . PROVIDE FRONT MOUNTED KEYPAD TO PROGRAM USER FUNCTIONS AND TO INTERFACE WITH VSD DISPLAY. THE LCD DISPLAY SHALL BE ALPHANUMERIC, BACK LIGHT ILLUMINATED WITH PREPROGRAMMED MENU TO GUIDE USER, AND ABLE TO DISPLAY AS A MINIMUM: SET-UP PARAMETERS, RUNNING PARAMETERS, FAULT REASON, AND HISTORY OF PREVIOUS FAULTS. DRIVE SHALL BE DESIGNED TO OPERATE RELIABLY AT TEMPERATURE RANGE FROM 0 TO 40C, AND 0 TO 90% RH.
- VSD SHALL HAVE CAPABILITY TO COMMUNICATE WITH THE NEW CONTROL SYTEM (BMS) USING MODBUS OR OTHER MAJOR COMMUNICATION PROTOCOL COMPATIBLE WITH THE BMS. A MINIMUM OF TWO ANALOG AND TWO DIGITAL OUTPUT FUNCTIONS SHALL BE AVAILABLE FOR REMOTE MONITORING. PROVIDE INTEGRAL DOOR INTERLOCKED DISCONNECT. PROVIDE EXTENDED WARRANTY. C. VSD'S SHALL INCLUDE SELF PROTECTION AND RELIABILITY FEATURES, INCLUDING CURRENT LIMITING, OVERCURRENT TRIP, OVERVOLTAGE TRIP, UNDERVOLTAGE TRIP, OVERTEMPERATURE TRIP, AUTOMATIC RESET/RESTART AND STATUS INDICATION. UNIT SHALL ALSO HAVE SINGLE POLE, DOUBLE THROW CONTACT FOR REMOTE ALARMING; CONTACT WILL CHANGE WHEN ANY TRIP CONDITION HAS OCCURRED.
- MANUFACTURER AND MODEL: SQUARE D IN A NEMA 3 ENCLOSURE, WITH THE FOLLOWING ACCESSORIES: HAND-OFF AUTO SWITCH, ANNUAL POTENTIOMETER, 0-100% SPEED METER, REMOTE "ENABLED" INDICATION AND DISCONNECT SWITCH.
- D. PROVIDE FUSED OR CIRCUIT BREAKER DISCONNECT WITH VSD WHERE SHOWN ON ELECTRICAL DRAWINGS.
- E. INSTALLATION OF VSDS AS INDICATED ON DRAWINGS
- F. WARRANTY AND START-UP SERVICE
- 1. THE VSD MANUFACTURER REPRESENTATIVE SHALL BE SUBCONTRACTED TO PROVIDE START UP SERVICE FOR ALL VFD'S PROVIDED. SERVICE SHALL INCLUDE INSPECTION, FINAL ADJUSTMENT, OPERATIONAL CHECKS, AND A FINAL REPORT FOR RECORD PURPOSE. START UP SERVICE SHALL BE PERFORMED BY A FACTORY APPROVED AND CERTIFIED TECHNICIAN.
- 2. VSDS SHALL HAVE 2 YEAR PARTS AND LABOR WARRANTY.

#### 6.0 TESTING AND BALANCING

- SUBCONTRACT WITH AN INDEPENDENT AGENCY FOR THE TESTING ADJUSTMENT, AND BALANCING OF AIR AND WATER SYSTEMS. AGENCY SHALL BE COMPANY SPECIALIZING IN THE ADJUSTING AND BALANCING OF SYSTEMS SPECIFIED IN THIS SECTION WITH MINIMUM 5 YEARS EXPERIENCE. CERTIFIED BY AABC. PERFORM WORK UNDER SUPERVISION OF REGISTERED PROFESSIONAL ENGINEER. TOTAL SYSTEM BALANCE SHALL BE PERFORMED IN ACCORDANCE WITH AABC NATIONAL STANDARDS FOR FIELD MEASUREMENT AND INSTRUMENTATION, TOTAL SYSTEM BALANCE.
- PRIOR TO START THE TESTING AND BALANCING THE CONTRACTOR SHALL CONFIRM ALL SYSTEMS ARE PROPERLY CLEAN,
- C. ADJUST FLOW TO WITHIN 10 PERCENT OF DESIGN REQUIREMENTS. PREPARE AND SUBMIT AN AIR & WATER BALANCING REPORT SHOWING ALL READINGS OF CFM (OR GPM) FOR EACH OUTLET, TRAVERSES OF ALL MAIN SUPPLY AIR DUCTS AND THE TOTAL FOR THE SYSTEM, INCLUDE DESIGN VALUES FOR THE SAME. REPORT TO INCLUDE ACTUAL ELECTRICAL CHARACTERISTICS OF EACH PIECE OF EQUIPMENT TO BE BALANCED (RPM, AMPS, BHP, ETC.) AS WELL AS ELECTRICAL NAMEPLATE CHARACTERISTICS. ACCURATELY RECORD ACTUAL LOCATIONS OF BALANCING VALVES AND DAMPERS.
- D. SEQUENCE WORK TO COMMENCE AFTER COMPLETION OF SYSTEMS AND SCHEDULE COMPLETION OF WORK BEFORE SUBSTANTIAL COMPLETION OF PROJECT. BEFORE COMMENCING WORK, VERIFY THAT SYSTEMS ARE COMPLETE AND OPERABLE. ENSURE THE EQUIPMENT IS OPERABLE AND IN A SAFE AND NORMAL CONDITION, THE TEMPERATURE CONTROL SYSTEMS ARE INSTALLED COMPLETE AND OPERABLE AND PROPER THERMAL OVERLOAD PROTECTION IS IN PLACE FOR ELECTRICAL EQUIPMENT. BEGINNING OF WORK MEANS ACCEPTANCE OF EXISTING CONDITIONS.
- REPORT ANY DEFECTS OR DEFICIENCIES NOTED DURING PERFORMANCE OF SERVICES TO ENGINEER. PROMPTLY REPORT ABNORMAL CONDITIONS IN MECHANICAL SYSTEMS OR CONDITIONS WHICH PREVENT SYSTEM BALANCE.
- PERMANENTLY MARK SETTINGS OF DAMPERS AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS, AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.
- G. LEAVE SYSTEMS IN PROPER WORKING ORDER, CLOSING DOORS TO ELECTRICAL SWITCH BOXES, AND RESTORING THERMOSTATS TO SPECIFIED SETTINGS.
- H. REPLACE BELTS AND SHEAVES FOR EXISTING FANS WHERE A SPEED CHANGE IS REQUIRED TO ACHIEVE CFM INDICATED ON DRAWINGS AND TO MINIMIZE FAN ENERGY.

#### COORDINATION DRAWING

- GENERAL CONTRACTOR SHALL COORDINATE CONSTRUCTION OPERATIONS, INCLUDED IN VARIOUS SECTIONS OF SPECIFICATIONS AS PROVIDED TO ASSURE EFFICIENT AND ORDERLY INSTALLATION OF ALL PARTS OF WORK. COORDINATE CONSTRUCTION OPERATIONS INCLUDED UNDER DIFFERENT SECTIONS THAT DEPEND ON EACH OTHER FOR PROPER INSTALLATION, CONNECTION, AND OPERATION. COORDINATION OF ALL PARTS OF WORK SHALL BE LIMITED TO BUT NOT EXCLUSIVE OF THE CONTRACT TO WHICH GENERAL CONTRACTOR IS UNDER CONTRACT TO PROVIDE.
- COORDINATION DRAWINGS: REPRODUCIBLE DRAWINGS SHOWING WORK WITH HORIZONTAL AND VERTICAL DIMENSIONS TO AVOID INTERFERENCE WITH STRUCTURAL FRAMING. CEILINGS. PARTITIONS, EQUIPMENT, LIGHTS, MECHANICAL, ELECTRICAL, CONVEYING SYSTEMS, AND OTHER SERVICES:
- a. IN AND ABOVE CEILINGS. b. WITHIN WALLS.

- - c. WITHIN CHASES.
  - IN MECHANICAL SPACES.
  - e. IN ELECTRICAL SPACES. C. PREPARE COORDINATION DRAWINGS WHERE COORDINATION IS NEEDED FOR INSTALLATION OF PRODUCTS AND MATERIALS FABRICATED BY SEPARATE
  - D. PREPARE COORDINATION DRAWINGS WHERE LIMITED SPACE AVAILABILITY NECESSITATES MAXIMUM UTILIZATION OF SPACE FOR EFFICIENT INSTALLATION OF DIFFERENT COMPONENTS.
  - E. COORDINATE INSTALLATION OF DIFFERENT COMPONENTS TO ASSURE MAXIMUM ACCESSIBILITY FOR REQUIRED MAINTENANCE, SERVICE, AND
  - F. WORK OUT ALL "TIGHT" CONDITIONS INVOLVING WORK OF VARIOUS SECTIONS IN ADVANCE OF INSTALLATION.
  - G. SLEEVE, COREDRILL AND BLOCKOUT LAYOUT DRAWINGS: DRAWINGS SHOWING PROPOSED LOCATIONS AND SIZES OF SLEEVES, COREDRILLS BLOCKOUTS, AND EMBEDDED ITEMS IN CONCRETE WALLS, COLUMNS, FLOORS AND BEAMS.
  - H. PRIOR TO START OF WORK AND INSTALLATION IN ANY GIVEN AREA, CONTRACTOR/SUBCONTRACTOR TO WHICH GENERAL CONTRACTOR IS UNDER CONTRACT SHALL APPROVE, SIGN, COORDINATION DRAWINGS AFFECTING THE CONTRACTOR/SUBCONTRACTOR'S WORK IN THAT AREA. MODIFICATIONS REQUIRED AS RESULT OF FAILURE TO RESOLVE
  - INTERFERENCE'S, PROVIDE CORRECT COORDINATION DRAWINGS, OR CALL ATTENTION TO CHANGES REQUIRED IN OTHER WORK AS RESULT OF MODIFICATIONS SHALL BE PAID FOR BY RESPONSIBLE CONTRACTOR/SUBCONTRACTOR.
  - J. COORDINATION MEETINGS SHALL BE SCHEDULED BY THE GENERAL CONTRACTOR, WITH ALL AFFECTED SUBCONTRACTORS.
  - 1.2 PRODUCTION OF COORDINATION DRAWINGS
  - A. CONTRACTOR SHALL PROVIDE MINIMUM 1/4 IN SCALE PLAN, ELEVATION AND SECTION DRAWINGS, BOTH AS PAPER HARD COPIES AND AS CAD ELECTRONIC FILES PREFERABLY DEVELOPED USING AUTOCAD, SHOWING:
  - a. PARTITIONS.
  - FIRE/SMOKE RATED BARRIERS.
  - c. CEILING HEIGHTS. d. STRUCTURAL FRAMING LOCATIONS AND ELEVATIONS.
  - e. COLUMN LINES.
  - f. OTHER WORK.
  - B. GENERAL CONTRACTOR SHALL PROVIDE AS IS CONTRACTED PER INDIVIDUAL TRADE, COORDINATION DRAWINGS IN ORDER FOR CONTRACTOR/SUBCONTRACTORS TO PRODUCE COMBINED COORDINATION LAYOUT DRAWINGS PLAN AND SECTIONS OF HVAC DUCTWORK, HYDRONIC,
  - STEAM, CONDENSATE, FUEL OIL, FIRE PROTECTION PIPING, PLUMBING, SPECIAL WATER SYSTEMS, GAS SYSTEMS, ELECTRICAL CABLE TRAY, CONDUIT, CONVEYING SYSTEMS, EQUIPMENT AND OTHER WORK, WHERE APPLICABLE.
  - C. GENERAL CONTRACTOR SHALL WORK TO RESOLVE MAJOR INTERFERENCE'S AT INITIAL COORDINATION MEETING PRIOR TO PRODUCTION OF ANY DRAWINGS.
  - D. GENERAL CONTRACTOR SHALL WORK TO PRODUCE INITIAL COORDINATION DRAWINGS WITHIN REASON, AFTER INITIAL MEETING, SO AS NOT TO DELAY PROPOSED TIMELINES, AND SCHEDULES.
  - E. GENERAL CONTRACTOR SHALL MEET AS IS REQUIRED, WITHIN REASON, TO RESOLVE INTERFERENCE'S AND CORRECT DRAWINGS.

#### 1.3 AFTER APPROVAL

- A. AFTER SUBCONTRACTORS' WRITTEN APPROVAL OF COORDINATION DRAWINGS, CONTRACTOR SHALL DETERMINE METHOD USED TO RESOLVE INTERFERENCE'S NOT PREVIOUSLY IDENTIFIED.
- B. CONTRACTOR SHALL GIVE WRITTEN APPROVAL OF CHANGES TO COORDINATION DRAWINGS PRIOR TO START OF WORK IN AFFECTED AREA.
- C. MAINTAIN ONE COPY OF CURRENT APPROVED COORDINATION DRAWINGS AT PROJECT SITE.
- 1.4 PRECEDENCE OF SERVICES FOR COORDINATION DRAWINGS
- A. IN EVENT OF CONFLICTS INVOLVING LOCATION AND LAYOUT OF WORK; GENERAL CONTRACTOR SHALL USE THE FOLLOWING PRIORITY TO RESOLVE
- a. STRUCTURE AND PARTITIONS HAVE HIGHEST PRIORITY.
- b. EQUIPMENT LOCATION AND ACCESS. CEILING SYSTEM AND RECESSED LIGHT FIXTURES.
- d. GRAVITY DRAINAGE LINES.
- e. HIGH PRESSURE DUCTWORK AND DEVICES.
- LARGE PIPE MAINS, VALVES AND DEVICES.
- LOW PRESSURE DUCTWORK, DIFFUSERS, REGISTERS, GRILLES, HVAC EQUIPMENT.
- h. FIRE PROTECTION PIPING, DEVICES AND HEADS.
- SMALL PIPING, TUBING, ELECTRICAL CONDUIT, AND DEVICES.
- ABOVE FINISHED CEILING. CONDUITS SHALL BE GROUPED WITHIN A 12 IN

B. CONDUITS INSTALLED IN CORRIDORS SHALL BE MAINTAINED AT LEAST 9 IN

- C. THE SPACE UTILIZED FOR CONDUIT SHALL BE SELECTED TO ALLOW ACCESS TO ALL DEVICES WHICH NORMALLY REQUIRE ADJUSTMENT, REPAIR, RESETTING, ETC.
- D. SLEEVES THROUGH RATED PARTITIONS.
- E. ACCESS PANELS.

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#### 1.5 PRODUCTION OF LAYOUT DRAWINGS

- A. CONTRACTOR SHALL PROVIDE TO GENERAL CONTRACTOR SCALE PLAN AND ELEVATION DRAWINGS, IN CAD FORMAT PREFERABLY FOR USE WITH
- B. SUBCONTRACTORS SHALL INDICATE TO GENERAL CONTRACTOR, PROPOSED LOCATION AND SIZE OF THEIR REQUIRED SLEEVES, COREDRILLS, BLOCKOUTS AND EMBEDDED ITEMS.
  - a. 1. AT FLOOR SLABS AND WALLS TO BE CORE DRILLED OR CUT. CONTRACTOR SHALL FIND AND MARK ALL REINFORCING IN BOTH FACES LOCATED BY MEANS OF X-RAY, PACH-OMETER, OR PROF-OMETER. SUBMIT SKETCH SHOWING LOCATION OF REBAR AND PROPOSED CORES FOR REVIEW AND IMPLEMENTATION BY GENERAL CONTRACTOR.

#### 1.6 SUBMITTALS

#### A. PROJECT INFORMATION:

- a. CONTRACTOR'S APPROVED COORDINATION DRAWINGS.
- LETTER INDICATING ONE COPY OF APPROVED COORDINATION DRAWINGS AVAILABLE AT PROJECT SITE.
- c. ONE COPY OF APPROVED COORDINATION DRAWINGS TO THE OWNER/GENERAL CONTRACTOR FOR INFORMATION, IF REQUESTED.
- CONTRACTOR'S PROPOSED SLEEVE, COREDRILL AND BLOCKOUT LAYOUT DRAWINGS.

ssued for Review 04.15.2016 Issued for Value Engineering Revision 01.30.2017 Issued for Construction 02.20.2017 **Purchase College** STATE UNIVERSITY OF NEW YORK

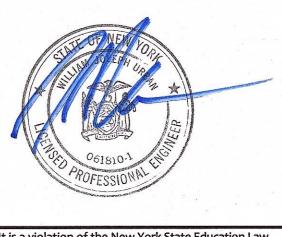
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June. 7, 2016

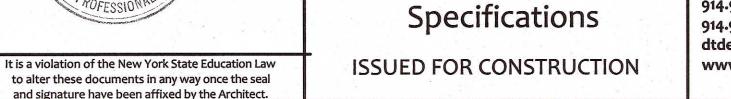
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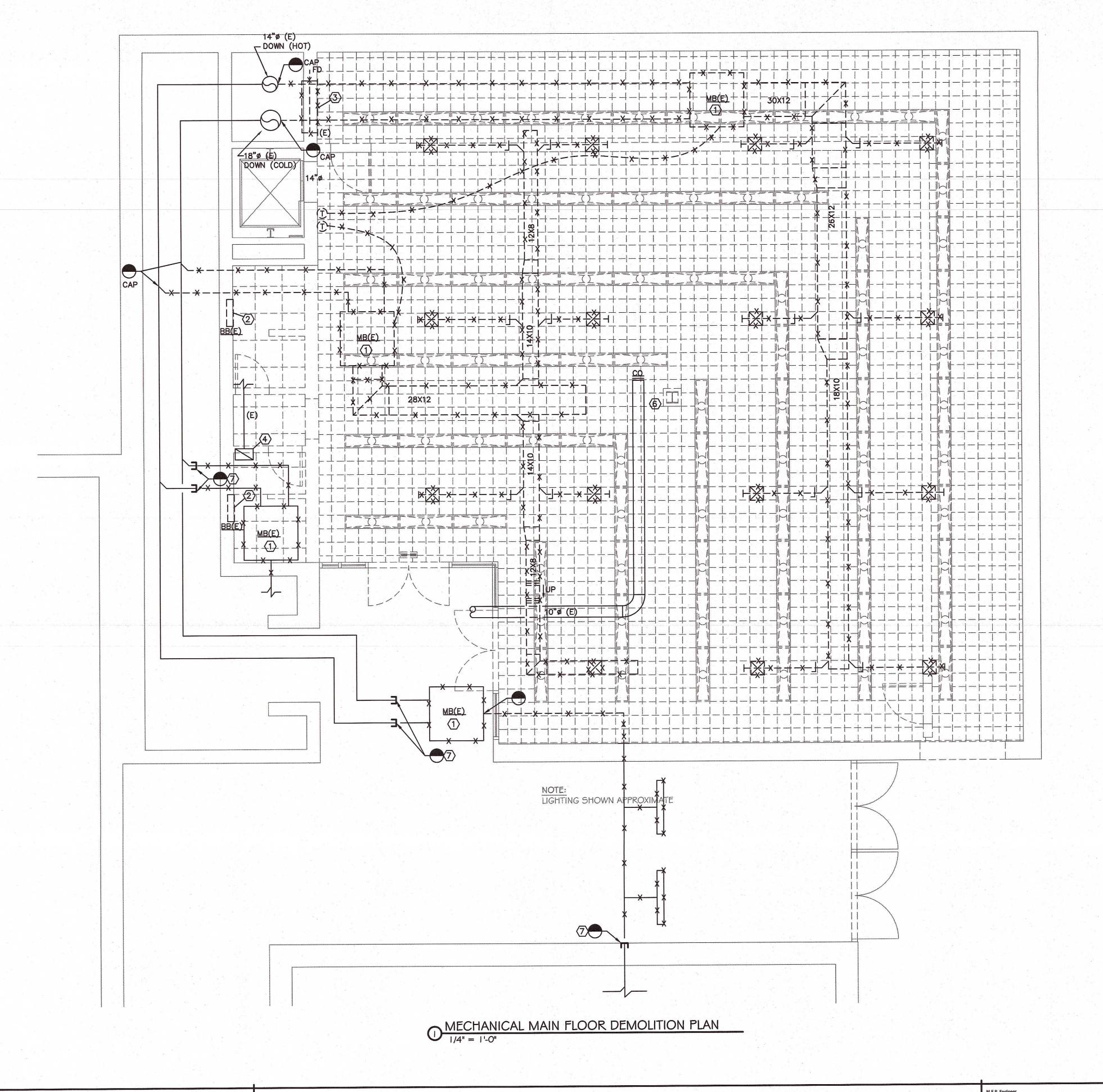
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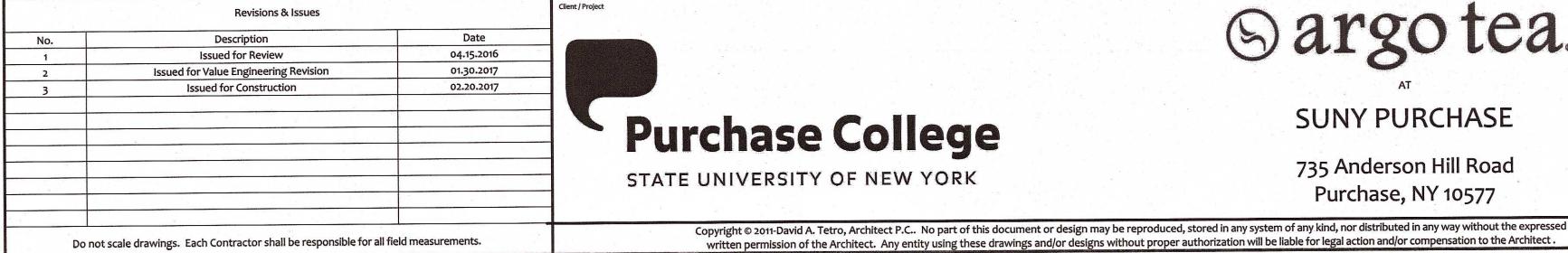


#### GENERAL NOTES - DEMOLITION LOWER LEVEL

1. REMOVE EXISTING DUCTWORK AND ASSOCIATED SPECIALTIES WHERE INDICATED ON DRAWINGS. REFER TO DWG M-300.00 FOR NEW SCOPE OF WORK.

#### DESIGN NOTES - DEMOLITION LOWER LEVEL

- 1 REMOVE EXISTING MIXING BOXES WHERE INDICATED INCLUDING ALL INTAKE DUCTWORK BACK TO MAIN AND CAP, DISCHARGE DUCTWORK AND SPECIALTIES, CIRCUITRY, SUPPORTS AND CONTROLS.
- (2) REMOVE EXISTING RECESSED HOT WATER CABINET HEATERS SERVING THE RESTROOMS AND ALL ASSOCIATED CONTROLS. REMOVE HOT WATER PIPING BACK TO FLOOR SLAB AND CAP.
- (3) REMOVE EXISTING RETURN GRILLE AND ASSOCIATED DUCTWORK AND SPECIALTIES THRU RATED ENCLOSURE AND REPAIR TO MATCH EXISTING. COORDINATE WITH ARCHITECT.
- (4) EXISTING EXHAUST DUCT THRU ROOF TO REMAIN
- (5) HVAC SCOPE OF WORK NOT REQUIRED ON THIS AREA.
- (6) EXISTING ROOF DRAIN TO REMAIN.
- (7) CUT BACK EXISTING DUCTWORK TO THIS POINT AND CAP.





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to alter these documents in any way once the seal and signature have been affixed by the Architect.

June. 7, 2016 M-2.115.44

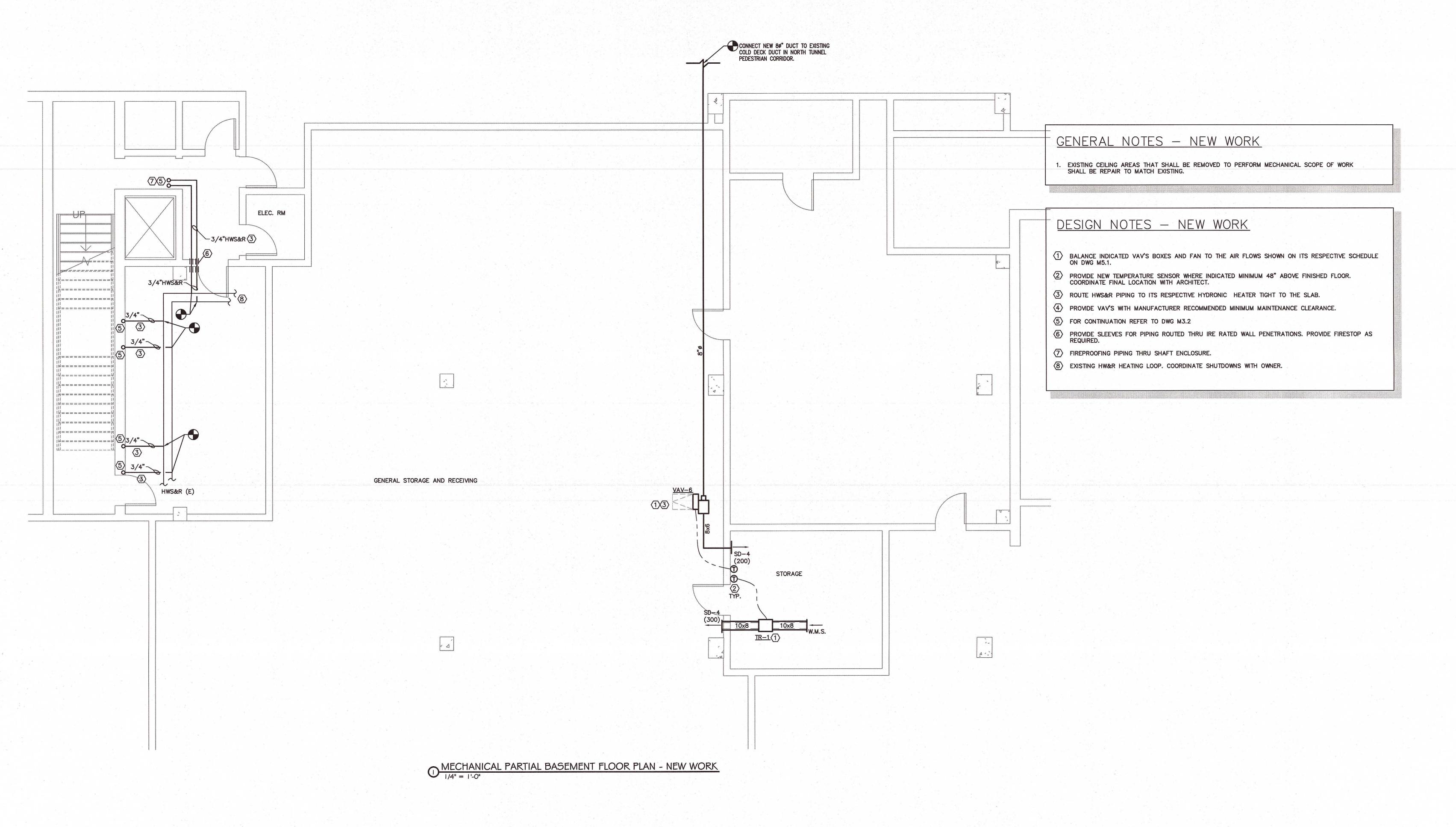
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**Mechanical Demolition** 

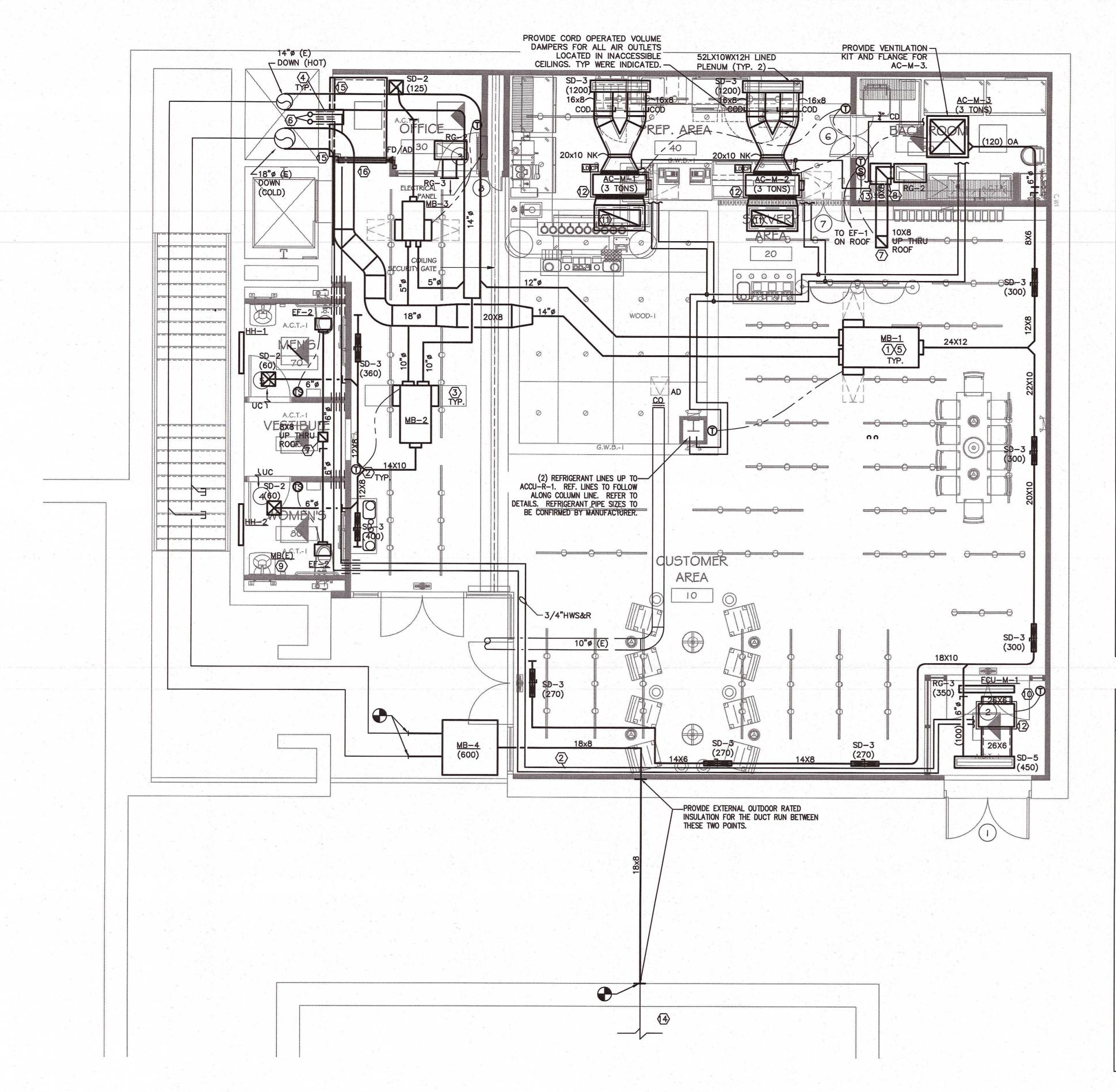
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MECHANICAL MAIN FLOOR PLAN - NEW WORK

**Purchase College** 

STATE UNIVERSITY OF NEW YORK

## GENERAL NOTES - NEW WORK

- 1. SUPPLY AND RETURN DUCTWORK UPSTREAM AND DOWNSTREAM OF AIR HANDLING UNITS AND FANS, AND DOWNSTREAM SHALL BE PROVIDED WITH 1.5" ACOUSTIC LINING FOR 25 FEET OF DUCT RUN. REFER TO DETAILS FOR ADDITIONAL REQUIREMENTS. PROVIDE SIMILAR FOR 15 FEET DOWNSTREAM OF ALL VAV & FAN POWERED BOXES.
- 2. EXISTING CEILING AREAS THAT SHALL BE REMOVED TO PERFORM MECHANICAL SCOPE OF WORK SHALL BE REPAIR TO MATCH EXISTING.
- 3. ALL VIBRATING AND ROTATING EQUIPMENT SHALL HAVE FLEXIBLE CANVAS CONNECTION AT DUCT CONNECTION TO EQUIPMENT AND SHALL BE RATED FOR PRESSURES TO MATCH CONNECTING DUCTWORK.
- 4. FIRE PROOFING TO BE CHOPPED, AS REQUIRED TO INSTALL DUCTWORK AND HVAC EQUIPMENT AS HIGH AS POSSIBLE. INTUMESCENT PAINT TO BE PROVIDED WHERE FIREPROOFING IS REMOVED TO MAINTAIN THE REQUIRED FIRE RATING. COORDINATE THIS WORK WITH THE GC.
- 5. ALL BRANCH DUCTWORK TO BE PROVIDED WITH VOLUME/AIR BALANCING DAMPERS. ALL BRANCH DUCTS ABOVE ACCESSIBLE CEILINGS SHALL BE PROVIDED WITH MANUAL BALANCING DAMPERS. PROVIDE A CABLE OPERATED DAMPER FOR ALL BRANCH DUCTWORK ABOVE AN INACCESSIBLE CEILING (I.E. GYPSUM BOARD/DRYWALL CEILING) AND BRANCH DUCTWORK SERVING LINEAR DIFFUSERS. DAMPER SHALL BE LOCATED NO MORE THAN TWO FEET FROM THE ASSOCIATED DIFFUSER/REGISTER FOR PROPER AIR BALANCING.
- 6. ALL LOW VOLTAGE CONTROL WIRING SHALL BE ENCASED IN RIGID METAL CONDUIT WHEN ROUTED THROUGH UTILITY ROOMS (I.E. JANITOR'S CLOSETS, MECHANICAL ROOMS, ELECTRICAL ROOMS, ETC.), STAIRS AND EXPOSED AREAS. SEE MECHANICAL SPECIFICATIONS FOR MORE INFORMATION.
- 7. ALL HVAC EQUIPMENT INSTALLED IN THE CEILING (I.E. SUPPLY DIFFUSERS, RETURN GRILLES, ETC.) SHALL BE ALIGNED WITH OTHER CEILING DEVICES. (I.E. SPRINKLER HEADS, ARCHITECTURAL LIGHTING, ETC.)
- 8. INSTALL ALL HVAC SQUARE DIFFUSERS CENTERED WITHIN THE CEILING TILE. ANY CUTTING OR MODIFICATION OF THE CEILING TILE AND/OR SUPPORT SYSTEM REQUIRED TO INSTALL DIFFUSERS CENTERED WITHIN TILE SHALL BE INCLUDED IN THE BID FOR THIS WORK AND COORDINATED WITH THE GC.
- 9. PROVIDE WIRE MESH SCREENS AT ALL OPEN END DUCTS AND TRANSFER SLEEVES. ALL TRANSFER DUCTS TO BE PROVIDED WITH TRANSFER GRILLES ON THE EXPOSED SIDE (BASIS: ANEMOSTAT SE3HD 45 DEG DEFLECTION). SIZE OF GRILLE TO MATCH TRANSFER DUCT OUTER DIMENSIONS. COLOR FINISH TO MATCH WALL UNLESS OTHERWISE SPECIFIED BY THE ARCHITECT.
- 10. ALL DUCT SMOKE DETECTORS AND COMBINATION FIRE/SMOKE DAMPERS TO BE TIED INTO THE BASEBUILDING FIRE ALARM SYSTEM. COORDINATE THIS WORK WITH BUILDING MANAGEMENT AND THE BUILDING FIRE ALARM VENDOR.
- 11. MC TO PROVIDE RECTANGULAR TO ROUND CONNECTIONS AS REQUIRED TO CONNECT VAVS TO SUPPLY TRUNKS AS SHOWN.
- 12. ALL DUCTWORK DIMENSIONS SHOWN ON THIS PLAN REPRESENT THE INTERIOR DIMENSION. REFER TO MECHANICAL SPECIFICATIONS FOR INSULATION REQUIREMENTS.
- 13. ALL DUCTWORK AND PIPING SHALL BE INSTALLED AS HIGH AS POSSIBLE TO THE UNDERSIDE OF STRUCTURE(S). COORDINATE THIS WITH ALL OTHER TRADES INSTALLED ABOVE THE CEILING. SUBMIT FULLY COORDINATED SHOP DRAWINGS FOR REVIEW INDICATING ALL CONFLICTS FOR THE ENGINEER'S REVIEW, AND APPROVAL, PRIOR TO FABRICATION, PURCHASING OF EQUIPMENT AND INSTALLATION.
- 14. PROVIDE LOCKABLE, TAMPER PROOF THERMOSTAT GUARDS (CLEAR) FOR ALL THERMOSTATS INSTALLED IN PUBLIC AREAS. THERMOSTAT SHALL BE COORDINATED WITH ARCHITECTURE AND BE INSTALLED ABOVE LIGHT SWITCHES WHEN LOCATED IN ENCLOSED ROOMS (I.E. OFFICES, ETC.). MOUNT 5'-0" ABOVE FINISHED FLOOR UNLESS OTHERWISE SPECIFIED.
- 15. ALL EQUIPMENT SHALL BE ACCESSIBLE. ACCESS DOORS TO BE PROVIDED FOR ALL ACCESS POINTS SHOWN ON THE DRAWING. ACCESS DOORS REQUIRED IN INACCESSIBLE CEILINGS SHALL BE SPECIFIED BY THE ARCHITECT AND BE NO LESS
- 16. ALL MEDIUM PRESSURE DUCTWORK IS TO BE LEAK TESTED AS PER SMACNA LEAK TEST MANUAL AND RESULTS SUBMITTED TO BASE BUILDING MANAGEMENT.
- 17. ALL EXPOSED DUCTWORK TO BE INTERNALLY LINED AND PAINTABLE. COORDINATE DUCT FINISH WITH ARCHITECT'S REQUIREMENTS. PROVIDE ADD/ALTERNATE FOR FLAT OVAL EXPOSED DUCTWORK.

## DESIGN NOTES - NEW WORK

- PROVIDE NEW TEMPERATURE SENSOR WHERE INDICATED MINIMUM 48" ABOVE FINISHED FLOOR. COORDINATE FINAL LOCATION WITH ARCHITECT. PROVIDE TAMPER PROOF COVERS IF REQUESTED BY OWNER.
- (2) ROUTE HWS&R PIPING TO ITS RESPECTIVE AIR HEATER TIGHT TO THE SLAB.
- 3 PROVIDE FLAT OVAL TAKE-OFF TRANSITION WHERE NEW OR EXISTING DUCT HEIGHT MATCH NEW DUCTWORK BRANCH SIZE.
- 4 PROVIDE SLEEVES FOR PIPING ROUTED THRU WALL PENETRATIONS AND FIREPROOFING THRU SHAFT ENCLOSURE.
- (5) PROVIDE EXISTING MIXING BOX WITH NEW LINED SUPPLY DISCHARGE DUCTWORK WHERE INDICATED. SIZE TO MATCH EXISTING.
- 6 FOR CONTINUATION REFER TO DWG M3.1
- FOR CONTINUATION REFER TO DWG M3.3
- PROVIDE ALUMINUM DUCTWORK FOR DUCTWORK SERVING THE EF-1. PITCH DUCTWORK BACK TO 18X18 DRAIN PAN WHERE INDICATED. EXTEND DRAIN TO NEAR FLOOR DRAIN AND TERMINATE WITH 2" AIR GAP.
- PROVIDE AN ALTERNATE TO RELOCATE EXISTING MIXING BOX TO CORRIDOR, RECONNECT ALL ASSOCIATED UTILITIES (DUCTWORK, CONTROL, POWER) AND PROVIDE NEW ACCESS PANEL. CONFIRM NEW LOCATION WITH BUILDING ENGINEER AND FIELD CONDITIONS.
- PROVIDE THERMOSTAT WITH INSULATED BACK COVER.
- 44"Lx22"Wx16"H RETURN PLENUM WITH 36"x14" TOP OPEN RETURN OPENING W/ W.M.S.
- PROVIDE AUXILIARY STAINLESS STEEL DRIP PAN WITH LEAK DETECTOR BENEATH ALL AC UNITS WHERE NOTED. LEAK DETECTION TO BE CONNECTED TO BMS AND UNIT OPERATION. SHUTDOWN OF AC UNIT SHALL OCCUR IF LEAK IS DETECTED.
- (3) F CONDENSATE DRAIN PIPE TO TERMINATE AT FLOOR SINK IN BACK ROOM. CONDENSATE DRAIN TO BE PITCHED DOWNWARD TOWARD TERMINATION AT PER LINEAR FOOT.
- REBALANCE EXISTING (3) DIFFUSERS TO 200 CFM EACH, 600 CFM TOTAL.
- PROVIDE 28x20 RETURN AIR OPENINGS WITH W.M.S.
- PROVIDE 42x24 RETURN AIR OPENING ABOVE CEILING WITH FD/AD AND W.M.S.

	Revisions & Issues	
No.	Description	Date
1	Issued for Review	04.15.2016
2	Issued for Value Engineering Revision	01.30.2017
3	Issued for Construction	02.20.2017
		278 2
	* //	

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15.44

M-3.2

DAVID A. TETRO

ARCHITECT P.C.

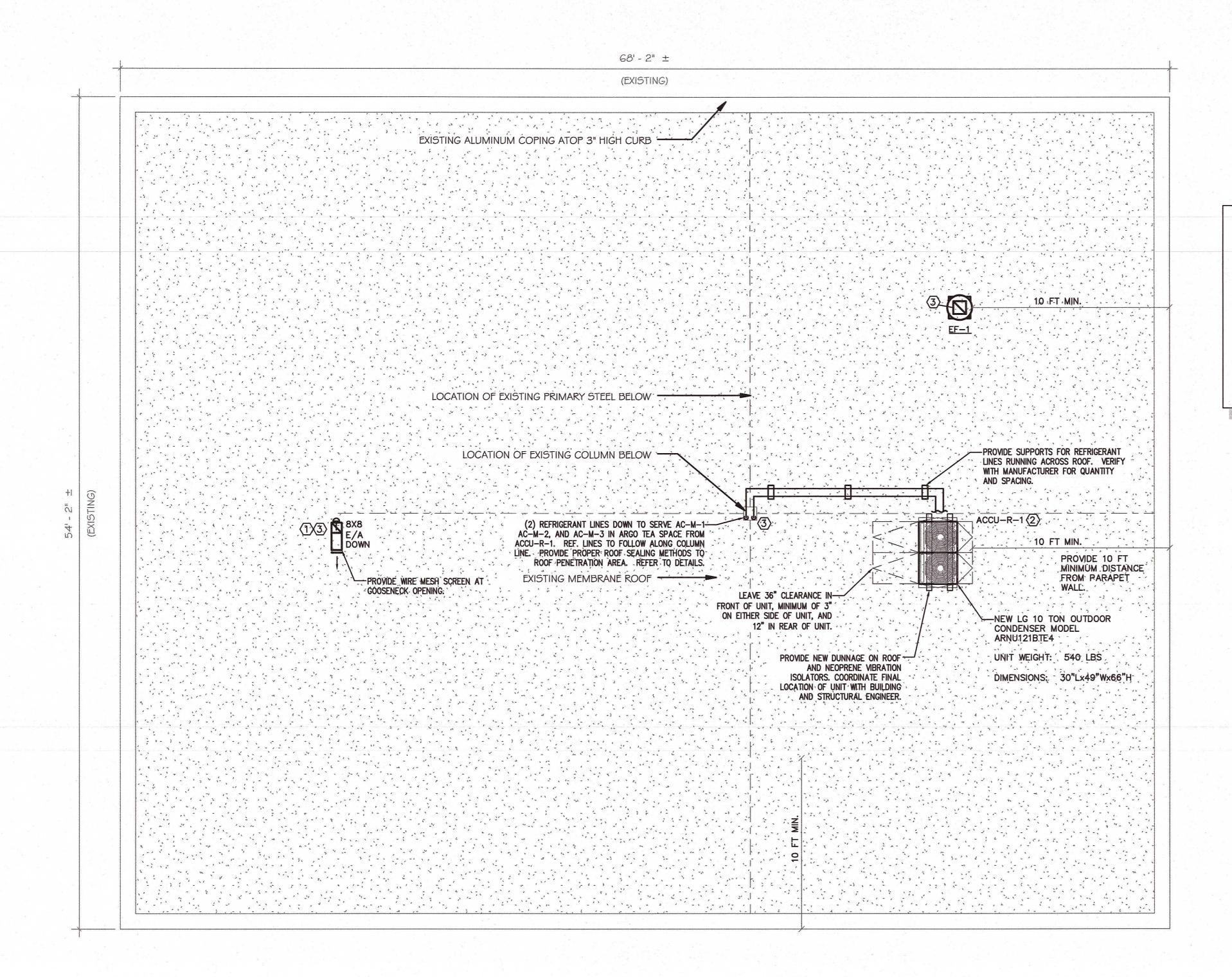
AIA - LEED A.P. - NCARB

Mechanical
Construction Plan

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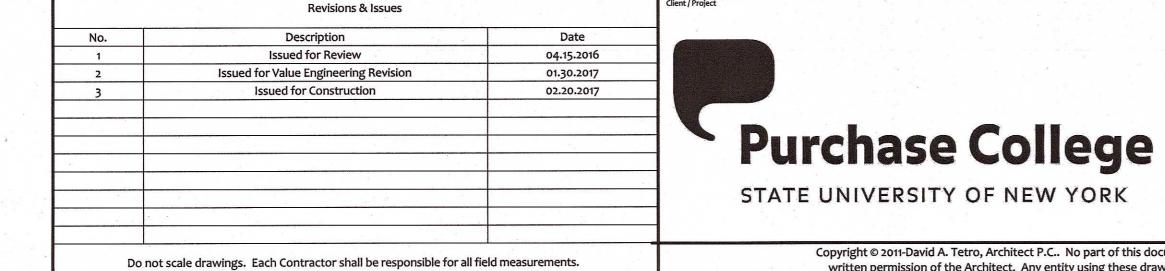




<u>DESIGN NOTES - NEW WORK</u>

- EXTEND EXHAUST DUCTWORK THRU ROOF AND TERMINATE WITH GOOSENECK. SEAL DUCT PENETRATION THRU ROOF WATER TIGHT. REFER TO DUCT PENETRATION THRU ROOF AND GOOSENECK DETAILS ON DWG M4.1
- (2) CONTRACTOR SHALL TAKE SPECIAL PRECAUTION WHEN RIGGING HVAC UNIT TO ROOF. ADJACENT AREA AROUND BUILDING IS "PLAZA" AND IS RATED 30 PSF. RIGGER SHALL HIRE LICENSE STRUCTURAL ENGINEER TO REVIEW APPROACH TO PLACEMENT OF HVAC UNIT. SUBMIT DETAILED PLANS TO OWNERSHIP FOR APPROVAL PRIOR TO RIGGING HVAC UNIT.
- (3) FOR CONTINUATION REFER TO DWG M3.2

MECHANICAL ROOF PLAN - NEW WORK



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Mechanical **Construction Plan** 

M - 3.3

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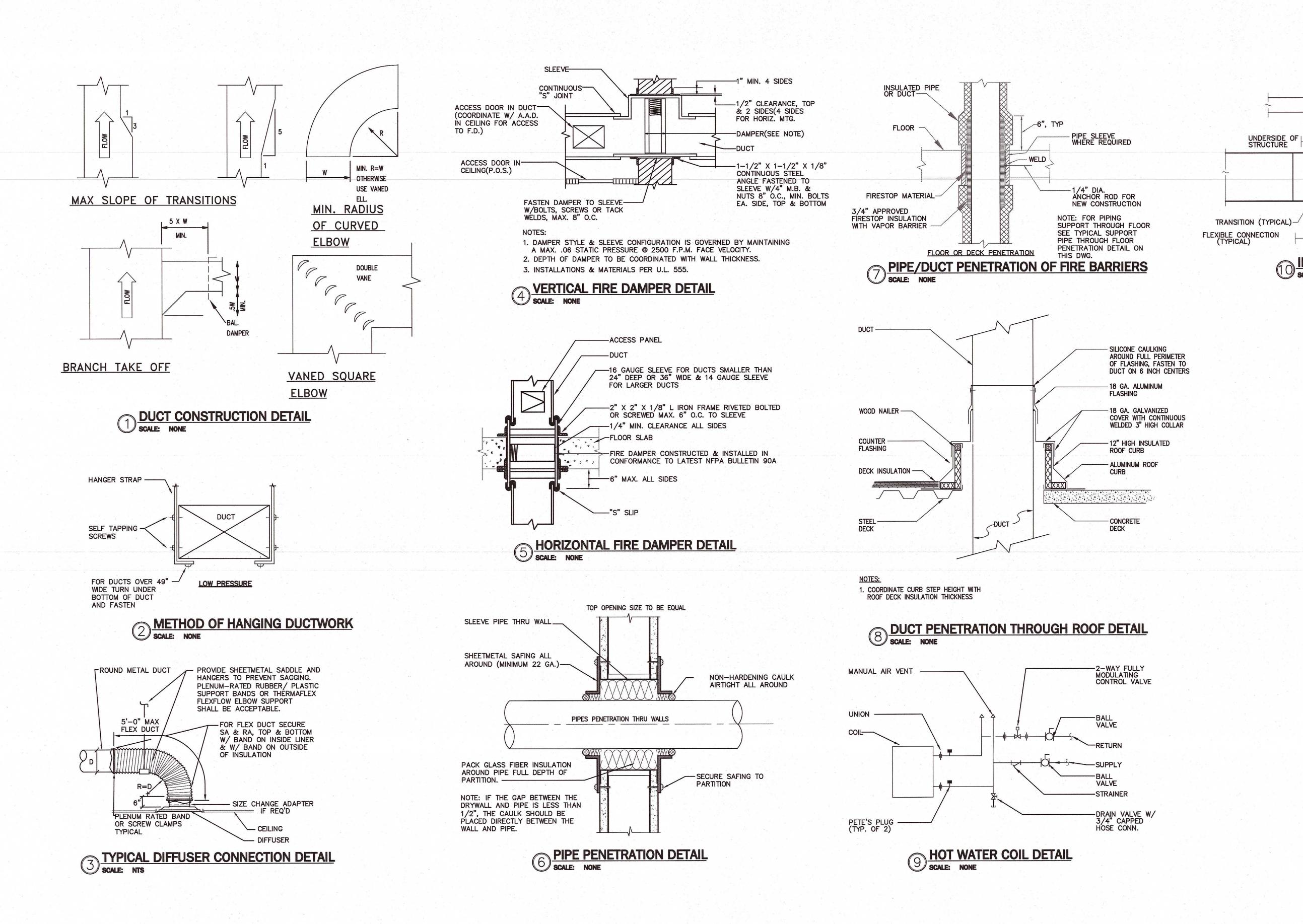
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VIBRATION ISOLATOR (TYPICAL FOR 4)

HANGER BRACKET (TYPICAL FOR 4)

FAN

IN-LINE FAN DETAIL
SCALE: NONE

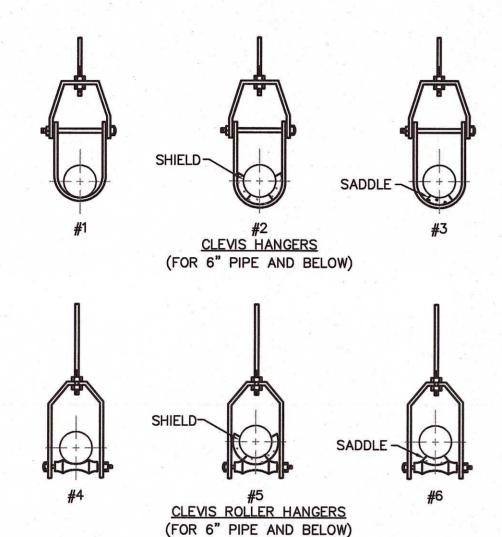


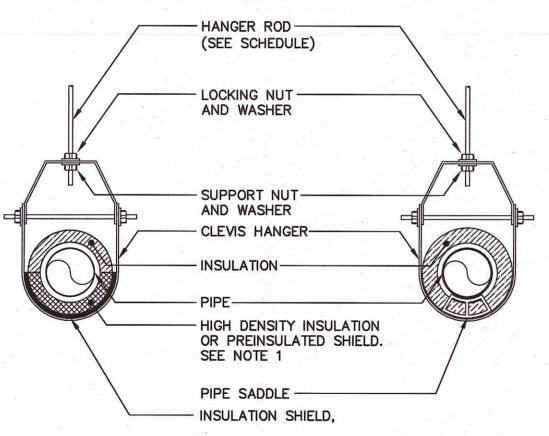
#### PIPE HANGER AND SUPPORT NOTES

- 1. PIPE SUPPORTS, ROD SPACING AND ROD SIZING SHALL COMPLY TO MSS-69.
- 2. SHIELDS AND HIGH DENSITY INSULATION SHALL BE A MINIMUM OF 12" OR 1.5 PIPE DIAMETER WHICHEVER IS LONGER, MAXIMUM LENGTH OF SHIELD IS 24". SHIELDS THICKNESS 0.06 UP TO 6 INCH PIPE SIZE. 0.075" FOR LARGER

HANGER ROD	SCHEDULE	HANGER	ROD SPACING
PIPE SIZE	ROD SIZE	PIPE SIZE	MAX. SPACING
UP TO 2"	3/8" DIA.	1/2" to 1-1/4	7'
2 1/2" THRU 3"	1/2"	1 1/2"	9'
4 & 5"	5/8"	2" AND 3	10'
6"	3/4"	4" AND 5	14'
8 THRU 12"	7/8"	6" AND 8	17'
LARGER SIZES	1"	LARGER	20'

# PIPE HANGER ROD SCHEDULE SCALE: NONE

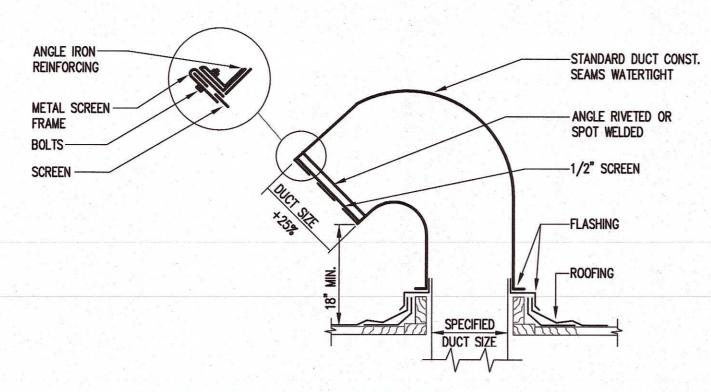




# INSULATED PIPE SUPPORT DETAIL SCALE: NTS

CLEVIS HANGER SHOWN: INSTALLATION TYPICAL FOR ROLLER HANGERS AND TRAPEZE HANGERS.

1. HIGH DENSITY REQUIRED FOR BOTTOM HALF FOR CLEVIS AND ROLLER HANGERS, AND ALL AROUND FOR TRAPEZE HANGERS. HIGH DENSITY INSULATION INSERT FOR COLD PIPING SHALL BE CELLULAR TYPE OR APPROVED FOR COLD USE. CALCIUM SILICATE SHALL BE USED FOR HOT PIPING.



# RECTANGULAR GOOSENECK & COUNTER FLASHING SCALE: NONE

CONCEALED VALVES AND FITTINGS WRAP WITH 1 INCH THICK, 1 POUND DENSITY TO REQUIRED PIPE INSULATION THICKNESS. SECURE WITH WIRE OR TAPE.
 VAPOR SEAL COLD WATER, CHILLED WATER AND STORM WATER PIPING.

EXPOSED VALVES AND FITTINGS PREMOLDED FIBERGLASS OR RADIAL MITERED PREMOLDED FIBERGLASS OR RADIAL MITERED PIPE INSULATION.

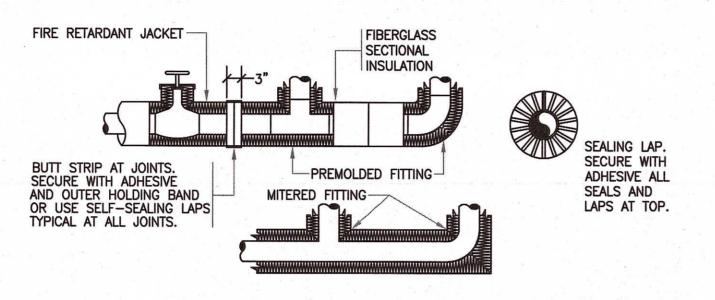
SKIM COAT OF INSULATION CEMENT.

COAT OF MASTIC

WRAP WITH FIBERGLASS REINFORCING CLOTH.

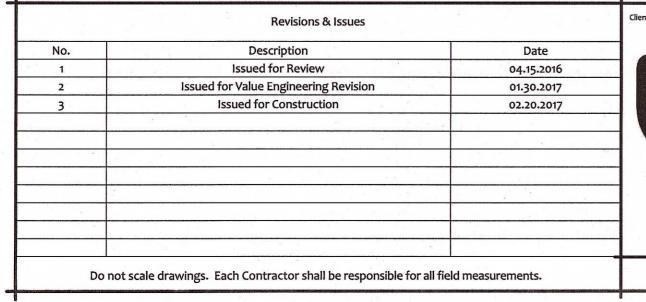
FINISH COAT OF MASTIC

OVERLAP 2 INCHES ON PIPE INSULATION.



INSULATION OF PIPING, VALVES AND FITTINGS FOR EXPOSED OR CONCEALED









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June. 7, 2016

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#### FAN SCHEDULE: GREENHECK OR APPROVED EQUAL

				PERFO	DRMANCE	DATA			CONSTRU	CTION DATA				FAN MOTOR	DATA		9		SPECIFICATIO	NS	
UNIT No.	LOCATION	SERVICE	CFM	ESP IN. W.G	RPM	MINI DUE	MAX. OV	CLACC	DISCH	ADDOMNIT	DRIVE	MHP/W	STARTER	at a resident	ELECTRICA	AL DATA		VIBRATION IS		MIN. STATIC	MODEL No.
8 8 K			CFM	ESP IN. W.G	RFM	MIN. BHF	(FPM)	CLASS	DISCH.	ARRGMNT.	DRIVE	MUL-/W	TYPE	MOTOR EFFICIENCY	VOLTS	PH	HZ	MOUNTING TYPE	BASE TYPE	DEFLECTION (IN.)	
EF-1	ROOF	STORAGE	300	0.25	1725	_	-	1	DUCTED	INLINE	DIRECT	1/6HP	VG	82.5	115	1	60	SPRING		1	G-070
EF-2	CEILING	RESTROOMS	100	0.25	1100	-	<del>.</del> <del>.</del> .	1	DUCTED	INLINE	DIRECT	52.5W		82.5	115	1	60	SPRING	_	1	SP-A125
TR-1	CEILING	STORAGE	300	0.25	1350	-	-	1	DUCTED	INLINE	DIRECT	140W	-	82.5	115	1	60	SPRING		1	CSP-A390

#### NOTES:

- BASIS FOR DESIGN: GREENHECK.
- 2. PROVIDE WITH SPEED CONTROLLER, ON-OFF SWITCH AND VIBRATION ISOLATORS FOR ALL FANS AS
- 3. PROVIDE FLEXIBLE CONNECTIONS WHERE DUCTWORK IS CONNECTING THE FANS CHASSIS.
- 4. PROVIDE A TIMER SWITCH FOR FAN EF-2 BESIDES THE ON-OFF SWITCH. 5. FANS TO THE BACKDRAFT DAMPER AT DISCHARGE.
- 6. MINIMUM MOTOR EFFICIENCY MUST MEET 2014 NY STATE ENERGY CODE AS PER ASHRAE 90.1. 7. PROVIDE MANUFACTURER RECOMMENDED ROOF CURB, HINGED CURB CAP WITH FIELD INSTALLED
- CABLERS, AND CURB SEAL. REFER TO MECHANICAL DETAILS.

#### HYDRONIC HEATER SCHEDULE

						HEA	ATING CAPACITY				Facility.
TAG	MANUFACTURER	MODEL No.	DIMENSIONS	SERVICE	BTUH	GPM	WATER PD/FT	ROWS	AVG. WATER TEMP	AIR FLOW (CFM)	FILTER
HH-1/2	BEACON/MORRIS	FWG-A / 436-18	36"Lx4-13/16"Dx18"H	STORAGE	2,500	0.5	0.16	-	160		

#### NOTES:

- PROVIDE WITH MANUFACTURER RECOMMENDED ACCESS DOOR. COORDINATE LOCATION WITH ARCHITECT
- 2. PROVIDE BACK-ONLY INSULATION.
- 3. PROVIDE BRONZE HEADER 3" NPT WITH COPPER TUBE/ALUMINUM FINS.
- 4. PROVIDE PENCIL-PROOF STAMPED LOUVERS.

MIXING BOX	<b>TERMINAL</b>	. UNITS:	TITUS (	OR A	<b>PPROVED</b>	<b>EQUIVALENT</b>
				and the second s		

IAIIVIIAO	DUNIL	CIAILIAME DIALIS.	11100	UN AF	FROV	LD LW	DIAMPEIAI			
			D/	AMPER & AIF	R VALVE DAT	Α	CONTROL TYPE			
			MIX AIF	R CFM	MIN P.D.	INLET DUCT	(DDC, ELECTRIC,	CONTROL PWR	MAX NC	
DESIGNATION	CFM RANGE	LOCATION SERVED	COLD DECK	HOT DECK	(IN W.G.)	SIZE	PNEUMATIC)	V/PHASE/HZ	RATING	MODEL NO.
MB-1	1500-2700	CUSTOMER AREA	1800	1200	0.25	14	DDC	115/1/60	30	DMDV
MB-2	900-1300	ENTRY CORRIDOR/RESTROOMS	900	650	0.25	10	DDC	115/1/60	30	DMDV
MB-3	150-350	OFFICE AREA	125	90	0.17	5	DDC	115/1/60	30	DMDV
MB-4	0-650	STUDENT BOOKSTORE	600	425	0.10	7	DDC	115/1/60	30	DMDV

- PROVIDE BOX WITH DDC CONTROLLERS THAT COMPLY WITH BUILDING STANDARDS.
- CONTROLS SHALL MATCH BUILDING STANDARD. PROVIDE THERMOSTAT SUITABLE FOR COOLING AND HEATING, AND WITH A BLANK FACEPLATE TO AVOID TAMPERING.
- PROVIDE WITH CONTROL PACKAGE TO ALSO ALLOW OPERATION DURING MORNING WARM-UP CYCLE.
- MIXING BOX TO BE INTERNALLY LINED WITH STERILOC 1" THICK DUAL DENSITY FIBERGLASS INSULATION.
- TERMINAL UNITS TO FAIL IN THE OPEN POSITION. MIXING BOXES SHALL INTERLOCK WITH EXISTING EMS INCLUDING GRAPHICS, SETPOINTS, ALARMS, AND MONITORING OF
- THE ENTIRE SYSTEM. 8. PROVIDE MOUNTING BRACKETS TO ACCEPT ALL THREAD HANGING RODS AND VIBRATION ISOLATION HANGERS AND
- SEISMIC RESTRAINTS.
- PROVIDE UNITS WITH MIXER/ATTENUATOR SECTION.

### **HOT WATER FAN COIL UNIT SCHEDULE**

					FAN MOTOR		HEA	TING CAPA	CITY			
TAG	MAKE	MODEL	CFM	FAN SPEED	WATTS	EXT. SP	VOLT/PH/HZ	TOTAL MBH	FLOW (GPM)	LAT (°F)	COIL ROWS	FILTER
FCU-M-1	IEC	CPY-04	350	MEDIUM	165	0.35	115/1/60	28 MBH	165	0.35	1	1" THROWAW

- 1. PROVIDE MANUFACTURER RECOMMENDED DISCONNECT SWITCH.
- PROVIDE CONTROL VALVE PIPING PACKAGE INCLUDING TWO-WAY VALVE, 2-BALL VALVES WITH 24 VOLT ACTUATORS AND AUTO CIRCUIT SETTER. CONTRACTOR SHALL CONFIRM FAN COIL UNIT PIPING CONFIGURATION PER FIELD CONDITIONS.
- CONTRACTOR TO PROVIDE THE FOLLOWING: SPRING-TYPE VIBRATION ISOLATION, WIRE MESH SCREEN ON RETURN, AND TRANSFORMER FOR CONTROL WIRING.
- 6. CONTRACTOR TO FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION.

Do not scale drawings. Each Contractor shall be responsible for all field measurements.

/RF	INDOOR UNII	<b>EQUIPMENI</b>	SCHEDULE:	LG MULII \	V OR APPROVED EQUAL	

LOCATION	MARK	ROOM NAME	TYPE	QUANTITY	COOLING CAPAG	CITY (BTU/h)	HEATING CAPACITY		PIPING CON	INECTIONS (in.)		POW	ER	
LOCATION	MARN	ROOM NAME	IIFE	QUANTIT	TOTAL COOLING	SENSIBLE COOLING	(BTU/H)	(CFM)	LIQUID	GAS	VOLTS	PHASE	HZ	RLA
SEE PLAN	AC-M-1	SERVERY 20 ARNU36	BGA2 DUCTED HIGH STATIC	1	36,200	-	40,600	1,141/1,024/894	3/8	5/8	208~230V	1Ph	60Hz	2.3
SEE PLAN	AC-M-2	SERVERY 20 ARNU36	BGA2 DUCTED HIGH STATIC	1	36,200	v * 4 (* . <b>–</b> . †	40,600	1,141/1,024/894	3/8	5/8	208~230V	1Ph	60Hz	2.3
SEE PLAN	AC-M-3	BACK RM 50 ARNU36	TNC4 4-WAY CASSETTE	1	36,200		40,600	883/777/706	3/8	3/4	208~230V	1Ph	60Hz	0.52

LIMITED TO: NUMBER OF PIPES, PIPE SIZES, TRAPS, SIGHT GLASS,

RECEIVER TANK(S), VALVES, RECOMMENDED HOOK-UP, ETC.

- PROVIDE WITH DIGITAL PROGRAMMABLE THERMOSTAT, DISCONNECT SWITCH, MIN. 1 INCH DEFLECTION SPRING VIBRATION ISOLATORS (CEILING MOUNTED UNITS, NEOPRENE PADS FOR FLOOR MOUNTED UNITS), LIQUID LINE SOLENOID VALVE, LOW AMBIENT DAMPER, HOT GAS
- PORT QUICK CONNECTS, CONDENSATE PUMP, START-UP AND TRAINING BY UNIT'S MANUFACTURER'S REP.
- PROVIDE WITH WELDED STAINLESS STEEL DRIP PAN WITH LEAK DETECTOR, LEAK DETECTOR PANEL, HOT GAS BYPASS.
- 3. THIS CONTRACTOR SHALL COORDINATE WITH MANUFACTURER'S FOR 4. REFRIGERANT Y-BRANCH ACCESSORIES AND HR UNITS SUPPLIED BY MANUFACTURER. SIZING THE REFRIGERANT PIPING (SUCTION, HOT GAS, LIQUID LINES) REQUIRED TO INTERCONNECT THE EVAPORATOR AND THE CONDENSER/CONDENSING UNIT. THIS SHALL INCLUDE BUT NOT BE
  - 5. PROVIDE AC-M-3 WITH VENTILATION KIT AND FLANGE
  - KIT FROM MANUFACTURER.

## VRF OUTDOOR UNIT EQUIPMENT SCHEDULE: LG MULTI V OR APPROVED EQUAL

LOCATION	MADIC	MODEL	TYPE	QUANTITY	CAPACITY	(BTU/h)	FAN D	ATA	REFRIGERANT -	PIPING C	ONNECTION	NS (in.)		POV	VER	
LOCATION	MARK	NUMBER		QUANTITI	TOTAL COOLING	TOTAL HEATING	AIRFLOW (CFM)	QUANTITY	REFRIGERANI	LIQUID	LP GAS	HP GAS	VOLTS	PHASE	HZ	MCA
ROOF	ACCU-R-1	ARUN121BTE4	MULTI-V IV HEAT PUMP	1	120,000	135,000	9,850	2	R410A	1/2		1-1/8	208V/230V	3Ph	60Hz	40.3

- . PROVIDE WITH FUSED DISCONNECT SWITCH FOR EACH SEPARATE CONDENSING MODULE, 1 INCH DEFLECTION SPRING VIBRATION ISOLATORS, PAINTED EXTERIOR,
- 2. EACH CIRCUIT TO HAVE LOW PRESSURE SWITCH BY-PASS, LOW AMBIENT CONDENSER FLOOD BACK-EXTERNAL TYPE HOT GAS BY-PASS, SUCTION LINE ACCUMULATOR, QUENCCH VALVE.
- PROVIDE MOUNTING STEEL DUNNAGE (2 FT HIGH MIN.), REVERSE TRAPS, CHARGE LINES.
- 4. REFRIGERANT LINES SHALL BE PITCHED TOWARDS CONDENSING UNIT 8. REFER TO MANUFACTURER PROVIDED AND INSULATED AS PER LATEST EDITION OF THE NYCECC.
- 5. CONTRACTOR TO FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION.
- 6. PROVIDE A DRAFT GAUGE FOR THE AIR FILTER AS PER 2008 NYC CODE SECTION 605.5.
- 7. PROVIDE FACTORY CERTIFIED ON SITE COMMISSIONING AND START UP SUPPORT FOR ALL 3 PHASE SYSTEMS.
- DETAILED REFRIGERANT PIPE SIZING AND FITTING SCHEDULE, PIPING SHOULD NOT BE INSTALLED IN FIELD UNTIL SHOP DRAWING SHOWING ACTUAL PIPING LENGTHS ARE CONFIRMED BY MANUFACTURER'S REP. PIPING LENGTHS AND SIZES THAT MAY BE INCLUDED IN DRAWINGS ARE FOR REFERENCE ONLY. DO NOT INSTALL PIPING BASED ON THESE

## DIFFUSER REGISTER & GRILLE SCHEDULE

SYMBOL	SERVICE	TYPE	CFM RANGE	FACE WIDTH X LENGTH	NUMBER OF SLOTS	PLENUM HEIGHT	INLET SIZE SQUARE OR ROUND	N.C. @ MAX CFM	MATERIAL	MANUFACTURER	MODEL	REMARKS
			0-150	24X24	-	-	6	30				
SD-1	SUPPLY	SURFACE MOUNT	155-200	24X24	· ·		6	30	ALUMINUM	TITUS	OMNI	1,2,3
	7 7 7 7 7		205-300	24X24	-	_	8	30			N 10	i war
		The state of the s	305-450	24X24		-	10	30			2,000	
			450-600	24X24	-	-	12	30				
SD-2	SUPPLY	LAY-IN	0-150	12X12	-	_	6	30	ALUMINUM	TITUS	OMNI	1,2,3
SD-3	SUPPLY	SURFACE MOUNT	0-150	12X3	-		-	30	ALUMINUM	TITUS	CT-580	4
			155-250	12X5								
			255-300	12X6								
			305-450	24X4			1.2					
			2400	48X6								
SD-4	SUPPLY	SURFACE MOUNT	0-200	8x6			· · · · · · · · · · · · · · · · · · ·	30	ALUMINUM	TITUS	301FL	1,2,3
			205-450	12X8							×	
			DDED	22X6								2.5
SD-5	SUPPLY	LAY-IN	0-150	48X2-1/2	·		-	30	ALUMINUM	TITUS	CT-580	5
RG-1	RETURN	LAY-IN	-	24X24			-	30	ALUMINUM	TITUS	TDC	1,3
RG-2	RETURN	LAY-IN	0-300	24X12	-	2	-	30	ALUMINUM	TITUS	355RL	1,3
RG-3	TRANSFER	SIDEWALL	-	12X8	-	-	-	30	ALUMINUM	TITUS	300RL	1,3
RG-4	RETURN	LAY-IN	•	48X2-1/2	-	-	-	30	ALUMINUM	TITUS	CT-580	5
								12-12-1				

- 1. Coordinate with ceiling type for frame. No screws to be visible
- 2. Provide cord. operated damper for inaccessible ceilings. Where possible keep dampers a minimum of 3'-0" from diffuser.
- 3. Coordinate color with Architect.
- 4. Provide with Manufacturer single blade damper model AG-30
- 5. Provide with frame and border type 2

#### Revisions & Issues Issued for Review 04.15.2016 Issued for Value Engineering Revision 01.30.2017 Issued for Construction 02.20.2017 STATE UNIVERSITY OF NEW YORK

# **Purchase College**

Sargo tea.

## **SUNY PURCHASE**

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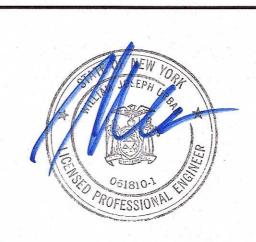
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June. 7, 2016 15.44 Mechanical

M-5.1

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Schedules

#### CONTROL SPECIFICATION

#### 1.1 WORK INCLUDED

- A. THE WORK INCUDES INSTALLATION OF DIRECT DIGITAL CONTROLS AS SPECIFIED IN THESE SPECIFICATIONS AND ON FLOW AND CONTROL DIAGRAMS ON DRAWING M6.1 AND AS NOTED ON OTHER PROJECT DRAWINGS. OTHER CONTROLS WORK SHALL INCLUDE:
- B. INTERNET INTERFACE AND SYSTEM MANAGER FOR PROGRAM AND DATA STORAGE AND COMMUNICATIONS INTERFACE.
- C. BACNET INTERFACE (OR OTHER APPROVED INTERFACE) TO LG ROOFTOP
- D. LOW AND LINE VOLTAGE WIRING.

#### 1.2 DIRECT DIGITAL CONTROLS

A. BASE BID: PROVIDE LOCAL CONTROLLER TO EACH SYSTEM AND ASSOCIATED INTERFACE CONTROLS AS INDICATED ON THE SEQUENCE OF OPERATION THIS PAGE.

#### 1.3 GENERAL REQUIREMENTS

- A. DIRECT DIGITAL CONTROLLERS (DDCS) WHICH ALLOW CUSTOM PROGRAMMING SHALL BE USED FOR ALL CONTROL APPLICATIONS. UNITARY CONTROLLERS, APPLICATION SPECIFIC CONTROLLERS AND CONTROLLERS WHICH LIMIT THE NUMBER OF CONTROL LOOPS AND FUNCTIONS SHALL NOT BE USED.
- B. A MINIMUM OF 2 SPARE POINTS OF EACH TYPE SHALL BE INSTALLED IN NEW DDC CONTROLLERS. WHERE A DDC PANEL(S) IS INSTALLED WITHIN A CONTRACTOR SUPPLIED ENCLOSURE THE ENCLOSURE MUST BE SIZED TO ALLOW THE ADDITION OF AT LEAST ONE POINT EXPANSION MODULE.
- C. IDENTIFY ALL EQUIPMENT INTERNAL TO PANEL AND FACE MOUNTED WITH LABELS TO MATCH APPROVED SHOP DRAWINGS.
- D. THE CONTRACTOR SHALL WARRANTY THE CONTROLS TO BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIAL FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ACCEPTANCE BY THE OWNER.
- E. THE OWNER SHALL NOT BE RESTRICTED IN THE USE AND MODIFICATIONS OF ALL SOFTWARE INSTALLED FOR THIS PROJECT. COPYWRITING OR OTHER RESTRICTIONS, BY THE CONTRACTOR, ON THE ACCESS, BY THE OWNER, TO THE INSTALLED SOFTWARE SHALL BE PROHIBITED.

#### 1.4 SUBMITTALS

- A. SUBMIT THREE HARD COPIES AND ONE SOFT COPY (PDF) OF THE SUBMITTALS INDICATED BELOW. INDICATE AT THE BEGINNING OF EACH SUBMITTAL, KNOWN SUBSTITUTIONS AND DEVIATIONS FROM REQUIREMENTS OF CONTRACT DOCUMENTS.
- B. SHOP DRAWING SUBMITTALS TO INCLUDE SUFFICIENT DATA TO INDICATE COMPLETE COMPLIANCE WITH CONTRACT DOCUMENTS. SUBMISSIONS IN FORM OF DRAWINGS, BROCHURES, BULLETINS, CATALOG DATA, CONTROL PROGRAMMING AND SEQUENCE OF OPERATIONS. DRAWING SIZE, 11" X 17" MINIMUM.
- C. FINAL CALIBRATION, COMMISSIONING AND TESTING REPORTS.
- D. PREPARE AS-BUILT DRAWINGS UPON COMPLETION OF THE PROJECT. AS-BUILT DRAWINGS TO INCLUDE POINT-TO-POINT WIRING, AND INDICATE ALL EQUIPMENT LOCATIONS.

#### 2.0 PRODUCTS

#### 2.1 SENSORS AND CONTROL DEVICES

#### A. GENERAL

- 1. PROVIDE SENSORS AND CONTROL DEVICES AS INDICATED ON DEVICE SCHEDULE PLANS, CONTROL DIAGRAMS AND AS REQUIRED TO MEET SPECIFIED PERFORMANCE.
- 2. ALL COMPONENTS OF SENSORS EXPOSED TO PROCESS SHALL BE RATED TO WITHSTAND 150 PERCENT OF MAXIMUM PROCESS TEMPERATURE AND

#### B. TEMPERATURE SENSORS

- 1. TEMPERATURE SENSOR ACCURACY SHALL NOT EXCEED ±1.0°F .
- 2. OUTSIDE AIR SENSORS SHALL BE MOUNTED ON A NORTHERN EXPOSURE AND MOUNTED WITHIN A VENTILATED ENCLOSURE.
- 3. IMMERSION SENSORS SHALL BE PROVIDED WITH A SEPARABLE STAINLESS STEEL OR BRASS WELL.
- C. CURRENT RELAY: SHALL BE SPLIT CORE, ADJUSTABLE SETPOINT, CURRENT SENSING RELAY WITH SPDT OUTPUT CONTACTS

#### 2.2 SOFTWARE

- A. GRAPHICS: EACH SYSTEM CONTROLLED SHALL HAVE A UNIQUE GRAPHIC.
- B. HISTORICAL TRENDING: ALL SYSTEM POINTS EITHER REAL OR CALCULATED SHALL BE ASSIGNABLE TO THE HISTORICAL TRENDING PROGRAM.

## 3.0 EXECUTION

#### 3.1 LOCATION OF EQUIPMENT

- A. THE DRAWINGS AND SPECIFICATIONS DESCRIBE APPROXIMATE LOCATIONS OF THE WORK. VERIFY ALL LOCATIONS IN THE FIELD.
- B. LOCATE EQUIPMENT AND ACCESSORIES SO AS TO PROVIDE EASY ACCESS FOR PROPER SERVICE AND MAINTENANCE. C. DIRECT DIGITAL CONTROLLERS AND FIELD EQUIPMENT PANELS SHALL BE

ELECTRICAL AND UTILITY ROOMS IN APPROVED LOCATIONS.

**Revisions & Issues** 

Do not scale drawings. Each Contractor shall be responsible for all field measurements.

D. DDCS AND FEPS SHALL NOT BE LOCATED DIRECTLY UNDERNEATH VALVES OR OTHER AREAS WHERE THEY MAY BE SUBJECT TO WATER OR HEAT DAMAGE. IN ADDITION, PANELS SHALL BE MOUNTED WITH THE BOTTOM NO LOWER THAN 3 FEET AND TOP NO HIGHER THAN 7 FEET ABOVE THE

LOCATED IN THE VICINITY OF THE EQUIPMENT CONTROLLED IN MECHANICAL

#### FLOOR, WITH A MINIMUM OF 3 FEET DEEP BY 2.5 FEET WIDE FOOT CLEARANCE AT THE FRONT.

#### 3.2 INSTALLATION OF WIRING

- A. PROVIDE CONTROL WIRING FOR CONTROL DEVICES, MONITORING DEVICES, INSTRUMENTATION, AND INTERLOCKS AS REQUIRED FOR A COMPLETE
- B. RUN ALL WIRING IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AUTHORITIES AND CODES HAVING JURISDICTION. ALL WIRING WITHIN BOILER ROOM AND PUMP ROOMS, AND OTHER EXPOSED AREAS TO BE INSTALLED
- C. PROVIDE SLEAVES FOR WIRING THROUGH FIRE RATED WALLS AND FLOORS. FIRESTOP TO MAINTAIN WALL AND FLOOR RATINGS.
- D. WIRING LESS THAN 50 VOLTS SHALL NOT BE RUN IN THE SAME RACEWAY WITH WIRING GREATER THAN 50 VOLTS.
- E. WHERE LOW VOLTAGE WIRING IS INSTALLED WITHIN AN ENCLOSURE WITH 120V OR GREATER VOLTAGE WIRING, THHN 600V INSULATED WIRING SHALL BE USED FOR WIRING LOW VOLTAGE.
- F. USE GREENFIELD FOR FINAL CONNECTIONS TO VALVES, MOTORS, ETC.
- G. CONNECTIONS FROM DDC CONTROLLER TO ITS FIELD DEVICES SHALL BE WITH BARRIER TYPE TERMINAL STRIPS.
- H. CONDUITS SHALL BE SEALED WHERE SUBJECT TO MOISTURE AND CONDENSATION SUCH AS CONNECTION TO COLD WATER VALVE ACTUATORS, COOLING TOWERS, OUTSIDE WALLS AND EQUIPMENT IN UNCONDITIONED
- I. COLOR CODE OR NUMBER ALL CONTROL WIRING. CODING SHALL CORRESPOND WITH CODING SHOWN ON THE APPROVED TEMPERATURE CONTROL SYSTEM DRAWINGS.
- J. ALL WIRES IN HVAC UNIT CONTROL CABINETS, PANELS, BOXES, ETC. SHALL BE NEATLY ARRANGED, TIED WHERE NECESSARY AND LEFT WITH SUFFICIENT SLACK FOR EASE OF SERVICING. WIRES SHALL BE NEATLY GROUPED AND BUNDLED. FOR WIRING BUNDLES WITH 20 OR MORE CONDUCTORS RUN IN PANDUIT OR APPROVED PLASTIC WIREWAYS WITH SNAP-ON COVERS. SEPARATE TERMINAL BLOCKS SHALL BE INSTALLED FOR 120 VOLT A.C. WIRING AND FOR LOW LEVEL SIGNAL WIRING. TERMINAL BLOCKS SHALL BE 300 VOLT RATED, MEDIUM DUTY, CHANNEL MOUNTED, WITH NUMBERED MARKING STRIPS. SPLICES USING "WIRE NUTS" OR OTHER METHODS SHALL NOT BE PERMITTED.
- K. CONTROLS TRANSFORMERS SHALL HAVE SERVICE SWITCHES AND BE FUSED ON THE HIGH VOLTAGE SIDE.

#### 3.3 INSTALLATION OF SENSORS AND CONTROL DEVICES

- A. EACH DDC, UC, AND CONTROL DEVICE, FIELD OR PANEL MOUNTED, SHALL BE IDENTIFIED BY A NAMEPLATE PERMANENTLY ATTACHED TO ITS ENCLOSURE (1/4" HIGH LETTERS MINIMUM). IDENTIFIERS SHALL MATCH RECORD DOCUMENTS.
- B. PROVIDE CAPPED TEST PORTS ON BOTH PORTS OF PRESSURE AIR AND WATER TRANSDUCERS.
- C. CURRENT SENSORS SHALL BE SET AT APPROXIMATELY 75% OF THE NORMAL OPERATING AMPS.

A. THE CONTRACTOR SHALL GIVE INSTRUCTION IN THE ADJUSTMENT, OPERATION AND MAINTENANCE, INCLUDING PERTINENT SAFETY REQUIREMENTS. OF THE EQUIPMENT AND SYSTEM INSTALLED. THREE TRAINING SESSIONS SHALL BE PROVIDE WITH A MINIMUM OF 8 HOURS TOTAL.

#### 3.5 CALIBRATION AND COMMISSIONING

- A. PERFORM COMMISSIONING CONSISTING OF FIELD I/O CALIBRATION AND COMMISSIONING, SYSTEM PROGRAM COMMISSIONING, AND SEASONAL COMMISSIONING. DOCUMENT ALL COMMISSIONING INFORMATION ON COMMISSIONING DATA SHEETS THAT SHALL BE SUBMITTED PRIOR TO ACCEPTANCE TESTING.
- 3.6 AUTOMATIC CONTROL PROGRAMS AND SEQUENCES

#### A. GENERAL

- 1. ALL CONTROL AND ALARM FUNCTIONS WHICH USE ANALOG POINTS TO SWITCH EQUIPMENT ON AND OFF (E.G., FANS,) MUST BE PROGRAMMED WITH DEAD BANDS, TIME DELAYS, MINIMUM ON AND ON TIME FUNCTIONS AND/OR OTHER FUNCTIONS TO PREVENT SHORT CYCLING OF EQUIPMENT AND NUISANCE ALARMS.
- 2. DEGRADED MODE: IF, BY FAILURE OF ANOTHER DDC, SENSOR OR SYSTEM COMPONENT WHICH CAUSES INFORMATION CRITICAL TO A DDC'S PROGRAM TO BE LOST, DEFAULT VALUES OR SUBROUTINES WILL AUTOMATICALLY BE USED TO APPROXIMATE CRITICAL INFORMATION TO ENSURE CONTINUED CONTROL.
- 3. WHERE HEATING AND COOLING IS AVAILABLE TO A TEMPERATURE CONTROL ZONE THE ZONE SHALL BE PROVIDED WITH A MINIMUM OF 5 DEGREE DEADBAND BETWEEN OPERATION OF HEATING AND COOLING SUPPLIED TO THE ZONE (EXCEPTION: LOW OR HIGH LIMIT CONTROL FUNCTIONS).

#### B. MIXING BOXES:

1. REFER TO CONTROL DIAGRAM THIS PAGE.

#### C. HYDRONIC HEATER. (HH-1 THRU HH-3)

1. THE HEATER SHALL BE ENABLE BY ITS DEDICATED THERMOSTAT, THE CONTROL VALVE SHALL OPEN TO MAINTAIN SPACE SETPOINT. UPON SETPOINT ITS ACHIEVE THE CONTROL VALVE SHALL CLOSE.

#### D. EXHAUST FAN (EF-1)

1. EXHAUST FAN EF-1 SHALL BE INTERLOCKED TO WASHER MACHINE.

### I. EXHAUST FANS (EF-2/EF-3)

1. EXHAUST FAN EF-2/3 SHALL BE ENABLE START/STOP BY ITS DEDICATED TIMER SWITCH.

#### DEVICE SCHEDULE DESCRIPTIONS

THE FOLLOWING DEVICE SCHEDULE IDENTIFIES THE MINIMUM MONITORING AND CONTROL DEVICE REQUIREMENTS. ADDITIONAL HARDWARE AND SOFTWARE REQUIRED TO PERFORM THE AUTOMATIC CONTROL SEQUENCES AND PROVIDE A COMPLETE WORKING CONTROL SYSTEM SHALL BE INCLUDED BY THIS CONTRACTOR WITHOUT ADDITIONAL COST.

POINT TYPE DO - DIGITAL OUTPUT DI- DIGITAL INPUT AO - ANALOG OUTPUT

AOP - ANALOG OUTPUT - PNEUMATIC AI - ANALOG INPUT CALC - CALCULATED POINT

POINT FUNCTIONS - INDICATES THE MINIMUM REQUIRED FMCS PROCESSING AND ALARM FUNCTIONS.

PRF (PROOF ALARM) - IF THE STATUS OF THE CONTROLLED DEVICE DOES NOT MATCH THE COMMANDED STATE OF THE DEVICE, AFTER ANS ADJUSTABLE TIME DELAY, A PROOF ALARM SHALL BE ANNUNCIATED AT THE OPERATORS TERMINAL.

ALM (ALARM) - WHENEVER THE POINT CHANGES FROM THE NORMAL STATE AN ALARM SHALL BE ANNUNCIATED AT THE OPERATORS TERMINAL.

HA (HIGH ALARM) - WHENEVER THE POINT VALUE EXCEEDS THE HIGH ALARM LIMIT AN ALARM SHALL BE ANNUNCIATED AT THE OPERATORS TERMINAL.

LA (LOW ALARM) - WHENEVER THE POINT VALUE FALLS BELOW THE LOW ALARM LIMIT AN ALARM SHALL BE ANNUNCIATED AT THE OPERATOR'S TERMINAL.

DEV (SETPOINT DEVIATION ALARM) — IF THE MEASURED VARIABLE OF A CONTROL LOOP DEVIATES FROM THE SETPOINT BY A PRESET OFFSET FOR MORE THAN A PRESET TIME LIMIT A DEVIATION ALARM SHALL BE ANNUNCIATED AT THE OPERATOR'S TERMINAL.

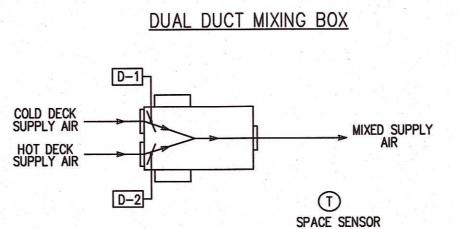
RT (RUN HOURS) - TOTALIZE THE HOURS OF OPERATION OF THE CONTROLLED DEVICE. WHEN THE TOTAL HOURS EXCEEDS A HIGH LIMIT VALUE AN ALARM SHALL BE ANNUNCIATED AT THE OPERATOR'S TERMINAL.

TOT (TOTAL) - TOTALIZE THE CUMULATIVE VALUE OF THE POINT (I.E., CUMULATIVE FLOW FROM A FLOW METER POINT).

PA (PULSE ACCUMULATE.) - COUNT A PULSED DIGITAL SIGNAL AND

CALC (CALCULATE) - CALCULATE VALUE FROM OTHER POINT

CALCULATE AN EQUIVALENT ANALOG VALUE.



IN "OCCUPIED MODE" A SPACE-TEMPERATURE SENSING ELEMENT T LOCATED AS SHOWN, ACTING THROUGH A MICROPROCESSOR-BASED MIXING BOX CONTROLLER, SHALL MODULATE THE SUPPLY-AIR CONTROL DAMPER FOR BOTH HOT AND COLD DECK SUPPLY DUCTS, TO PROVIDE A VARIABLE VOLUME OF AIR TO THE SPACE TO MAINTAIN AN ADJUSTABLE COOLING SET POINT UNTIL THE SUPPLY-AIR DAMPER GOES TO MINIMUM SUPPLY-AIR FLOW. WHEN THE SPACE TEMPERATURE CALLS FOR HEAT, THE COLD DECK DAMPER (D-1) WILL CLOSE TO MINIMUM VALUE, THEREAFTER THE HEATING AIR TEMP WILL BE MODULATED BY THE HOT DECK DAMPER (D-2.) WHEN THE SPACE TEMPERATURE HAS BEEN SATISFIED TO THE CONTROL SETPOINT, DAMPERS D-1 AND D-2 WILL MODULATE ACCORDINGLY TO MAINTAIN SPACE TEMPERATURE WITHIN PRESET DRIFT POINTS.

WHEN IN THE "UNOCCUPIED MODE", DAMPER "D-1" SHALL BE AT MIN. WHEN THE SPACE TEMPERATURE CALLS FOR HEAT, DAMPER D-2 WILL MODULATE OPEN TO SATISFY SPACE TEMPERATURE AT SENSING ELEMENT

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Client / Project

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Mechanical Controls

M-6.1

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