### **ABBREVIATIONS**

RV

SCW

TOP

REFRIGERATION VENT

SOFTENED COLD WATER

STEAM RELIEF VENT

TOP OF PIPE

**GENERAL** 

AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AFC	ABOVE FINISHED GRADE
BHP	BRAKE HORSEPOWER
BOP	BOTTOM OF PIPE
BOT	BOTTOM
C/L	CENTER LINE
CLG	CEILING
CFM	CUBIC FEET PER MINUTE
CO	CARBON MONOXIDE
CO2	CARBON DIOXIDE
CSR	CURRENT SENSING RELAY
DISCH	DISCHARGE
DN	DOWN
DS	DISCONNECT SWITCH; DOOR SWITCH
(E)	EXISTING
EA	EACH
EC	ELECTRICAL CONTRACTOR; END CAP
EP	ELECTRICAL PANEL; END PLUG
EPO	EMERGENCY POWER OFF
ESP	EXTERNAL STATIC PRESSURE
(F)	FUTURE
FA	FIRE ALARM
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
FLEX	FLEXIBLE
FLR	FLOOR
FP	FIRE PROTECTION
FTG	FOOTING
GA	GAGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
HP	HORSEPOWER; HIGH PRESSURE
HTG	HEATING
HTR	HEATER
IAW	IN ACCORDANCE WITH
ID	INSIDE DIAMETER/DIMENSION
IN WC	INCHES WATER COLUMN
MC	MECHANICAL CONTRACTOR
MFR	MANUFACTURER
MH	MANHOLE
MTD	MOUNTED
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN; NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OVHD	OVERHEAD
PERF	PERFORATED
POC	POINT OF CONNECTION
QTY	QUANTITY
(R)	RELOCATED
RCP	REFLECTED CEILING PLAN
REQD	REQUIRED
SECT	SECTION
SIM	SIMILAR
SPEC	SPECIFICATION
STD	STANDARD
TBD	TO BE DETERMINED
TI	TENANT IMPROVEMENTS
TOC	TOP OF CONCRETE
TOS	TOP OF STEEL
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UG	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
VFD	VARIABLE FREQUENCY DRIVE
VSD	VARIABLE SPEED DRIVE
W/	WITH
W/O	WITHOUT
WC	WATER COLUMN
WG	WATER GAUGE

<u>HVAC</u> AC AHU	AIR CONDITIONING AIR HANDLING UNIT
BDD BOD	BACKDRAFT DAMPER BOTTOM OF DUCT
CC CRU CT CV	COOLING COIL COMPUTER ROOM UNIT COOLING TOWER CONSTANT VOLUME
db Diff DMPR	DUCT BOARD DIFFUSER DAMPER
EA EAT ECG EF	EXHAUST AIR ENTERING AIR TEMPERATURE EGGCRATE GRILLE EXHAUST FAN
FCU FD FM FP FSD FTU	FAN COIL UNIT FIRE DAMPER FREQUENCY MODULATION FIRE PROTECTION; FAN POWERED COMBINATION FIRE/SMOKE DAMPER FAN TERMINAL UNIT
GRD	GRILLE, REGISTER, DIFFUSER
HC HVAC	HEATING COIL HEATING, VENTILATION AND AIR CONDITIONING
LAT LD	LEAVING AIR TEMPERATURE LINEAR DIFFUSER
Ma Mod Mau Mua	MIXED AIR MOTOR OPERATED DAMPER; MODULATING MAKE-UP AIR UNIT MAKE-UP AIR
OA OBD	OUTSIDE AIR OPPOSED BLADE DAMPER
RA RAT RTU	RETURN AIR RETURN AIR TEMPERATURE ROOF TOP UNIT
SA SAT SD SF SL SLSM SM SO SP	SUPPLY AIR SUPPLY AIR TEMPERATURE SMOKE DAMPER; SMOKE DETECTOR SUPPLY FAN SOUND LINED SOUND LINED SHEET METAL SHEET METAL SCREENED OPENING STATIC PRESSURE
TG TOD	TRANSFER GRILLE TOP OF DUCT
VAV VD	VARIABLE AIR VOLUME
<u>PIPING</u> BD BP	STEAM BLOWDOWN BACKFLOW PREVENTER
PIPING BD BP CA CHWR CHWS CLPS CNDS CNDWR CNDWS	STEAM BLOWDOWN BACKFLOW PREVENTER COMPRESSED AIR CHILLED WATER RETURN CHILLED WATER SUPPLY CLEAN LOW PRESSURE STEAM CONDENSATE CONDENSER WATER RETURN CONDENSER WATER SUPPLY
PIPING BD BP CA CHWR CHWS CLPS CNDS CNDWR CNDWS DRAIN DTR DTS	STEAM BLOWDOWN BACKFLOW PREVENTER COMPRESSED AIR CHILLED WATER RETURN CHILLED WATER RETURN CHILLED WATER SUPPLY CLEAN LOW PRESSURE STEAM CONDENSATE CONDENSER WATER RETURN CONDENSER WATER RETURN CONDENSER WATER SUPPLY TANK OVERFLOW & DRAINS DUAL TEMPERATURE RETURN DUAL TEMPERATURE SUPPLY
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PIPING BD BP CA CHWR CHWS CLPS CNDS CNDWR CNDWR CNDWS DRAIN DTR DTS EWT FCD FEED FOF FOR FOS FOV G 2# G 5# G	STEAM BLOWDOWN BACKFLOW PREVENTER COMPRESSED AIR CHILLED WATER RETURN CHILLED WATER RETURN CHILLED WATER SUPPLY CLEAN LOW PRESSURE STEAM CONDENSATE CONDENSER WATER RETURN CONDENSER WATER RETURN CONDENSER WATER RETURN DUAL TEMPERATURE RETURN DUAL TEMPERATURE SUPPLY ENTERING WATER TEMPERATURE FLUE CONDENSATE DRAIN BOILER FEED WATER FUEL OIL FILL FUEL OIL FILL FUEL OIL SUPPLY FUEL OIL VENT NATURAL GAS NATURAL GAS - LOW PRESSURE, 2 PSI NATURAL GAS - LOW PRESSURE, 5 PSI
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PIPING BD BP CA CHWR CHWS CLPS CNDS CNDWR CNDWS DRAIN DTR DTS EWT FCD FOR FOR FOS FOV G 2# G 5# G GE GFWR GFWS GWR GWS HPC HPS HWS	STEAM BLOWDOWN BACKFLOW PREVENTER COMPRESSED AIR CHILLED WATER RETURN CHILLED WATER RETURN CHILLED WATER SUPPLY CLEAN LOW PRESSURE STEAM CONDENSATE CONDENSER WATER RETURN CONDENSER WATER RETURN CONDENSER WATER RETURN DUAL TEMPERATURE SUPPLY TANK OVERFLOW & DRAINS DUAL TEMPERATURE SUPPLY ENTERING WATER TEMPERATURE FLUE CONDENSATE DRAIN BOILER FEED WATER FUEL OIL FILL FUEL OIL RETURN FUEL OIL SUPPLY FUEL OIL SUPPLY FUEL OIL VENT NATURAL GAS NATURAL GAS - LOW PRESSURE, 2 PSI NATURAL GAS - LOW PRESSURE, 5 PSI GENERATOR EXHAUST GEO - FIELD WATER RETURN GEO - FIELD WATER RETURN GROUND WATER RETURN GROUND WATER RETURN GROUND WATER SUPPLY HIGH PRESSURE CONDENSATE HIGH PRESSURE STEAM HEATING WATER RETURN
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PIPINGBDBPCACHWRCHVSCLPSCNDWRDTSEWTFCDFOFFOFFOVGGFGFWRGFWSGWRHPCHPSHWRHWSLPCLPGLPSLWTMPCMPSPCWRPHWR	STEAM BLOWDOWN BACKFLOW PREVENTER COMPRESSED AIR CHILLED WATER RETURN CHILLED WATER RETURN CHILLED WATER SUPPLY CLEAN LOW PRESSURE STEAM CONDENSATE CONDENSER WATER RETURN CONDENSER WATER RETURN CONDENSER WATER RETURN DUAL TEMPERATURE RETURN DUAL TEMPERATURE RETURN DUAL TEMPERATURE SUPPLY ENTERING WATER TEMPERATURE FLUE CONDENSATE DRAIN BOILER FEED WATER FUEL OIL FILL FUEL OIL RETURN FUEL OIL SUPPLY FUEL OIL VENT NATURAL GAS NATURAL GAS - LOW PRESSURE, 2 PSI NATURAL GAS - LOW PRESSURE, 5 PSI GENERATOR EXHAUST GEO - FIELD WATER RETURN GEO - FIELD WATER RETURN GEO - FIELD WATER RETURN GEO - FIELD WATER RETURN GEO - FIELD WATER RETURN GROUND WATER SUPPLY HIGH PRESSURE CONDENSATE HIGH PRESSURE STEAM HEATING WATER SUPPLY LOW PRESSURE STEAM LEAVING WATER TEMPERATURE MEDIUM PRESSURE STEAM LEAVING WATER TEMPERATURE PROCESS COOLING WATER RETURN PROCESS COOLING WATER RETURN PROCESS HOT WATER PROCESS HOT WATER PROCESS HOT WATER PROCESS HOT WATER RETURN

### **<u>PIPING IDENT</u>IFICATION**

#### RETURN PIPING SUPPLY PIPING

### **PIPING FITTINGS**

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HVAC

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### **PIPING ACCESSORIES**

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TEE UP TEE DOWN TEE DN W/ ELBOW TEE UP W/ ELBOW 90° ELBOW UP 90° ELBOW DN CAP UNION FLANGE FLEX HOSE CONNECTION DOUBLE BELLOWS FLEX CONNECTION SINGLE BELLOWS FLEX CONNECTION FLOW ARROW REDUCER SLOPE SYMBOL BREAK OR CONTINUATION SYMBOL DOWN SPOUT NOZZLE CLEANOUT

MOTORIZED 2-WAY VALVE MOTORIZED 3-WAY VALVE PRESSURE REDUCING VALVE CONTROL VALVE

RELIEF VALVE BALL VALVE 3-WAY GATE VALVE BUTTERFLY VALVE DIAPHRAGM VALVE CHECK VALVE NEEDLE VALVE GLOBE VALVE FUSIBLE LINK VALVE GLOBE VALVE ANGLE GLOBE VALVE 3-WAY GATE VALVE PLUG VALVE BALANCING VALVE HOSE BIBB AUTO FLOW VALVE

MANUAL AIR VENT

PUMP

AUTOMATIC AIR VENT

HIGH CAPACITY AIR VENT

SHOCK ARRESTOR FLOW SWITCH

VACUUM BREAKER

PRESSURE GAUGE

TEMPERATURE SENSOR

TEMPERATURE INDICATOR

FLOW METER

Y STRAINER W/ BALL VALVE PIPE SLEEVE

STEAM TRAP

PETES PLUG SUCTION DIFFUSER W/ STRAINER

REDUCED PRESSURE BACKFLOW PREVENTOR

### **INSTRUMENTATION AND CONTROLS**

/	
Ţ/	THERMOSTAT
s)'	SENSOR
co	CARBON MONOXIDE SENSC
202	CARBON DIOXIDE SENSOR
occ	OCCUPANCY SENSOR
SD	SMOKE DETECTOR

### **GENERAL INFORMATION SYMBOLS**

	- NEW MECHANICAL WORK
	- FUTURE TI SCOPE & NEW WORK OTHER THAN MECHANICAL
•	- POINT OF CONNECTION
0	- POINT OF DEMOLITION
ſ	- CENTERLINE
(X) (X)	- KEY NOTE REFERENCE
X X	<ul> <li>PIPING RISER CALLOUT (CHW; HW)</li> <li>PIPING RISER #</li> </ul>
x x	PLAN NUMBER SHEET NUMBER WHERE PLAN SHOWN
x	<ul> <li>DETAIL OR DIAGRAM NUMBER</li> <li>SHEET NUMBER</li> <li>WHERE DETAIL/DIAGRAM SHOWN</li> </ul>
	- SECTION LETTER - SHEET NUMBER WHERE SECTION SHOWN
{~~~	REVISION NUMBER - DENOTES NUMBER AND DATE WHEN REVISION OR ISSUE OCCURRED
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	- REVISION CLOUD - DENOTES AREA OF CHANGE
	DETAIL REFERENCE OUTLINE WITH NUMBER AND SHEET LOCATION

### **DUCTWORK ACCESSORIES PROJECT SPECIFIC**

SUPPLY GRILLE

VOLUME DAMPER

AIRFLOW MONITOR

BACK DRAFT DAMPER

FLEX CONNECTION

FIRE DAMPER THROUGH WALL

FIRE DAMPER THROUGH FLOOR

FIRE/SMOKE DAMPER THROUGH WALL

FIRE/SMOKE DAMPER THROUGH FLOOR

ACOUSTICALLY LINED DUCT (X" THICK

RETURN OR EXHAUST GRILLE

MOTOR OPERATED DAMPER

REMOTELY OPERATED VOLUME DAMPER

COORDINATE WITH CEILING APPURTENANCES.

(YOUNG REGULATOR OR APPROVED)

#### **GRILLE/REGISTER/DIFFUSER PROJECT SPECIFIC**



RETURN / EXHAUST / OUTSIDE AIR SUPPLY / TRANSFER AIR

### DUCTWORK

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RECTANGULAR DUCT
RECTANGULAR DUCT
RECTANGULAR DUCT
RECTANGULAR DUCT
, RECTANGULAR DUCT
RECTANGULAR DUCT
ROUND DUCT
ROUND DUCT
ROUND DUCT
ROUND DUCT
ROUND DUCT
ROUND DUCT
OVAL DUCT
OVAL DUCT

SUPPLY AIR DUCT TURNING UP OR TOWARD

SUPPLY AIR DUCT TURNING DOWN OR AWAY

RETURN AIR DUCT TURNING UP OR TOWARD

RETURN AIR DUCT TURNING DOWN OR AWAY

EXHAUST AIR DUCT TURNING UP OR TOWARD

EXHAUST AIR DUCT TURNING DOWN OR AWAY

SUPPLY AIR DUCT TURNING UP OR TOWARD

SUPPLY AIR DUCT TURNING DOWN OF

AWAY

RETURN AIR DUCT TURNING UP OR TOWARD

RETURN AIR DUCT TURNING DOWN OR AWAY

EXHUAST AIR DUCT TURNING UP OR TOWARD

EXHAUST AIR DUCT TURNING DOWN OR AWAY

SUPPLY AIR DUCT TURNING UP OR TOWARD

#### SUPPLY AIR DUCT TURNING DOWN OR AWAY

FLEXIBLE DUCT

CEILING SUPPLY AIR DIFFUSER CEILING RETURN GRILLE OR TRANSFER AIR GRILLE CEILING EXHAUST GRILLE LINEAR DIFFUSER (CEILING) LINEAR DIFFUSER (WALL) LOUVER PLAN VIEW LOUVER (ELEVATION VIEW)

### **HVAC - ANNOTATION** EQUIPMENT / LOUVER TAG

EQUIPMENT DESIGNATION CONSECUTIVE EQUIPUIPMENT # - FLOOR OF EQUIP.

**GRILLE, REGISTER, OR DIFFUSER TAG** - TYPE CODE - WIDTH — HEIGHT SWG-WxH x CFM

LOCATION

CFM



SHEET INDEX		
M-001	MECHANICAL LEGEND, VICINITY MAP & SHEET INDEX	
M-020	MECHANICAL SPECIFICATIONS	
M-021	MECHANICAL SCHEDULES AND DETAILS	
M-050	MECHANICAL CONTROLS	
MD-101	MECHANICAL DEMOLITION PLAN	
MD-301	ENLARGED MECHANICAL DEMOLITION PLAN	
M-301	ENLARGED MECHANICAL RENOVATION PLAN	
MP-101	MECHANICAL PIPING RENOVATION PLAN	

### **GENERAL NOTES**

- THE CONTRACTOR IS RESPONSIBLE TO VISIT THE SITE AND DETERMINE THE EXACT EXTENT OF WORK, COORDINATION, DEMOLITION, ETC., NECESSARY TO COMPLETE THE PROJECT AS INDICATED IN THE CONTRACT DOCUMENTS.
- INTERRUPTIONS OF SERVICES (POWER, WATER, HVAC, ETC.) AND WORK IN OCCUPIED TENANT SPACES MUST BE SCHEDULED THRU THE BUILDING MANAGER A MINIMUM OF 24 HOURS IN ADVANCE. ANY INTERRUPTIONS OR CONSTRUCTION WHICH WILL AFFECT NORMAL OPERATION OF THE BUILDING OR FENANTS MUST BE SCHEDULED, WITH THE MCKINSTRY CONSTRUCTION MANAGER'S APPROVAL, ON AN AFTER-HOURS BASIS.
- FURNISH LABOR, MATERIALS, EQUIPMENT, APPARATUS AND APPURTENANCES REQUIRED FOR A COMPLETE WORKING AND COORDINATED SYSTEM. MATERIALS, EQUIPMENT, APPARATUS, AND APPURTENANCES SHALL MATCH EXISTING BUILDING STANDARDS IN QUALITY TYPE AND FINISH UNLESS OTHERWISE NOTED.
- VERIFY PHYSICAL DIMENSIONS OF EQUIPMENT. COORDINATE THE EXACT LOCATIONS OF NEW MECHANICAL AND PLUMBING EQUIPMENT WITH THE LOCATIONS OF LIGHTING FIXTURES, PIPING, AND THER CONSTRUCTION, TO ALLOW FOR PROPER ACCESS TO SERVICE AND MAINTAIN EQUIPMEN PRIOR TO START OF CONSTRUCTION.
- COORDINATE THE LOCATION OF DUCTWORK AND PIPING WITH OTHER TRADES. PROVIDE OFFSETS IN DUCTWORK AND PIPING AS REQUIRED AT NO ADDITIONAL COST TO OWNER.
- TRADES TO LEAVE 36" CLEARANCE IN FRONT OF MECHANICAL EQUIPMENT ACCESS PANELS FOR SERVICING.
- INSTALL DUCTWORK AND PIPING TO ALLOW MINIMUM ACCESS OF 6" ABOVE AND TO THE SIDE OF THE ELECTRICAL CABLE TRAYS.
- SUPPORT CONDUIT, PIPING, AND DUCTWORK INDEPENDENTLY. SUPPORTS ARE INDEPENDENT OF PARTITION AND CEILING SYSTEM SUPPORTS.
- IN NO INSTANCE SHALL OTHER TRADES HANG OR SUPPORT EQUIPMENT, CEILING WIRES, LIGHT FIXTURE HANGERS, ETC., FROM HVAC EQUIPMENT, DUCTWORK, OR PIPING.
- 10. CUTTING, FRAMING, PATCHING, AND PAINTING OF WALL, CEILING, AND FLOOR OPENINGS SHALL BE BY THE CONTRACTOR REQUIRING THE OPENING. THIS INCLUDES OPENINGS THROUGH AREA SEPARATION
- PROVIDE SEISMIC RESTRAINTS AND ANCHORAGE PER SMACNA AND THE INTERNATIONAL BUILDING CODE FOR DUCTWORK, PIPING, AND EQUIPMENT.
- PROVIDE PIPE AND EQUIPMENT, LABELING FOR IDENTIFICATION. MATCH OWNERS EXISTING LABELING 12 SCHEME IF APPLICABLE.
- 13. LIGHT FIXTURE CLEARANCE: COORDINATE LOCATIONS OF MECHANICAL WORK TO PROVIDE CLEARANCES OVER LIGHTING FIXTURES FOR REMOVAL AND REPLACEMENT.
- 14. PROVIDE FIRE SAFE PENETRATIONS OF FIRE RATED CONSTRUCTION.

#### MINIMUM VENTILATION QUANTITIES SHALL COMPLY WITH OR EXCEED THE 2021 INTERNATIONAL MECHANICAL CODE.

SUBMITTAL NOTES:

WALLS

- PROVIDE A HVAC/PLUMBING EQUIPMENT AND COMPONENT SUBMITTAL PACKAGE. INCLUDE IN THE PACKAGE SUBMITTALS FOR ITEMS INCLUDED ON THE SCHEDULE AND/OR SPECIFICATION SHEETS. ALSO INCLUDE SUBMITTALS FOR VALVES, GAUGES, AND INSTRUMENTATION. PIECEMEAL SUBMITTALS ARE NOT ACCEPTABLE.
- PROVIDE CONTROLS SUBMITTAL PACKAGE. INCLUDE IN THE PACKAGE SUBMITTALS FOR SEQUENCE OF OPERATIONS, SYSTEM DIAGRAMS, ARCHITECTURE DIAGRAMS, PLANS, PLUS EQUIPMENT AND COMPONENTS.
- THE PIPING CONTRACTOR SHALL PROVIDE FULL SUBMITTALS OF PIPING AND DEVICES FOR APPROVAL PRIOR TO PURCHASE AND INSTALLATION.
- 4. THE MECHANICAL CONTRACTOR SHALL PROVIDE OWNER TRAINING ON CONTRACTOR PROVIDED EQUIPMENT.

### CONTROLS SYSTEM AND GRAPHIC NOTES:

- MAIN CONTROL PORTAL: ONE COMMON SCREEN PER BUILDING THAT DISPLAYS AND PROVIDES THE ABILITY TO MANIPULATE THE ASPECTS OF SCHEDULING AND SET POINTS FOR THE FACILITY ON A GLOBAL LEVEL SHALL BE INCORPORATED INTO THE CONTROLS DELIVERABLE.
- GRAPHICS SHALL MIRROR THE BUILDING FLOOR PLANS, WITH IDENTIFIABLE ROOM AND EQUIPMENT/SYSTEM LOCATIONS.
- GRAPHICS SHALL BE LINKABLE TO SPECIFIC EQUIPMENT, SYSTEM POINTS AND OPERATING PARAMETERS WHICH ALLOW FOR 'ONE CLICK' DIAGNOSIS WHEN ISSUES ARE IDENTIFIED.
- GRAPHICS SHALL HAVE DROP DOWN WINDOWS LINKING REFERENCES TO THE CONTROL DRAWINGS, SEQUENCES OF OPERATION, CONTROL PARAMETERS AND SPECIFIC EQUIPMENT/SYSTEM INFORMATION.
- 5. THE CONTROL CONTRACTOR SHALL COORDINATE WITH OWNER ON THE PROPOSED GRAPHICS LAYOUT PRIOR TO SUBMITTALS.
- REFERENCE THE SEQUENCE OF OPERATION CONTAINED WITHIN THESE CONSTRUCTION DOCUMENTS
- CRIMP CONNECTIONS ON CONTROL WIRING ARE NOT ALLOWED, ALL WIRING CONNECTIONS ARE TO BE NON-PERMANENT TO ALLOW FOR POINT TO POINT TESTING AND VERIFICATION.
- 8. PROVIDE OWNER TRAINING FOR CONTROL SYSTEM.

FOR ADDITIONAL CONTROLS REQUIREMENTS.

### PIPING NOTES:

HYDRONIC PIPING.

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- VALVE CONNECTION SIZES.
- EQUIPMENT
- PROVIDE DIELECTRIC NIPPLES (BRASS) AT CONNECTIONS OF DISSIMILAR PIPE MATERIALS.
- ARRANGEMENT
- TO EQUIPMENT. 8
- 9. SYSTEM FILL AND ANTI-FREEZE:
  - **CLEANER**



DEPARTMENT. SHEET METAL NOTES:

- 2. DUCT SIZES INDICATED ARE INSIDE CLEAR DIMENSIONS.

- SPECIFICATION MATRICES CONTAINED WITHIN THIS DRAWING SET.

- SIMILAR EQUIPMENT
- CODE SECTION C408.
- CONSERVATION CODE SECTION C408.2.2.
- COMMISSIONING REPORT, AND RECORD DRAWINGS.
- CONSERVATION CODE SECTION C103.
- CONSERVATION CODE SECTION C408.



### SOUND LINING) CHANGE OF ELEVATION RISE(R) DROP(D) TURNING VANES

ACCESS DOORS

----- PROJECT LOCATION

INSTALL AIR VENTS AT HIGH POINTS IN HYDRONIC PIPING. INSTALL DRAIN VALVES IN LOW POINTS IN

PROVIDE FLANGES OR UNIONS AT PIPING CONNECTIONS TO EQUIPMENT, COILS, TRAPS, CONTROL VALVES, AND OTHER COMPONENTS TO ALLOW FOR MAINTENANCE.

PROVIDE REDUCERS AS REQUIRED FROM LINE PIPE SIZE TO EQUIPMENT, TRAP, COIL, AND CONTROL PROVIDE OFFSETS FOR BRANCH LINES TO EQUIPMENT TO ALLOW FOR SERVICE AND MAINTENANCE OF

PIPE SUPPLY WATER LINES TO BOTTOM OF COILS LEAVING AIR SIDE TO OBTAIN COUNTERFLOW

PROVIDE PRESSURE AND TEMPERATURE TEST PORTS AT SUPPLY AND RETURN PIPING CONNECTIONS

SIZE BALANCING/MEASURING VALVES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. DO NOT PROVIDE VALVES LARGER THAN LINE SIZE.

A. AFTER COMPLETION OF PIPING SYSTEM INSTALLATION AND PRESSURE TESTING, AND BEFORE MAKING CONNECTIONS TO EQUIPMENT, REMOVE TRACES OF DIRT, OIL, PIPE JOINT COMPOUND, ETC. BY FLUSHING THE NEW PIPE SYSTEM WITH APPROVED CLEANER AND DRAIN, RE-FILL, AND RE-FLUSH SYSTEM IN ORDER TO REMOVE ALL TRACES OF CHEMICAL

B. AFTER SYSTEM HAS BEEN THOROUGHLY CLEANED AND PRESSURE TESTED, FILL WITH A MIXTURE OF WATER AND PROPYLENE GLYCOL (35%, DOWFROST HD) WITH APPROPRIATE CORROSION INHIBITORS. SUBMIT GLYCOL-WATER MIXTURE AND SEND TO MANUFACTURER'S LABORATORY FOR ANALYSIS. ADD GLYCOL AND/OR INHIBITOR AS DIRECTED BY LAB REPORT. SUBMIT FINAL LAB REPORT TO MCKINSTRY ENGINEERING

C. RUN PUMPS TO CIRCULATE UNTIL THOROUGHLY MIXED AND AIR HAS BEEN PURGED FROM SYSTEM. THEN, DRAW A SAMPLE OF GLYCOL-WATER MIXTURE AND SEND TO MANUFACTURER'S LABORATORY FOR ANALYSIS. ADD GLYCOL AND/OR INHIBITOR AS DIRECTED BY LAB REPORT. SUBMIT FINAL LAB REPORT TO MCKINSTRY ENGINEERING

PROVIDE DUCTWORK IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE, SECOND EDITION, 2005 (SMACNA HVACDCS).

PROVIDE A MANUAL VOLUME DAMPER FOR EACH SUPPLY, RETURN, AND EXHAUST OPENING EXCEPT WHERE PROHIBITED BY CODE. INSTALL AS FAR FROM INLET OR OUTLET AS POSSIBLE.

PROVIDE FLEXIBLE CONNECTION AT EACH DUCT CONNECTION TO FANS, AIR HANDLING UNITS, AND INTERNATIONAL ENERGY CONSERVATION CODE NOTES

1. PROVIDE COMMISSIONING PLAN IN ACCORDANCE WITH 2021 INTERNATIONAL ENERGY CONSERVATION

PROVIDE SYSTEMS TESTING AND BALANCING IN ACCORDANCE WITH 2021 INTERNATIONAL ENERGY

PROVIDE SYSTEMS, EQUIPMENT, AND CONTROLS FUNCTIONAL TESTING IN ACCORDANCE WITH 2021 INTERNATIONAL ENERGY CONSERVATION CODE SECTION C408.

4. PROVIDE SUPPORTING DOCUMENTATION IN ACCORDANCE WITH 2021 INTERNATIONAL ENERGY CONSERVATION CODE C408 INCLUDING OPERATION AND MAINTENANCE MANUALS, HVAC CONTROL SYSTEM MAINTENANCE AND CALIBRATION INFORMATION, HVAC CONTROL SEQUENCE OF OPERATIONS,

5. PROVIDE OWNER SYSTEMS OPERATION TRAINING IN ACCORDANCE WITH 2021 INTERNATIONAL ENERGY

6. PROVIDE COMMISSIONING COMPLIANCE FORM IN ACCORDANCE WITH 2021 INTERNATIONAL ENERGY

7. MOTORS SHALL COMPLY WITH SECTION C403 OF THE 2021 INTERNATIONAL ENERGY CONSERVATION CODE. FOR ADDITIONAL DETAILS, SEE EQUIPMENT SCHEDULES CONTAINED WITHIN THIS DRAWING SET

. SYSTEMS SHALL BE INSULATED AS PRESCRIBED IN SECTION C403 OF THE 2021 INTERNATIONAL ENERGY CONSERVATION CODE. FOR ADDITIONAL REQUIREMENTS, SEE DUCTWORK, PIPING AND INSULATION



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# ARL BUILDING -LAB 114 FIT OUT

2380 TECHNOLGY BLVD. BOZEMAN, MT 59718

CONSULTANTS:

PROJECT:





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1	01-25-2023	OWNER REVIEW SET
2	03-07-2023	ISSUED FOR PERMIT

DESIGNED: DRAWN: CHECKED: JOB NO:

P. FALLON		
P. FALLON		
P. FALLON		
XXXXXX		

### SHEET TITLE: MECHANICAL -LEGEND, VICINITY MAP AND SHEET INDEX

SHEET NUMBER:

HVAC P	IPING SPECIFICATION	
ID	CATEGORY	SERVICE DESCRIPTION
HWS&R	HEATING WATER SUPPLY AND RETURN	HVAC HEATING WATER
		WHITE LETTERING ON GREEN BACKGROUND - ANSI/ASME A 13.1 - 2007
	RATED OPERATING PRESS & TEMP	UP TO 100 PSI; 140 F TO 200 F
	SIZES THRU 2"	
	PIPE MATERIAL	COPPER TUBE TYPE L ASTM B88
	JOINTS	SWT, THREADED AT SPECIALTIES AS APPLICABLE
	COUPLINGS	WROT COPPER/BRONZE SWT JOINT
	FLANGES	SWT OR THREADED; (WROT OR CAST COPPER) CLASS 150
	FLANGED GASKETS - RAISED FACED	SPIRAL WOUND GASKET
	FLANGED BOLTS (PLATED)	CARBON STEEL BOLTS AND STUDS - GRADE A - FOR FLANGED JOINTS IN PIPING
	VALVES - ISOLATION	2-PC BALL -CAST BRONZE BODY - FPT - 600 PSI WOG
	VALVES - ISOLATION	2-PC BALL -CAST BRONZE BODY - SWT - 600 PSI WOG
	VALVES - AUTO BALANCE - PRESSURE INDEPENDENT	PRESSURE INDEPENDENT AUTO-FLOW CONTROL
	VALVES - DRAINING	3/4" 2-PC BALL - HOSE END WITH CAP & CHAIN - T HANDLE - 600 PSI WOG/CWP - SV
ALL	SPECIAL TIES	PIPING SPECIALTIES - APPLICABLE SPECIALTIES IDENTIFIED IN FA
7.22	AIR VENT - MANUAI	HIGH CAPACITY AIR VENT
	DIFLECTRIC FITTINGS	6" BRASS NIPPLES, DIELECTRIC NIPPLES, DIELECTRIC ELANGES AND ELANGE KIT
	FLEX CONNECTIONS	SPOOLED RUBBER ELEXIBLE JOINT - SINGLE SPHERE
	ELEX CONNECTIONS - TU'S - COILS - AHU'S (COLD WATER)	EPDM HOSE WITH SS BRAID, MNPT X MNPT BRASS SWIVELEND CONNECTION AT
	GLYCOL	PROPVIENE GLYCOL BASED HEAT TRANSFER FLUID WITH INHIBITORS
	PETE'S PLUG	BRASS WITH NEOPRENE VALVE CORES
	DEFINITIONS	
	N/A	
		POUNDS PER SQUARE INCH (PRESSURE)
	SCH SID	SCHEDULE STANDARD
	SWT	SWEAT (SOLDERED JOINTS)
	WOG	WATER-OIL-GASS (PRESSURE CLASS)
	WROT	WROUGHT

	ATION;								
DUCT SYSTEM	PRESSURE CLASS	DUCT MATERIALS SPECIFICATION	FITTINGS	FLEX CONNECTION/ FLEX DUCT	SEAL CLASS	CLEANLINESS DURING CONSTRUCTION	INSULATION	LINING MATERIALS	NOTES
HVAC SUPPLY S MEDIUM PRESSURE FOR VAV	SMACNA +4"	ALL DUCT TO BE UNLINED GALVANIZED DUCT, GAUGE AND REINFORCEMENT SHALL BE SMACNA OR BETTER	ELBOWS: CENTERLINE RADIUS OF 1.5 DIA OR MITERED 90S WITH VANES	3-FOOT MAX. LENGTH WITH NO OFFSETS; USE JPL OR EQUAL;	SMACNA SEAL CLASS A	FOLLOW BASIC "LEVEL A" SMACNA	OWENS CORNING TYPE 150 FIBERGLASS BOARD, 3.0 LB/CU.FT., 2" THICK WITH ASJ25 WHITE KRAFT FOIL LAMINATE FACING.	N/A	NOTES 1, 2, 3, 4, 5
SYSTEMS		RECTANGULAR DUCT TO HAVE TDF CONNECTIONS	CL RADIUS OF 1.0 DIA ON DUCTS LARGER THAN 24" DIA	FLEX AT EQUIP CONNECTIONS TO COMPLY WITH SMACNA APPLICABLE			SECURE INSULATION TO TO DUCT BY IMPAUNG OVER		
UPSTREAM OF VAV TERMINAL UNITS		ROUND MAY BE SPIRAL.	TAPS: CONICAL OR BOOT-STYLE	PRESSURE CLASS			MECHANICAL FASTENERS, SUCH AS WELD PINS, ON 18" CENTERS A MINIMUM OF TWO ROWS PER SIDE, AND SECURE WITH SPEED CLIPS. BUTT JOINTS TIGHTLY.		
HVAC SUPPLY S	SMACNA +1" PRESSURE	GALVANIZED DUCT; GAUGE AND REINFORCEMENT SHALL BE SMACNA OR BETTER	ELBOWS: PURCHASED ADJUSTABLE ELBOWS IN ACCORDANCE WITH SMACNA +1" STANDARDS	N/A	SMACNA SEAL CLASS C	FOLLOW BASIC "LEVEL A" SMACNA	OWENS CORNING TYPE 150 FIBERGLASS BOARD, 3.0 LB/CU.FT., 2" THICK WITH ASJ25 WHITE KRAFT FOIL	N/A	NOTES 1, 2, 3, 4, 5
LOW PRESSURE		RECTANGULAR MAY BE S+DRIVE	CL RADIUS OF 1.0 DIA ON DUCTS LARGER THAN 24"				LAMINATE FACING.		
TERMINAL UNITS TO DIFFUSERS		ROUND MAY BE SNAPLOCK.	SPIN-IN / ATTO BRANCHES OK				SECURE INSULATION TO TO DUCT BY IMPALING OVER MECHANICAL FASTENERS, SUCH AS WELD PINS, ON 18" CENTERS A MINIMUM OF TWO ROWS PER SIDE, AND SECURE WITH SPEED CLIPS. BUTT JOINTS TIGHTLY.		
HVAC EXHAUST	SMACNA -1" PRESSURE	GALVANIZED DUCT; SEE SUBMITTAL FOR GAUGE AND REINFORCEMENT.	ELBOWS: PURCHASED ADJUSTABLE ELBOWS IN ACCORDANCE WITH SMACNA -1" STANDARDS	N/A	SMACNA SEAL CLASS LEVEL C	FOLLOW BASIC "LEVEL A" SMACNA	OWENS CORNING TYPE 150 FIBERGLASS BOARD, 3.0 LB/CU.FT., 2" THICK WITH ASJ25 WHITE KRAFT FOIL	N/A	NOTES 1, 2, 3, 4, 5
		RECTANGULAR MAY BE S+D, ROUND MAY BE SNAPLOCK.	CL RADIUS OF 1.0 DIA ON DUCTS LARGER THAN 24"				LAMINATE FACING.		
			SPIN-IN / ATTO BRANCHES OK				MECHANICAL FASTENERS, SUCH AS WELD PINS, ON 18" CENTERS A MINIMUM OF TWO ROWS PER SIDE, AND SECURE WITH SPEED CLIPS. BUTT JOINTS TIGHTLY. COVER CLIPS WITH WITH TAPE TO MATCH INSULATION.		
HVAC EXHAUST S	SMACNA -4" PRESSURE	GALVANIZED DUCT; SEE SUBMITTAL FOR GAUGE AND REINFORCEMENT	ELBOWS: CENTERLINE RADIUS OF 1.5 DIA OR MITERED 90S WITH VANES	3-FOOT MAX. LENGTH WITH NO OFFSETS; USE JPL OR EQUAL;	SMACNA SEAL CLASS LEVEL A	FOLLOW BASIC "LEVEL A" SMACNA	OWENS CORNING TYPE 150 FIBERGLASS BOARD, 3.0 LB/CU.FT., 2" THICK WITH ASJ25 WHITE KRAFT FOIL	N/A	NOTES 1, 2, 3, 4, 5
		RECTANGULAR TO HAVE TDF CONNECTIONS, ROUND MAY BE SPIRAL	CL RADIUS OF 1.0 DIA ON DUCTS LARGER THAN 24" DIA	FLEX AT EQUIP CONNECTIONS TO COMPLY WITH SMACNA			SECURE INSULATION TO TO DUCT BY IMPALING OVER		
UNITS			TAPS: CONICAL OR BOOT-STYLE				CENTERS A MINIMUM OF TWO ROWS PER SIDE, AND SECURE WITH SPEED CLIPS. BUTT JOINTS TIGHTLY.		
	N/A	N/A	N/A	N/A		PER APPLICABLE DUCT SYSTEM	N/A	N/A	NOTES 1, 2, 3

	MAXIMUM PRESSURE & TEMP	MANUFACTURER, PRODUCT OR EQUAL
		HANPLY (HANSEN SUPPLY), MARKING SERVICES INC. MS-970 (INDOOR); MS-995 (OUTDOOR) ; DURALABEL
		-
NG SYSTEMS; NUTS: A536A HEX; WASHERS: F884 STANDARD FLAT	TO 1200F 600 PSI @ 250 F 600 PSI @ 250 F	GARLOCK STYLE BLUE-GAURD 3000 - MILWAUKEE BA-400, APOLLO 77CA-100; MILWAUKEE BA-450, APOLLO 77C-200 IMI FLOW DESIGN, RANGE 2-32 PSID MILWAUKEE BA 100H/150H - APOLLO 70, 200 HC
- 5₩1		
EACH ID CATEGORY	150 PSI @ 250F	
KITS. AT EQPT (2" & BELOW). MNPT X MNPT 2 1/2" & ABOVE		EFP SERIES MASON SAFELEX SFU IMI FLOW DESIGN MATCH EXISTING FLUID TYPE (DOWTHERM-HD 35% PROP. GLYCOL) PETERSON EQUIPMENT CO PETE'S PLUG II
		N/A

MECHANICAL PIPE INSULATION SCHEDULE											
PIPING	TEMP RANGE	THERMAL	MEAN RATING	INSULATION							
SYSTEM	(Deg F)	COND.	TEMPERATURE	MATERIAL	<1"	1" TO <1-1/2"	1 1/2" TO 4"	4" - 8"	OVER 8"	NOTES	
HEATING WATER	105-140	0.21-0.28	100	MPI	1.0	1.0	1.5	1.5	1.5	1, 3, 4, 5,10	
MPI: MINERAL WOOL PREFORMED PIPE IN	NSULATION										
CAL-SIL: CALCIUM SILICATE											

KEY NOTES:

1. FOR PIPING CLAMPED TO UNISTRUT SUPPORTS, UTILIZE RIGID INSERTS WITH SHEETMETAL SHIELDS CONTINUOUS THROUGH THE HANGER; UTILIZE CALCIUM SILICATE INSERTS OR STYRENE INSERTS 2. UTILIZE RIGID INSERTS AND SHEETMETAL SHIELDS; INSULATION TO BE CONTINUOUS THROUGH THE HANGER; UTILIZE CALCIUM SILICATE INSERTS OR STYRENE INSERTS 3. FOR PIPING SMALLER THAN 1 1/2 INCH AND LOCATED IN PARTITIONS WITHIN A CONDITIONED SPACE, MAY REDUCE THICKNESSES BY 1 INCH BUT TOTAL THICKNESS TO NOT BELOW 1" AS ALLOWED BY ENERGY CODE. 4. ASTM E 84 AND UL 723 TESTED AND LISTED TO FLAME SPREAD INDEX OF 25 AND SMOKE DEVELOPED INDEX OF NOT EXCEEDING 50

PR	ESSURE TES	T PROCEDU	RE
MEDIA	TEST PRESSURE	DURATION	CODE
WATER	1.5 TIMES MAX OPERATING PRESSURE, BUT NOT LESS THAN 100 PSI	15 MINUTES	2018 IMC, SECTION 1208
N/A	N/A	N/A	N/A



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# ARL BUILDING -LAB 114 FIT OUT

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CONSULTANTS:

PROJECT:

REGISTRATION:



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N	C	DATE	DESCRIPTION
1		01-25-2023	OWNER REVIEW SET
2		03-07-2023	ISSUED FOR PERMIT

DESIGNED:	P. FALLON
DRAWN:	P. FALLON
CHECKED:	P. FALLON
JOB NO:	XXXXXX

# SHEET TITLE: MECHANICAL SPECIFICATIONS

SHEET NUMBER:

	VARIABLE AIR VOLUME UNIT SCHEDULE																					
			PRIMARY AIR VALVE					HEATING COIL														
TAG	MANUFACTURER/ MODEL #	AREA SERVED	UNIT SIZE	INLET / W (IN)	OUTLET H (IN)	DIA. (IN)	COOLING MAX AIRFLOW	COOLING MIN AIRFLOW	APD (IN W.G)	HEATING MIN AIRFLOW	HEATING MAX AIRFLOW	MIN. MBH	MIN. ROWS	EWT	LWT	EAT	LAT	GPM	WPD	FLUID	APD (IN W.G) @ MAX BOX AIRFLOW	NOTES
VAV-114-SA	PRICE / SDVQ	LAB 114 (SUPPLY)	10	14	12.5	10	800	220	0.10"	220	400	15	2	140	129	55	94	3 GPM	2.5 FT	35% PG	0.40"	1, 2, 3
VAV-114-EA	PRICE / SDEQ	LAB 114 (EXHAUST)	10	14	12.5	10	800	220	0.25"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1, 3
																				<u> </u>		
NOTES: 1.	SINGLE DUCT TERMI COMPLYING WITH UL	INAL UNIT WITH 22 GAUGE CASING 181 AND NFPA 90A. VAV ACTUAT	WITH 36 Tor An	6" SOUNE ID CONTR	) ATTENU ROLLER F	iator. P Providei	ROVIDE WI D BY CONTI	TH FACTOR	Y HANGIN RACTOR.	G BRACKET, S	S&D CONNECT	fion, Mul	.TI-POINT C	ROSSFLO	W SENSOR	WITH AIRFI	LOW SEN	SOR TUBI	NG. PRO	VIDE WITH	1" INTERNAL LI	NER
Ζ.	2. PROVIDE WITH MULTI-ROW HEATING COIL.																					

3. REFERENCE PLANS FOR HANDING

.



STATIC PRES OVERALL LEN OVERALL WID OVERALL HEI CENTERLINE

SOUND POWE BAND - VALUE OPERATING C

NOTES:

VARIABLE AIR VOLUME UNIT SCHEDULE
-----------------------------------

TTENUATOR SCHEDULE									
		SA-114-SA	SA-114-EA						
SIGN	MANUF.	PRICE	VIBRO ACOUSTICS						
	MODEL	CS	ERM						
	TYPE	CIRCULAR	RECT. ELBOW						
	GAUGE	22 GALV.	22 GALV.						
D		LAB 114	LAB 114						
LOCATION		SUPPLY DUCT	EXHAUST DUCT						
		800 CFM	800 CFM						
CTION SIZE		10"	12"×12"						
LOCITY (FPM)		1467 FPM	800 FPM						
SURE DROP		0.08"	0.09"						
IGTH (INCHES)		24"	24"						
TH (INCHES)			24"						
GHT (INCHES)		10 DIA	12"						
LENGTH		N/A	36"						
ER REDUCTION BY	63	4	5						
ES SHOWN ARE TAKEN AT	125	7	11						
CONDITIONS	250	15	20						
	500	27	27						
	1000	42	40						
	2000	42	38						
	4000	34	30						
	8000	24	26						
	NOTES	1	2						



NOTES: 1. CONTROL VALVE AND ACTUATOR FURNISHED BY CONTROLS CONTRACTOR. 2. VALVE KITS TO BE TAGGED BY MFR FOR VALVE NUMBER, GPM, CV

1. CIRCULAR SILENCER WITH POLYMER FILM LINER

2. RECTANGULAR ELBOW SILENCER WITH POLYMER FILM LINER



WALL PENETRATION



SCALE: NTS



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### VAV TERMINAL UNIT COIL PIPING DETAIL

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SHEET NUMBER:



SUPPLY AIR TERMINAL UNIT

LAB 114 - CONTROLS SCHEMATIC

/R	$\geq$
S	$\leq$

![](_page_3_Figure_4.jpeg)

	Mckinstry For The Life Of Your Building	PROJECT: JOB #:				
	SYSTEM	POINT DESCRIPTION	ΡΟΙΝΤ ΤΥΡΕ	ADJUSTABLE	ALARM POINT	
	VAV TERMINAL UNIT (SUPPLY)					
_	,		10			
_			AO			
-		PRIMARY AIR DAMPER COMMAND	AO			
-			A1			
-						
-			A			-
-		SPACE TEMPERATURE				
-		SPACE TEMPERATURE SETPOINT		Х		
-		OVERRIDE OCCUPIED BUTTON	COM			)
		TEMPERATURE SETPOINT LOCAL ADJUSTMENT				
-						
	VAV TERMINAL UNIT (EXHAUST)					
		AIR DAMPER COMMAND	AO			)
		AIR VALVE CFM	AI			)

#### VARIABLE AIR VOLUME BOX (VAV)

#### **SETPOINTS**

ITEM	SETPOINT	
OCCUPIED HEATING SETPOINT	70F	
OCCUPIED COOLING SETPOINT	75F	4.
UNOCCUPIED HEATING SETPOINT	55F	]
UNOCCUPIED COOLING SETPOINT	85F	
DISCHARGE AIR TEMPERATURE SETPOINT	85F	

1. GENERAL

- 1.1. PROVIDE SYSTEM GRAPHICS SHOWING THE VAV TERMINAL UNITS AND ASSOCIATED EQUIPMENT ON AN OVERALL FLOOR PLAN AND EXPANDED ROOM EQUIPMENT INFORMATION WHENEVER ZONES ARE GRAPHICALLY SELECTED. PROVIDE REAL-TIME DATA, WHICH WILL BE DISPLAYED ON THE GRAPHICS SCREEN. ALL POINTS LISTED SHALL BE VISIBLE ON THE GRAPHICS SCREEN. 1.2. ALL CONTROL SETPOINTS CONTAINED HEREIN SHALL BE ADJUSTABLE VIA THE GRAPHICAL INTERFACE
- ON THE BAS.
- 1.3. EXPOSED WIRING IN OCCUPIED SPACES SHALL BE RUN IN CONDUIT. 1.4. EACH SUPPLY AIR VAV BOX SHALL BE CONTROLLED FROM A DEDICATED ROOM THERMOSTAT.
- 1.5. OCCUPIED, UNOCCUPIED, MORNING WARM UP AND COOL DOWN MODE SCHEDULES SHALL BE DETERMINED BY THE TENANT.
- 1.6. SPACE THERMOSTATS SHALL ALLOW FOR USER OVERRIDE FROM THE UNOCCUPIED MODE TO THE OCCUPIED MODE VIA A PUSHBUTTON ON THE FACE OF THE SPACE THERMOSTAT. THE OVERRIDE SHALL BE IN EFFECT FOR PROGRAMMABLE TIME PERIOD, INITIALLY SET FOR 2-HOURS.
- 1.7. THE BAS SHALL ALLOW FOR USER ADJUSTED SETPOINTS AT THE LOCAL THERMOSTAT. A RANGE OF + OR MINUS 3 DEGREES F. (ADJ.) SHALL BE INITIALLY PROGRAMMED.

#### 2. TEMPERATURE CONTROL

- 2.1. THE SUPPLY AIR PRIMARY AIR DAMPER MODULATES TO MAINTAIN THE DESIRED PRIMARY AIRFLOW. 2.2. FOR VAV BOXES WITH HEAT, MODULATE THE HEATING CONTROL VALVE TO MAINTAIN DISCHARGE TEMPERATURE SETPOINT.
- 2.3. ON A CALL FOR COOLING, RESET THE SUPPLY AIR PRIMARY AIRFLOW SETPOINT TO BETWEEN THE MINIMUM AND MAXIMUM SCHEDULED VALUES TO MAINTAIN THE SPACE TEMPERATURE SETPOINT.
- 2.4. FOR VAV BOXES WITH HEAT: ON A CALL FOR HEATING, IF THE DISCHARGE AIR TEMPERATURE SETPOINT REACHES THE HEATING SUPPLY DA SETPOINT AND THE SPACE IS STILL IN NEED OF HEATING RESET THE SUPPLY PRIMARY AIRFLOW TO MEET THE ROOM TEMPERATURE SETPOINT. THE SUPPLY PRIMARY AIRFLOW SHALL NOT EXCEED THE MAXIMUM HEATING AIRFLOW AS SCHEDULED.

#### 3. OCCUPIED MODE

- 3.1. AIR SHALL FLOW CONTINUOUSLY. REFERENCE VAV BOX SCHEDULE FOR AIRFLOW MINIMUMS AND MAXIMUMS
- 3.2. SEE THE TEMPERATURE CONTROL SECTION ABOVE FOR VAV BOX OPERATION

- 8. ALARMS

CONTROLS POINTS LIST MSU - APPLIED RESEARCH LAB - LAB 114							
TREND	OVERRIDEABLE	SHOW ON GRAPHIC	REMARKS				
Х	Х	Х					
Х	Х	Х					
Х		Х	PROBE TYPE				
Х		Х					
~		v					
X		X					
^ X		X		-			
X		X					
х	Х	Х					
Х		Х					

#### UNOCCUPIED MODE

4.1. THE SUPPLY AIR VAV BOX IS CLOSED UNLESS THERE IS A CALL FOR TEMPERATURE CONTROL. 4.2. WHEN SPACE TEMPERATURE HAS REACHED UNOCCUPIED HEATING SETPOINT, THE UNIT CONTROLLER SHALL MODULATE THE SUPPLY AIR TERMINAL UNIT DAMPER TO ITS DESIGN HEATING AIRFLOW AND MODULATE THE 2-WAY HEATING COIL VALVE OPEN TO MAINTAIN A 85 DEG. F. DISCHARGE AIR TEMPERATURE UNTIL SPACE TEMPERATURE HAS REACHED TWO DEGREES ABOVE THE HEATING SETBACK TEMPERATURE, AT WHICH TIME THE UNIT SHALL REVERT BACK TO ITS UNOCCUPIED MODE. 4.3. WHEN SPACE TEMPERATURE HAS REACHED UNOCCUPIED COOLING SETPOINT, THE UNIT CONTROLLER SHALL MODULATE SUPPLY AIR TERMINAL UNIT DAMPER TO ITS MAXIMUM COOLING AIRFLOW UNTIL THE SPACE TEMPERATURE HAS REACHED TWO DEGREES BELOW THE COOLING SETBACK TEMPERATURE, AT WHICH TIME THE UNIT SHALL REVERT BACK TO ITS UNOCCUPIED MODE.

#### 5. MORNING WARM UP MODE

5.1. MORNING WARM-UP START TIME SHALL BE CALCULATED BY THE BAS OPTIMAL START PROGRAM. 5.2. THE SUPPLY AIR VAV BOX IS CLOSED UNLESS THERE IS A CALL FOR TEMPERATURE CONTROL. REFERENCE VAV BOX SCHEDULE FOR AIRFLOW MAXIMUMS. MINIMUM AIRFLOW IS ZERO. 5.3. SEE THE TEMPERATURE CONTROL SECTION ABOVE FOR VAV BOX OPERATION

#### 6. MORNING COOL DOWN MODE

6.1. MORNING COOL DOWN START TIME SHALL BE CALCULATED BY THE BAS OPTIMAL START PROGRAM. 6.2. VAV BOX IS CLOSED UNLESS THERE IS A CALL FOR TEMPERATURE CONTROL. REFERENCE VAV BOX SCHEDULE FOR AIRFLOW MAXIMUMS.

6.3. SEE THE TEMPERATURE CONTROL SECTION ABOVE FOR VAV BOX OPERATION 6.4. COOL DOWN MODE ENDS AT SCHEDULED OCCUPIED TIME OR WHEN SPACE TEMPERATURE IS SATISFIED, WHICHEVER COMES FIRST.

6.5. HEAT IS DISABLED IN COOL DOWN MODE.

#### 7. EXHAUST AIR TERMINAL UNIT CONTROL

7.1. ANYTIME THE SUPPLY AIR TERMINAL UNIT HAS MODULATED OPEN, THE EXHAUST AIR TERMINAL UNIT SHALL MODULATE ITS AIR DAMPER TO MATCH THE SUPPLY AIR TERMINAL UNIT AIRFLOW.

8.1. "LOW ZONE TEMPERATURE ALARM": GENERATE AN ALARM WHEN THE ROOM TEMPERATURE IS 5 DEGREES BELOW SETPOINT FOR 15 MINUTES.

8.2. "HIGH ZONE TEMPERATURE ALARM": GENERATE AN ALARM WHEN THE ROOM TEMPERATURE IS 5 DEGREES ABOVE SETPOINT FOR 15 MINUTES. 8.3. "HIGH DISCHARGE TEMPERATURE ALARM": GENERATE AN ALARM WHEN THE DISCHARGE TEMPERATURE

IS 10 DEGREES ABOVE SETPOINT FOR 15 MINUTES (FOR BOXES WITH HEAT).

![](_page_3_Picture_51.jpeg)

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### MONTANA STATE UNIVERSITY -

### ARL BUILDING -LAB 114 FIT OUT

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![](_page_3_Picture_59.jpeg)

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):	P. FALLON	
	P. FALLON	
	P. FALLON	
	XXXXXX	

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SHEET NUMBER:

![](_page_4_Figure_0.jpeg)

![](_page_4_Picture_4.jpeg)

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DRAWN:	P. FALLON	_
CHECKED:	P. FALLON	
JOB NO:	XXXXXX	

SHEET TITLE: LAB 114 - MECHANICAL DEMOLITION PLAN

SHEET NUMBER:

MD-101

![](_page_5_Figure_0.jpeg)

![](_page_5_Picture_1.jpeg)

### **KEYED DEMOLITION NOTES:**

# LAB 114 - ENLARGED MECHANICAL DEMOLITION PLAN

![](_page_5_Picture_5.jpeg)

![](_page_5_Picture_6.jpeg)

1. REMOVE 6" DIA SUPPLY AND EXHAUST DUCTWORK INCLUDING VOLUME DAMPERS BACK TO 16" DIA DUCT CONNECTIONS AT MAIN AND PREPARE FOR NEW CONNECTION, SEE RENOVATION PLAN.

![](_page_5_Picture_8.jpeg)

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![](_page_5_Picture_15.jpeg)

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SHEET TITLE:

![](_page_5_Picture_19.jpeg)

SHEET NUMBER:

MD-301

![](_page_6_Figure_0.jpeg)

![](_page_6_Picture_1.jpeg)

# LAB 114 - ENLARGED MECHANICAL RENOVATION PLAN

### GENERAL NOTES: - TRANSITION DUCTWORK AS REQUIRED TO EQUIPMENT CONNECTIONS.

### **KEYED RENOVATION NOTES:**

- 2. TRANSITION ROUND DUCT TO RECTANGULAR DUCT SILENCER.
- CLOTH.
- ADJUSTMENT.
- APPROXIMATELY 10'-0" A.F.F.
- TEMPERATURE CONTROLS.

![](_page_6_Picture_13.jpeg)

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### MONTANA STATE UNIVERSITY -

# ARL BUILDING -LAB 114 FIT OUT

2380 TECHNOLGY BLVD. BOZEMAN, MT 59718

CONSULTANTS:

REGISTRATION:

PROJECT:

1. ENLARGE EXISTING OPENINGS, PROVIDE PIPE SLEEVE FOR DUCT PENETRATION. SLEEVE SHALL BE FLANGED ON BOTH SIDES AND LARGE ENOUGH TO PROVIDE 1/4" SPACE BETWEEN SLEEVE WALL AND DUCT INSULATION. FILL ENTIRE VOID WITH ACOUSTICAL FOAM. DUCT INSULATION SHALL RUN CONTINUOUS THRU WALL.

3. PROVIDE 10"x24" OPENING IN TOP OF EXHAUST DUCT, COVER WITH 1/2" HARDWARE

4. DDC THERMOSTAT WITH OCCUPANCY OVERRIDE BUTTON AND TEMPERATURE SETPOINT

5. TRANSITION 10" DIA RUNOUTS TO EXISTING 16" TAPS IN DUCT MAINS.

6. MAINTAIN LEVEL DUCT INSTALLATION THROUGHOUT THE LAB, DUCT CENTERLINES TO BE

7. SUPPLY AIR GRILLES SHALL BE PRICE MODEL 520 DOUBLE DEFLECTION, FRONT BLADES SHALL BE HORIZONTAL, FURNISH WITH OPPOSED BLADE VOLUME DAMPER. 14"W x 4"H.

8. TEMPERATURE CONTROLS CABINET WITH TOGGLE DISCONNECT FOR VAV TERMINAL CONTROLS POWER, 120V POWER BY E.C. TRANSFORMER AND 24V POWER BY

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SHEET TITLE:

# LAB 114 - MECHANICAL **RENOVATION PLAN**

SHEET NUMBER:

![](_page_7_Figure_0.jpeg)

![](_page_7_Picture_1.jpeg)

- LOCATION.

# LAB 114 - MECHANICAL PIPING RENOVATION PLAN

![](_page_7_Picture_7.jpeg)

![](_page_7_Picture_8.jpeg)

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KEYED PIPING NOTES:

1. PIPE VAV TERMINAL HEATING COIL PER DETAIL 1/M-021.

2. PROVIDE PIPE SLEEVE FOR PENETRATION OF HEATING WATER PIPES THRU WALL. REFERENCE DETAIL 2/M-021.

3. CONNECT TO EXISTING 1" PLUGGED AND CAP HEATING WATER LINES AT MAIN PROVIDED IN CORE AND SHELL. FIELD VERIFY EXACT

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# ARL BUILDING -LAB 114 FIT OUT

2380 TECHNOLGY BLVD. BOZEMAN, MT 59718

CONSULTANTS:

PROJECT:

![](_page_7_Picture_19.jpeg)

![](_page_7_Picture_20.jpeg)

ISSUES:		
NO	DATE	DESCRIPTION
1	01-25-2023	OWNER REVIEW SET
2	03-07-2023	ISSUED FOR PERMIT

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SHEET TITLE: LAB 114 - MECHANICAL PIPING RENOVATION PLAN

SHEET NUMBER:

MP-101