AHU REPLACEMENT

FOR

DAYTONA STATE COLLEGE

1155 Co Rd 4139, DeLand, FL 32724

PERMIT SET

08/31/2022

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ARCHITECTURAL GENERAL NOTES

1. THESE DRAWINGS HAVE BEEN PREPARED TO THE BEST OF OUR ABILITY TO BE IN COMPLIANCE AND CONFORMANCE WITH THE FEDERAL ACCESSIBILITY LAW CONTAINED WITHIN THE AMERICANS WITH DISABILITIES ACT GUIDELINES FOR DESIGN.
2. THE DESIGN AND DRAWINGS OF THIS PROJECT HAVE BEEN SPECIFICALLY PREPARED FOR THE USE AND CONSTRUCTION AT THE LOCATION SHOWN. REPRODUCTION FOR USE IN ANY OTHER SITE OR MANNER EXCEEDS THE INTENDED PURPOSE OF THESE DOCUMENTS AND IS PROHIBITED.
3. CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES BELOW GRADE AND RELATED SERVICE CONNECTIONS WITH THE RESPECTIVE UTILITY COMPANIES. CONTRACTOR SHALL COORDINATE THE REMOVAL, ABANDONMENT OR RELOCATION OF EXISTING UTILITIES SHOWN ON THESE DOCUMENTS WITH RESPECTIVE UTILITY COMPANIES. ANY INTERRUPTIONS IN EXISTING UTILITY SERVICES NEEDS TO BE COORDINATED AND APPROVED BY THE UTILITY COMPANY PRIOR TO START OF WORK.
4. CONTRACTOR SHALL PERFORM ALL WORK WITHIN PUBLIC RIGHTS OF WAY ACCORDING TO THESE DOCUMENTS AND REQUIREMENTS BY THE GOVERNING AGENCY AND SHALL OBTAIN NECESSARY APPROVALS AS REQUIRED.
5. ARCHITECT SHALL BE NOTIFIED BY CONTRACTOR OF ANY DISCREPANCIES ON THESE DOCUMENTS PRIOR TO COMMENCEMENT OF WORK.
6. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE ALL NEW AND EXISTING CONDITIONS AND DIMENSIONS FOR COMPARISON TO THE DOCUMENTS PRIOR TO BIDDING AND THE COMMENCEMENT OF CONSTRUCTION. NOTIFY ARCHITECT IN WRITING OF ANY DISCREPANCIES, INCONSISTENCIES OR OMISSIONS BEFORE THE COMMENCEMENT OF WORK.
7. ALL CONSULTANT DRAWINGS SHALL BE CONSIDERED COMPLIMENTARY TO THE ARCHITECT'S DOCUMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE CONSULTANT DRAWINGS AND NOTIFY THE ARCHITECT IN WRITING OF ANY DISCREPANCIES, INCONSISTENCIES OR OMISSIONS BEFORE THE COMMENCEMENT OF WORK.
8. DO NOT SCALE THESE DRAWINGS. CONTRACTOR SHALL RELY ON THE DIMENSIONS SHOWN AND SHALL FIELD VERIFY ALL DIMENSIONS AND COORDINATE THE WORK WITH ALL TRADES. NOTIFY THE ARCHITECT IN WRITING OF ANY DISCREPANCIES, INCONSISTENCIES OR OMISSIONS BEFORE THE COMMENCEMENT OF WORK.

MATERIALS LEGEND

- BATT INSULATION
- CONCRETE
- EARTH OR FINISHED GRADE
- GRATING, SPAN DIRECTION INDICATED
- GYPSUM WALLBOARD / PLASTER
- MASONRY - CONCRETE BLOCK (PLAN)
- METAL STUD WALL (PLAN)
- RIGID INSULATION
- METAL / STEEL
- PLYWOOD
- WOOD BLOCKING / WOOD FRAMING (THROUGH MEMBER)
- WOOD BLOCKING / WOOD FRAMING (INTERRUPTED MEMBER)
- FINISH WOOD
- SAND / MORTAR PLASTER

DIMENSIONING

1. DIMENSIONS ARE INDICATED ON DRAWINGS; DO NOT SCALE DRAWINGS.
2. DIMENSIONS SHOWN ARE TO FACE OF STUDS, MASONRY OR CONCRETE AND ARE INDICATED WITH A DIAGONAL MARK.
3. CLEAR DIMENSIONS AND DIMENSIONS TO FACE OF FINISH ARE NOTED WITH A LEADER HEAD.
4. CENTERLINE DIMENSIONS ARE INDICATED WITH A 'CL'.
5. WALLS, PARTITIONS OR MULLIONS THAT ARE DIMENSIONED TO THE CENTERLINE ARE SHOWN WITH A DASHED LINE.
6. ELEMENTS THAT ARE CENTERED BETWEEN TWO WALLS ARE SHOWN WITH 'EQ.' SYMBOLS.
7. UNLESS NOTED OTHERWISE, DOORS ARE LOCATED 6" FROM THE CORNER IN METAL FRAMED WALLS AND 8" FROM A CORNER IN CMU WALLS.
8. DIMENSIONS TO ROUGH OPENINGS (RO) OR MASONRY OPENINGS (MO) ARE NOTED ACCORDINGLY.

X'-X" FACE OF MASONRY UNIT TO FACE OF MASONRY UNIT

X'-X" CENTERLINE OF COLUMN TO CENTERLINE OF COLUMN

X'-X" FACE OF METAL STUD TO FACE OF METAL STUD

CODE INFORMATION

APPLICABLE CODES

CODE	EDITION
FLORIDA BUILDING CODE (FBC)	2020, 7th EDITION
FLORIDA BUILDING CODE - EXISTING BUILDING (FBC)	2020, 7th EDITION
FLORIDA BUILDING CODE - PLUMBING (FBC)	2020, 7th EDITION
FLORIDA BUILDING CODE - ELECTRICAL (FBC)	2020, 7th EDITION
FLORIDA BUILDING CODE - ENERGY CONSERVATION (FBC)	2020, 7th EDITION
FLORIDA BUILDING CODE - MECHANICAL (FBC)	2020, 7th EDITION
FLORIDA BUILDING CODE - ACCESSIBILITY (FBC)	2020, 7th EDITION
NATIONAL ELECTRICAL CODE - NFPA 70	2017
FLORIDA FIRE PREVENTION CODE (FFPC)	2020, 7th EDITION
NFPA-1 & NFPA-101	2020

PROJECT INFORMATION

SCOPE OF PROJECT	AIR HANDLER UNIT REPLACEMENT		
OCCUPANCY	BUSINESS - GROUP B	FBC BUILDING (SECTION 304)	
BUILDING USE		FBC BUILDING (SECTION 1004.5)	
AREA	SQUARE FOOTAGE	OCCUPANTS/SQ.FT.	TOTAL OCCUPANTS
BUSINESS - BUILDING A	12,292	1/150	81
MECHANICAL - BUILDING A	1,008	1/300	3
BUSINESS - BUILDING B	17,800	1/150	118
MECHANICAL - BUILDING B	1,386	1/300	4
TOTAL ALTERATION SQ.FT.	2,394 SQ.FT.		
TOTAL OCCUPANTS OF ALTERATION	7		
TOTAL SQ.FT.	30,092 SQ.FT.		
TOTAL OCCUPANTS	206		
ALTERATION LEVEL	LEVEL 1	FBC EXISTING BUILDING (SECTION 801)	

TYPE OF CONSTRUCTION

CONSTRUCTION TYPE	IV		FBC BUILDING (SECTION 504)
SPRINKLED	UNSPRINKLED		FBC BUILDING (SECTION 504)
PROTECTED	UNPROTECTED		FBC BUILDING (SECTION 506.2)
	ALLOWABLE	ACTUAL	
BUILDING HEIGHT	EXISTING	EXISTING	FBC BUILDING (SECTION 504.3)
NUMBER OF STORIES	2	2	FBC BUILDING (SECTION 504.4)
INTERIOR FINISHES			
	EXITS - CLASS A		
	EXIT ACCESS - CLASS B		
	OTHER SPACES - CLASS C		

MEANS OF EGRESS

	REQUIRED	ACTUAL BUILDING A	ACTUAL BUILDING B	CODE SECTION
MINIMUM NUMBER OF EXITS	2	2	2	FBC BUILDING 2020 (SECTION 1006.3.1)
MAXIMUM DEAD END CORRIDOR	20 FT	0 FT	18 FT	FBC BUILDING 2020 (SECTION 1020.4)
MAXIMUM TRAVEL DISTANCE	200 FT	154 FT	136 FT	FBC BUILDING 2020 (SECTION 1017.2)
COMMON PATH OF EGRESS	75 FT	65 FT	48 FT	FBC BUILDING 2020 (SECTION 1006.2.1)
MINIMUM CORRIDOR WIDTH	44"	72"	72"	FBC BUILDING 2020 (SECTION 1020.2)

PLUMBING CODE ANALYSIS

TOTAL OCCUPANTS (EXISTING OCCUPANT LOAD IS NOT IMPACTED BY THIS PROJECT) 206

PLUMBING FACTORS

PLUMBING FIXTURES	EXISTING BUILDING A		EXISTING BUILDING B	
	MALE	FEMALE	MALE	FEMALE
WATER CLOSETS	2+URINAL	2	1+URINAL	2
LAVATORIES	2	2	2	2
DRINKING FOUNTAINS	1		1	
SERVICE SINK	1		1	

ANNOTATION LEGEND

SYMBOL	DESCRIPTION
101	DOOR IDENTIFIER
L-1	LOUVER IDENTIFIER
N	WALL TYPE IDENTIFIER
H	WINDOW IDENTIFIER
0	GRID REFERENCE INDICATOR
	KEYNOTE
1 A101	DETAIL INDICATOR / DETAIL CALLOUT
1 A101 1	ELEVATION INDICATOR
1 A101	SECTION HEAD INDICATOR
N	NORTH ARROW
1	REVISION TAG
FIN. FLR. X'-X"	ELEVATION TAG
Room name 101	ROOM IDENTIFICATION TAG

VICINITY MAP

PROJECT LOCATION

HOUSEMAN ARCHITECTURE
931 S. SEMORAN BLVD. #204B WINTER PARK, FL 32792
321-972-8446 AR0017646

ALL WORK, DESIGNS, AND DETAILS REPRESENTED IN THIS DRAWING ARE OWNED BY AND THE PROPERTY OF HOUSEMAN ARCHITECTURE, LLC, AND WERE CREATED, EVOLVED AND DEVELOPED FOR USE ON AND IN CONNECTION WITH THE SPECIFIED PROJECT. NONE OF THE IDEAS, DESIGNS, OR DETAILS SHALL BE USED BY OR DISCLOSED TO ANYONE FOR ANY PURPOSE WHATSOEVER WITHOUT THE WRITTEN PERMISSION OF HOUSEMAN ARCHITECTURE, LLC.

PROJECT TEAM

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Michael M Houseman

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

1155 Co Rd 4139, DeLand, FL 32724

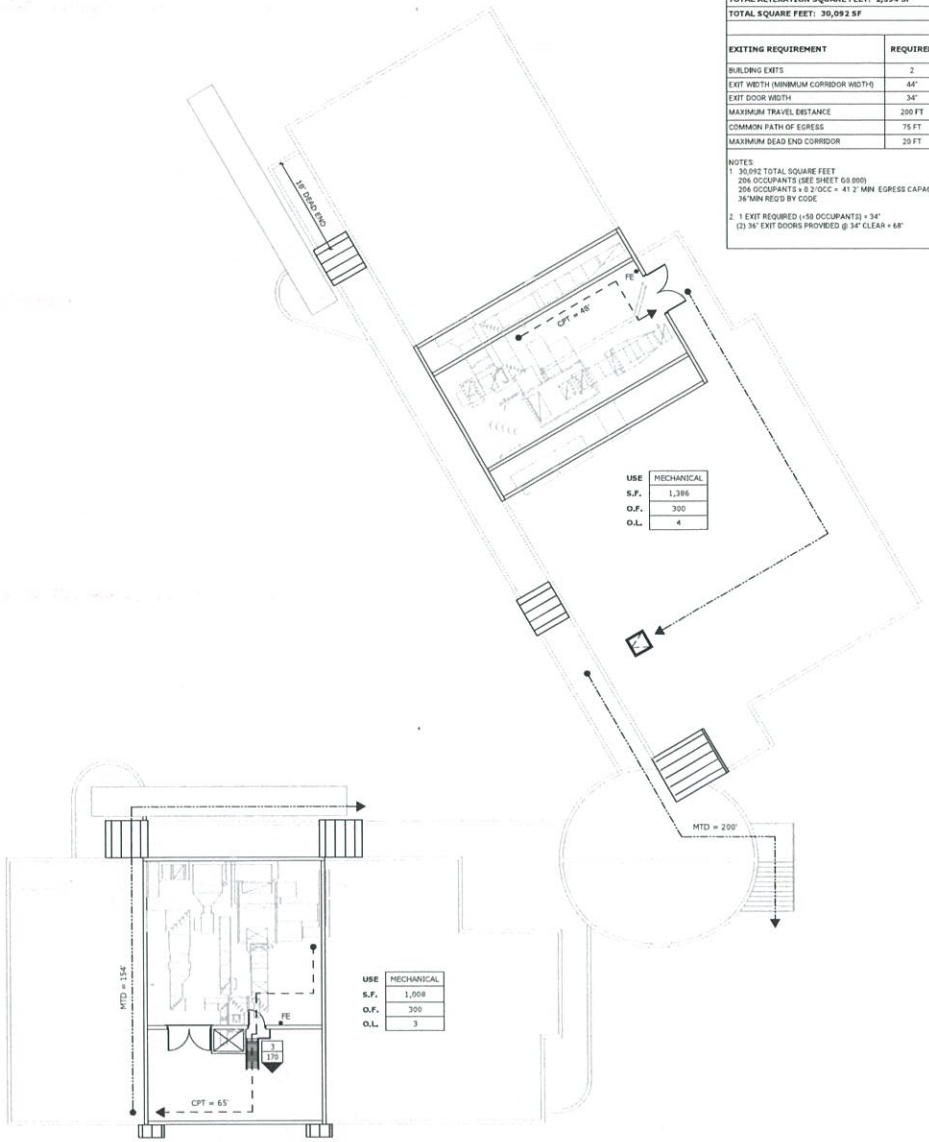
SHEET NAME:

COVER SHEET & GENERAL INFORMATION

Date	HISTORY	No.
08/31/2022	PERMIT SET	

PROJECT NO: 21-076

SHEET NO: G0.000



N
1 LIFE SAFETY PLAN
3/32" = 1'-0"

LIFE SAFETY SUMMARY

TOTAL ALTERATION SQUARE FEET: 2,394 SF	TOTAL ALTERATION OCCUPANTS: 7
TOTAL SQUARE FEET: 30,092 SF	TOTAL OCCUPANTS: 206

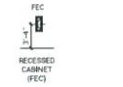
EXITING REQUIREMENT	REQUIRED	ACTUAL BUILDING A	ACTUAL BUILDING B	CODE SECTION
BUILDING EXITS	2	2	2	FBC BUILDING (SECTION 1006.3.2)
EXIT WIDTH (MINIMUM CORRIDOR WIDTH)	44"	72"	72"	SEE NOTE #1
EXIT DOOR WIDTH	34"	68"	68"	SEE NOTE #2
MAXIMUM TRAVEL DISTANCE	200 FT	154 FT	136 FT	FBC BUILDING (SECTION 1017.2)
COMMON PATH OF EGRESS	75 FT	65 FT	48 FT	FBC BUILDING (SECTION 1006.2.1)
MAXIMUM DEAD END CORRIDOR	20 FT	0 FT	18 FT	FBC BUILDING (SECTION 1020.4)

NOTES:
1. 30,092 TOTAL SQUARE FEET
   206 OCCUPANTS (SEE SHEET G0.000)
   206 OCCUPANTS x 0.2 OCC = 41.2" MIN. EGRESS CAPACITY REQUIRED
   36"MIN REQ'D BY CODE
2. 1 EXIT REQUIRED (<50 OCCUPANTS) = 34"
   (2) 36" EXIT DOORS PROVIDED @ 34" CLEAR = 68"

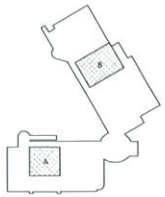
LIFE SAFETY NOTES

1. TO THE BEST OF THE ARCHITECT'S KNOWLEDGE, THE DOCUMENTS COMPLY WITH THE APPLICABLE MINIMUM BUILDING CODES AND THE APPLICABLE MINIMUM FIRE SAFETY CODES AS DETERMINED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
2. THESE DOCUMENTS HAVE BEEN PREPARED TO THE BEST OF OUR ABILITY TO BE IN COMPLIANCE AND CONFORMANCE WITH THE FEDERAL ACCESSIBILITY LAW CONTAINED WITHIN THE AMERICANS WITH DISABILITIES ACT GUIDELINES FOR DESIGN.
3. CONTRACTOR TO COORDINATE ALL EXIT SIGNS SHOWN ON THE LIFE SAFETY PLANS WITH ELECTRICAL DRAWINGS. REFER TO ELECTRICAL DRAWINGS FOR SIGN DIRECTION, MOUNTING, CIRCUITING AND FIXTURE TYPES.
4. FURNITURE IS SHOWN ON THE PLANS FOR GENERAL REFERENCE ONLY. OWNER WILL VERIFY 44" MIN CLEARANCE AROUND ALL MOVABLE FURNITURE ELEMENTS.

FIRE EXTINGUISHER DETAILS



NOTE:
PROVIDE UL RATED FIRE EXTINGUISHERS MULTI-PURPOSE USE 4-A:80B-C, 10 POUND



N
KEY PLAN
1/64" = 1'-0"

HOUSEMAN
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LIFE SAFETY LEGEND

SYMBOL	LEGEND
MTD= 1'- 0"	MAXIMUM TRAVEL DISTANCE
CPT= 1'- 0"	COMMON PATH OF TRAVEL
	STARTING POINT OF TRAVEL DISTANCE
	EXIT (PRIMARY)
	EXIT LIGHT
FE	FIRE EXTINGUISHER WALL MOUNTED
X / Y	X = OCCUPANTS USING EXIT Y = EXIT CAPACITY
USE / S.F. / O.F. / O.L.	O.L.F. = OCCUPANT LOAD FACTOR
USE / AREA / O.L.F. / MAX OCC	USE = FUNCTION OF SPACE
	MAX OCC = MAXIMUM OF OCCUPANTS PER SPACE OR AREA

Michael M Houseman

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AHU REPLACEMENT

1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
LIFE SAFETY PLAN

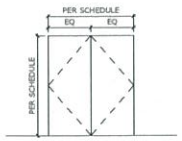
DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 21-076

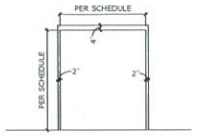
SHEET NO: G1.101

DOOR SCHEDULE

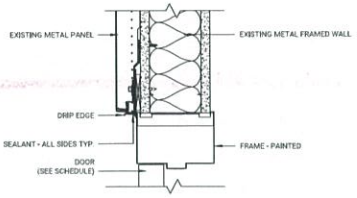
NUMBER	DOOR WIDTH	DOOR HEIGHT	DOOR THK	DOOR MATERIAL	DOOR TYPE	FRAME MATERIAL	FRAME TYPE	FIRE RATING	HEAD DETAIL	JAMB DETAIL	THRESHOLD	KEYNOTES
301A	8' - 0"	7' - 0"	1 3/4"	HOLLOW METAL	2F	HOLLOW METAL	F4	-	3/G2.101	4/G2.101	5/G2.101	1,2,3,4,5
302	8' - 0"	7' - 0"	1 3/4"	HOLLOW METAL	2F	HOLLOW METAL	F4	-	1/G2.101	2/G2.101	6/G2.101	1,2,3,4



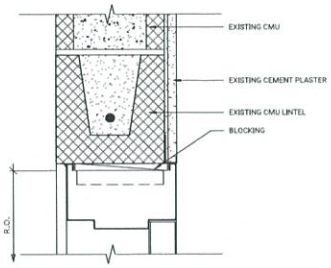
2F
DOUBLE FLUSH DOOR
ELEVATION



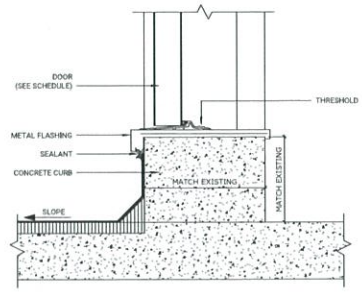
F4
DOUBLE DOOR FRAME
ELEVATION



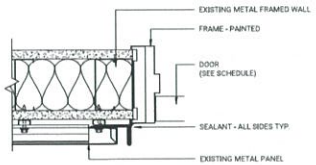
1 HM DOOR DETAIL - HEAD TYP.
3" = 1'-0"



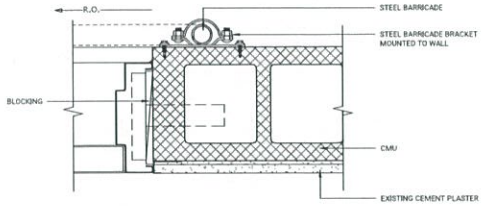
3 DOOR DETAIL - CMU HEADER
3" = 1'-0"



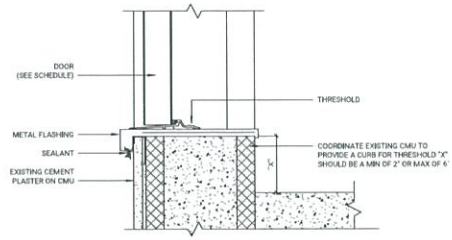
5 DOOR DETAIL - CURB & THRESHOLD
3" = 1'-0"



2 HM DOOR DETAIL - JAMB TYP.
3" = 1'-0"



4 DOOR DETAIL - CMU JAMB
3" = 1'-0"



6 DOOR DETAIL - CURB & THRESHOLD
3" = 1'-0"

HOUSEMAN
ARCHITECTURE
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321-972-8446 AR0017646

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DOOR NOTES

1. ALL HARDWARE TO MEET APPLICABLE LOCAL, STATE AND FEDERAL CODES.
2. CONTRACTOR TO PREP DOORS AS NECESSARY TO RECEIVE SPECIFIED HARDWARE.
3. ALL HOLLOW METAL FRAMES SHALL BE WELDED CONSTRUCTION, KNOCK-DOWN FRAMES ARE NOT ACCEPTABLE.
4. ALL EXTERIOR GLASS TO INSULATED, TINTED & TEMPERED. ALL INTERIOR GLASS TO BE 1/4" CLEAR TEMPERED.
5. ALL HOLLOW METAL FRAMES TO BE PAINTED
6. DOOR HARDWARE TO BE LEVER STYLE ADA COMPLIANT HARDWARE.

DOOR KEYNOTES

1. WEATHER STRIPPING AROUND DOOR
2. DRIP EDGE ABOVE DOOR
3. PAINT
4. HARDWARE TO MATCH CAMPUS STANDARDS
5. HARDWARE ON OCCUPIABLE SIDE

Michael M Houseman

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

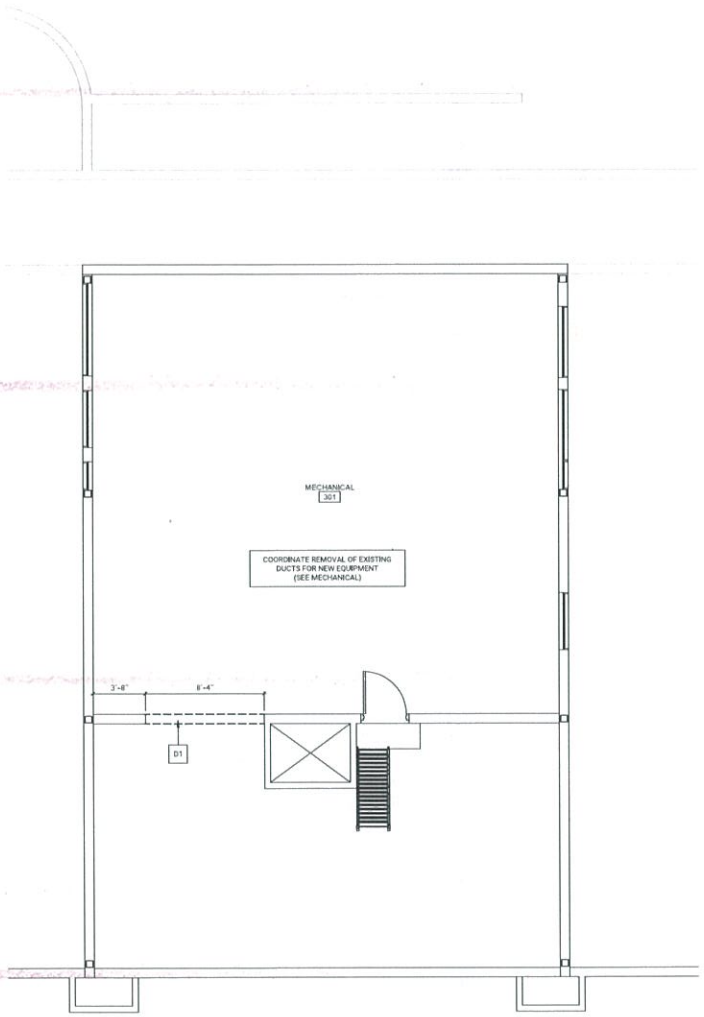
1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
DOOR SCHEDULE & TYPES

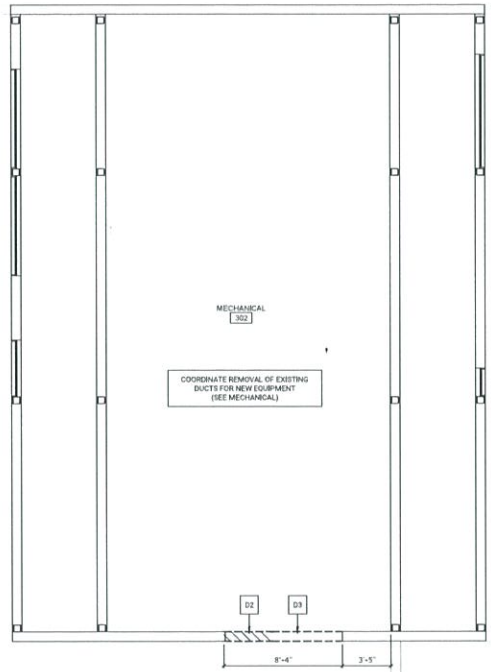
DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO.: 21-076

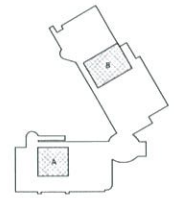
SHEET NO.: G2.101



1 DEMOLITION PLAN - BUILDING A
1/4" = 1'-0"



2 DEMOLITION PLAN - BUILDING B
1/4" = 1'-0"



KEY PLAN
1/64" = 1'-0"

DEMOLITION LEGEND

CONTINUOUS LINES DENOTE ITEMS TO REMAIN	DASHED LINES REPRESENT ITEMS TO BE REMOVED

DEMOLITION KEYNOTES

NUMBER	DESCRIPTION
D1	CREATE OPENING FOR NEW DOUBLE DOORS & PROTECT EXISTING CURB (SEE SHEET G2.101 FOR DOOR SCHEDULE AND DETAILS)
D2	PREPARE AREA FOR EXTENSION OF EXISTING CURB
D3	REMOVE EXISTING 3' X 7' DOOR AND EXTEND OPENING TO ACCOMODATE NEW DOOR

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DEMOLITION NOTES

1. FIELD VERIFY ALL EXISTING CONDITIONS AND NOTIFY ARCHITECT OF ANY DISCREPANCIES IN WRITING PRIOR TO START OF DEMOLITION WORK.
2. DEMOLITION/RESTORATION ITEMS MAY BE ALL INCLUSIVE. THE DEMOLITION CONTRACTOR IS TO REVIEW THE REQUIREMENTS OF NEW CONSTRUCTION AND IS TO COMPLETE ALL DEMOLITION/RESTORATION, CUTTING, AND PATCHING NECESSARY TO ACHIEVE INTENDED NEW CONDITION AND QUALITY.
3. COST OF REPAIR TO ANY ADJACENT CONDITIONS WHICH ARE DAMAGED AS A RESULT OF THIS DEMOLITION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
4. ITEMS ARE TO BE RETURNED TO THE BUILDING OWNER COORDINATE WITH THE BUILDING OWNER WHICH ITEMS ARE TO BE RETURNED.
5. THE BUILDING ENVELOPE SHALL BE MAINTAINED IN A WATER TIGHT CONDITION AT ALL TIMES.
6. PROTECT ALL STRUCTURAL MEMBERS FROM DAMAGE. DURING DEMOLITION BRACE ALL EXISTING STRUCTURES AS NEEDED.
7. SEE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS FOR DEMOLITION OF UTILITIES AND MECHANICAL SYSTEMS. ALL ELECTRICAL, MECHANICAL, PLUMBING, OR COMMUNICATION SERVICES NOT BEING USED ARE TO BE CAPPED AND/OR REMOVED AS REQUIRED FOR NEW CONDITIONS AND IN ACCORDANCE WITH APPLICABLE CODES.
8. REMOVE EXISTING FINISHES WHERE NEW FINISHES ARE PROPOSED. PATCH AND REPAIR ALL AREAS WHERE A DEMOLISHED WALL INTERSECTS A REMAINING WALL. FINISH EXISTING WALL TO MATCH ADJACENT SURFACES, AND PREPARE WALL TO RECEIVE NEW FINISHES AS DIRECTED BY FINISH PLANS, SCHEDULES, AND NOTES.

Michael M Houseman

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

1155 Co Rd 4139, DeLand, FL 32724

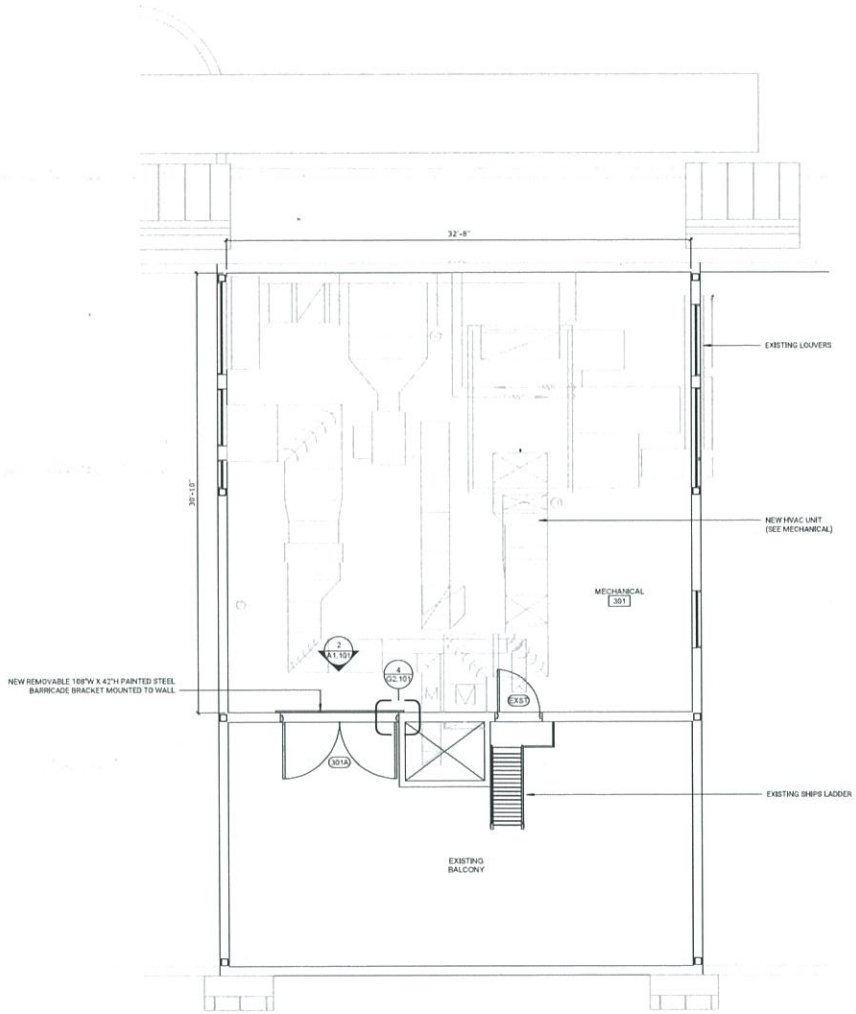
SHEET NAME:

DEMOLITION PLAN - BUILDING A & B

DATE	HISTORY	REV.
08/01/2022	PERMIT SET	

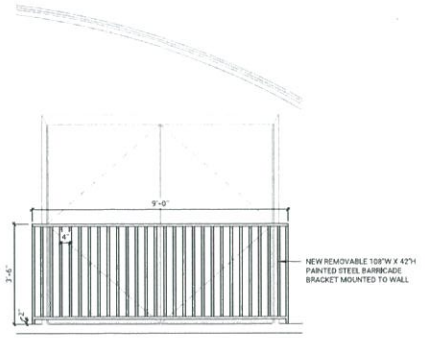
PROJECT NO: 21-076

SHEET NO: A0.010

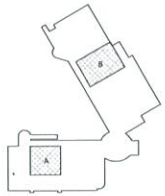


N

1 FLOOR PLAN - BUILDING A
1/4" = 1'-0"



2 DOOR & BARRICADE ELEVATION
1/2" = 1'-0"



N

KEY PLAN
1/64" = 1'-0"

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FLOOR PLAN NOTES

1. DO NOT SCALE THESE DRAWINGS
2. THE INTENT OF THESE DRAWINGS IS TO INDICATE THE SCOPE OF WORK REQUIRED IN ORDER TO CONSTRUCT A COMPLETE AND FINISHED SPACE READY FOR OCCUPANCY. THE CONTRACTOR AND SUB-CONTRACTORS ARE EXPECTED TO VISIT THE PROJECT SITE PRIOR TO CONSTRUCTION AND NOTIFY THE ARCHITECT - PRIOR TO CONSTRUCTION - OF ANY DISCREPANCIES WITHIN THE DRAWINGS OR POSSIBLE CONFLICTS WHICH AFFECT THE PROGRESS OF THIS PROJECT. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND FIELD CONDITIONS NOTIFYING THE ARCHITECT OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK.
3. ALL DIMENSIONS ON FLOOR PLANS ARE FROM FACE OF STUD TO STUD OF WALL, UNLESS NOTED OTHERWISE. DIMENSIONS TO EXTERIOR WALLS ARE TO INSIDE FACE OF STRUCTURE

Michael M Houseman

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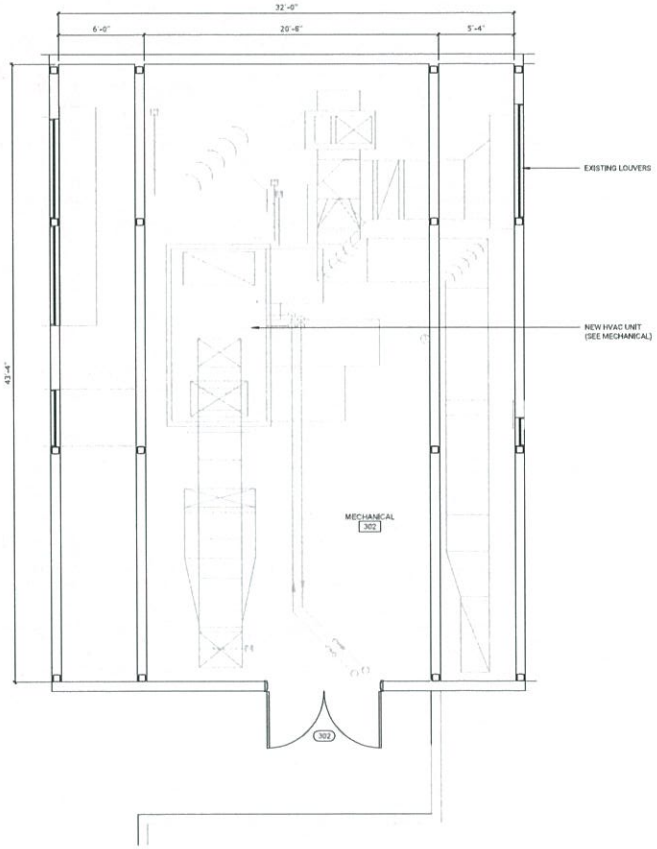
SHEET NAME:

FLOOR PLAN - BUILDING A

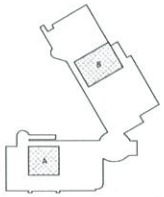
DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO.: 21-076

SHEET NO.: A1.101



1 FLOOR PLAN - BUILDING B
1/4" = 1'-0"



N
KEY PLAN
1/64" = 1'-0"

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Michael M Houseman

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SHEET NAME:

FLOOR PLAN - BUILDING B

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 21-076

SHEET NO: A1.102

GENERAL NOTES

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEMS.
2. REFER TO TYPICAL DETAILS FOR ADDITIONAL INFORMATION REGARDING THE INSTALLATION OF DUCTWORK, PIPING, AND EQUIPMENT.
3. THE CONTRACTOR IS EXPECTED TO ORDER MATERIALS IN SUFFICIENT TIME TO AVOID DELAYING THE COMPLETION OF THE PROJECT. DELAY IN DELIVERIES WILL NOT BE CONSIDERED A JUSTIFIABLE REASON FOR SUBSTITUTION OF MATERIALS.
4. THE CONTRACTOR SHALL COMPLY WITH THE 2020 FLORIDA BUILDING CODE AND ALL OTHER APPLICABLE CODES AND STANDARDS.
5. ALL REQUESTS FOR INFORMATION (RFIS) SUBMITTED BY THE CONTRACTOR SHALL INCLUDE A PROPOSED SOLUTION.
6. INSTALLATION OF EQUIPMENT SHALL COMPLY WITH EQUIPMENT MANUFACTURER'S INSTALLATION AND CLEARANCE REQUIREMENTS. THE CONTRACTOR SHALL VERIFY INSTALLATION CLEARANCES WILL BE MAINTAINED AND DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER PRIOR TO THE ACQUISITION OF EQUIPMENT.
7. THE GENERAL CONTRACTOR SHALL COORDINATE THE WORK OF THE DIFFERENT TRADES SO THAT INTERFERENCE BETWEEN HVAC, PIPING, EQUIPMENT, STRUCTURAL, AND ELECTRICAL WORK WILL BE AVOIDED. ALL NECESSARY OFFSETS IN DUCTWORK, PIPING, AND FITTINGS REQUIRED TO INSTALL THE WORK PROPERLY SHALL BE PROVIDED COMPLETE IN PLACE AT NO ADDITIONAL COST TO THE OWNER.
8. THE CONTRACTOR IS RESPONSIBLE TO REPAIR, AT HIS COST, ANY DAMAGED ITEMS DUE TO WORK PERFORMED. DAMAGED ITEMS SHALL BE BROUGHT BACK TO LIKE-NEW CONDITION OR REPLACED WITH ORIGINAL.
9. DUCTWORK, PIPING, AND EQUIPMENT LOCATIONS SHOWN ARE SCHEMATIC. PRIOR TO EXCAVATION, LAYOUT AND CONSTRUCTION OF THE MECHANICAL SYSTEMS, THE CONTRACTOR SHALL SUBMIT LAYOUT AND FABRICATION SHOP DRAWINGS FOR APPROVAL. CONTRACTOR SHALL NOT COMMENCE WORK WITHOUT APPROVED SHOP DRAWINGS ON THE CONSTRUCTION SITE.
10. INSULATE ALL SURFACES SUBJECT TO CONDENSATION.
11. ALL DUCTWORK DIMENSIONS SHOWN ON THE DRAWINGS ARE THE INTERNAL CLEAR DIMENSIONS.
12. INSULATE ALL LOUVER PLENUMS AND BLANK-OFFS TO PREVENT CONDENSATION.
13. ALL NEW SUPPLY AND RETURN DUCTWORK SHALL BE GALVANIZED STEEL, EXTERNALLY INSULATED WITH 2.2 INCH THICK, 3/4 POUND DENSITY FIBERGLASS DUCT WRAP WITH VAPOR BARRIER. INSTALLED R VALUE SHALL BE A MINIMUM OF 6.0. SEAL ALL JOINTS AND SEAMS WITH GLASS FABRIC AND MASTIC MEETING UL 181.
14. REFER TO ARCHITECTURAL AND/OR STRUCTURAL SHEETS FOR LOUVER MOUNTING HEIGHTS.
15. PROVIDE A 4-INCH THICK CONCRETE HOUSEKEEPING PAD WITH 4-INCH BORDER AND CHAMFERED EDGE ALL AROUND FOR ALL INTERIOR FLOOR-MOUNTED MECHANICAL EQUIPMENT.
16. PROVIDE COLD GALVANIZED PAINT ON ALL FIELD CUTS/WELDS OF GALVANIZED STEEL SUPPORTS AND THREADED RODS.
17. ROUTE CONDENSATE TO EXISTING HUB DRAIN AND TERMINATE INDIRECTLY.
18. THE BUILDING HAS AN EXISTING FIRE ALARM SYSTEM. PROVIDE A DUCT-MOUNTED SMOKE DETECTOR IN THE SUPPLY OF THE AIR HANDLING UNIT. THE UNIT SHALL SHUT DOWN UPON ACTIVATION OF THE DEVICE. THE DUCT SMOKE DETECTORS SHALL BE INSTALLED BY THE MECHANICAL CONTRACTOR. THE DUCT SMOKE DETECTORS SHALL BE PROVIDED, WIRED, AND INTERFACED WITH THE FIRE ALARM SYSTEM BY THE ELECTRICAL CONTRACTOR.
19. ALL TEMPERATURE SENSORS/CONTROLS SHALL BE LOCATED TO ALLOW THE PARALLEL APPROACH BY A PERSON IN A WHEELCHAIR AND MOUNTED 54" AFF, WHERE ONLY FORWARD APPROACH IS POSSIBLE. SENSORS/CONTROLS SHALL BE MOUNTED 48" AFF.
20. THE CONTRACTOR SHALL PERFORM A COMPLETE CERTIFIED TEST AND BALANCE OF EACH MECHANICAL SYSTEM IN ACCORDANCE WITH A NATIONAL STANDARD. SEE SPECIFICATIONS FOR DETAILS AND PROVIDE THREE (3) WRITTEN COPIES OF THE COMPLETED TEST AND BALANCE REPORT TO THE OWNER FOR REVIEW.

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION	ABBREV.	DESCRIPTION
AC	ALTERNATING CURRENT	ID	INNER DIAMETER
AFF	ABOVE FINISHED FLOOR	IN	INCH
AFMS	AIRFLOW MEASURING STATION	IN W.G.	INCHES OF WATER - GAUGE
AH	AIR HANDLER	IPS	IRON PIPE SIZE
AHU	AIR HANDLING UNIT	KEF	KITCHEN EXHAUST FAN
AMP	AMPERE	KSF	KITCHEN SUPPLY FAN
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	KW	KILOWATT
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS	L	LENGTH
		LAT	LEAVING AIR TEMPERATURE
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS	LBS	POUNDS
A/V	AUDIBLE/VISUAL	LF	LINEAR FEET
AWG	AMERICAN WIRE GAUGE	LWT	LEAVING WATER TEMPERATURE
B	BOILER	MAX	MAXIMUM
BCU	BLOWER COIL UNIT	MBH	THOUSAND BTU PER HOUR
BDD	BACKDRAFT DAMPER	MCA	MINIMUM CURRENT AMPACITY
BHP	BRAKE HORSEPOWER	MIN	MINIMUM
BLDG	BUILDING	MOCP	MAXIMUM OVERCURRENT PROTECTION
BMS	BUILDING MANAGEMENT SYSTEM	MSS	MANUFACTURERS STANDARDIZATION SOCIETY
BTU	BRITISH THERMAL UNITS	MVD	MANUAL VOLUME DAMPER
CFM	CUBIC FEET PER MINUTE	N	NORTH
CH	CHILLER	N/A	NOT APPLICABLE, NONE ASSOCIATED, NONE AVAILABLE
CHWR	CHILLED WATER RETURN		
CHWS	CHILLED WATER SUPPLY	NC	NOISE CRITERIA, NORMALLY CLOSED
CRAC	COMPUTER ROOM AIR CONDITIONER	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
CT	COMPRESSION TANK	NIC	NOT IN CONTRACT
CU	CONDENSING UNIT	NO	NUMBER, NORMALLY OPEN
CWR	CONDENSER WATER RETURN	NTS	NOT TO SCALE
CWS	CONDENSER WATER SUPPLY	OA	OUTDOOR AIR
CxA	COMMISSIONING AGENT	OAT	OUTDOOR AIR TEMPERATURE
D	DEPTH	OD	OUTER DIAMETER
dB	DECIBEL	OZ	OUNCE
DB	DRY BULB	P	PUMP
DC	DIRECT CURRENT	PH	PHASE
DDC	DIRECT DIGITAL CONTROL	PPM	PARTS PER MILLION
DEG F	DEGREE FAHRENHEIT	PRESS	PRESSURE
DIA	DIAMETER	PRV	PRESS RELIEF VALVE, PRESS REGULATING VALVE
DOAS	DEDICATED OUTDOOR AIR SYSTEM	PSI	POUNDS PER SQUARE INCH
EA	EXHAUST AIR, EACH	PSI-A	POUNDS PER SQUARE INCH - ABSOLUTE
EAT	ENTERING AIR TEMPERATURE	PSI-G	POUNDS PER SQUARE INCH - GAUGE
ECM	ELECTRICALLY COMMUTATED MOTOR	PVC	POLYVINYL CHLORIDE
EDH	ELECTRIC DUCT HEATER	QTY	QUANTITY
EFF	EFFICIENCY	RA	RETURN AIR
EER	ENERGY EFFICIENCY RATIO	RH	RELATIVE HUMIDITY
EF	EXHAUST FAN	RLA	RUNNING LOAD AMPS
ESP	EXTERNAL STATIC PRESSURE	RM	ROOM
ETC	ET CETERA	RPM	REVOLUTIONS PER MINUTE
EWT	ENTERING WATER TEMPERATURE	RPZ	REDUCED PRESSURE ZONE
FA	FIRE ALARM	RTU	ROOFTOP UNIT
FBC	FLORIDA BUILDING CODE	SA	SUPPLY AIR
FBC-M	FLORIDA BUILDING CODE - MECHANICAL	SD	SMOKE DETECTOR
FCU	FAN COIL UNIT	SEER	SEASONAL ENERGY EFFICIENCY RATIO
FD	FIRE DAMPER, FLOOR DRAIN	SF	SQUARE FEET
FLA	FULL LOAD AMPS	SC	SHADING COEFFICIENT
FPM	FEET PER MINUTE	SHGC	SOLAR HEAT GAIN COEFFICIENT
FPS	FEET PER SECOND	SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
FRP	FIBERGLASS REINFORCED PLASTIC		
FT	FEET	SP	STATIC PRESSURE
FT-H2O	FEET OF WATER	STD	STANDARD
GA	GAGE	T	THERMOSTAT
GAL	GALLON	TSP	TOTAL STATIC PRESSURE
GPD	GALLONS PER DAY	TYP	TYPICAL
GPH	GALLONS PER HOUR	UH	UNIT HEATER
GPM	GALLONS PER MINUTE	UL	UNDERWRITERS LABORATORIES
H	HEIGHT	UNO	UNLESS NOTED OTHERWISE
HB	HOSE BIBB	V	VOLTAGE
HD	HUB DRAIN	VA	VOLT AMPERE
H-O-A	HAND-OFF-AUTOMATIC	VAV	VARIABLE AIR VOLUME
HP	HORSEPOWER	VFD	VARIABLE FREQUENCY DRIVE
HR	HOUR	W	WATT, WIDTH
HVAC	HEATING, VENTILATING, AND AIR CONDITIONING	WB	WET BULB
HX	HEAT EXCHANGER	WWF	WELDED WIRE FABRIC
HZ	HERTZ	YR	YEAR

HVAC DESIGN DATA

LOCATION	DELAND, FLORIDA				
CLIMATE ZONE	2A				
OUTDOOR AIR DESIGN CONDITIONS	SUMMER		WINTER	BUILDING CONSTRUCTION	
	DB (DEG F)	WB (DEG F)	DB (DEG F)	WALL R-VALUE	0.08
				ROOF R-VALUE	0.08
	95	78	37	FLOOR R-VALUE	0.15
INDOOR AIR DESIGN CONDITIONS	SUMMER		WINTER	WINDOW GLAZING	DOUBLE
	DB (DEG F)	RELATIVE HUMIDITY	DB (DEG F)	WINDOW SHGC	0.5
				WINDOW SHGC	0.55
ALL UNITS	75	50%	72		

NOTES
THIS IS AN EXISTING BUILDING AND THE VALUES LISTED ARE ESTIMATES BASED ON THE EXISTING BUILDING PLAN SETS AND HAVE NOT BEEN FIELD VERIFIED.

ABBREVIATIONS
cⓒ = CONTINUOUS INSULATION
LS = LINEAR SYSTEM

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
GENERAL	
CS-A / 100 CFM OR SS/12X8 / 100 CFM	AIR DEVICE TAG — MARK - TYPE OR (INxIN) / AIRFLOW (CFM)
UC / 100	UNDER CUT DOOR AIR FLOW AMOUNT (CFM)
1 OR B	REFERENCE NOTE
X / X-X	DETAIL NUMBER / SHEET DETAIL APPEARS
X / X	TYPE OF EQUIPMENT / EQUIPMENT NUMBER
X / X-X	SECTION NUMBER / SHEET SECTION APPEARS
	POINT OF DISCONNECTION
	POINT OF CONNECTION
HVAC	
24x12	RECTANGULAR DUCT, FIRST FIGURE IS DIMENSION OF SIDE SHOWN (IN INCHES)
	FLAT OVAL DUCT, FIRST FIGURE IS DIMENSION OF SIDE SHOWN (IN INCHES)
	ROUND DUCT, DIAMETER SHOWN (IN INCHES)
	SUPPLY DUCT RISER
	RETURN DUCT RISER
	EXHAUST DUCT RISER
	SUPPLY DUCT DOWN
	RETURN DUCT DOWN
	EXHAUST DUCT DOWN
	DUCT CONTINUES
MVD	MANUAL VOLUME DAMPER
BDD	BACKDRAFT DAMPER
M	MOTORIZED DAMPER
FD	FIRE DAMPER (HORIZONTAL)
FD	FIRE DAMPER (VERTICAL)
SD	SMOKE DAMPER (HORIZONTAL)
SD	SMOKE DAMPER (VERTICAL)
F/SD	COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL)
F/SD	COMBINATION FIRE/SMOKE DAMPER (VERTICAL)
	DUCT-MOUNTED SMOKE DETECTOR
	DUCT ACCESS DOOR - TOP
	DUCT ACCESS DOOR - BOTTOM
	DUCT ACCESS DOOR - SIDE
DROP / RISE	DUCT RISE OR DROP IN DIRECTION OF FLOW
	SQUARE TO ROUND DUCT TRANSITION
	TERMINAL UNIT
	CROSS HATCHED AREA = MINIMUM CLEARANCE FOR HEATER ACCESS. MAINTAIN CLEARANCE
	SINGLE LINE DUCTWORK
	BELL MOUTH TAP W/MVD
	MVD HAS REMOTE CONTROL IN RIGID CEILING
	FLEXIBLE DUCT
	SUPPLY OUTLET (SEE AIR DEVICE SCHEDULE)
	RETURN INLET (SEE AIR DEVICE SCHEDULE)
	EXHAUST INLET (SEE AIR DEVICE SCHEDULE)
	LINEAR DIFFUSER
	ELBOW W/TURNING VANES
	ROTATING BEACON LIGHT
CO	CARBON MONOXIDE SENSOR
CO2	CARBON DIOXIDE SENSOR
NO2	NITROGEN OXIDE SENSOR
SD	SMOKE DETECTOR A/V ANNUNCIATOR
H	HUMIDISTAT
R	REFRIGERANT SENSOR
SD	DUCT SMOKE DETECTOR
T	THERMOSTAT
TS	TEMPERATURE SENSOR

SYMBOL	DESCRIPTION
PIPING	
	PIPE CONTINUATION
	PIPE ELBOW DOWN
	PIPE ELBOW UP
	BLIND FLANGE
	CAPPED LINE
	HOSE END CONNECTION
	DIRECTION OF FLOW IN PIPE
	PIPE TEE DOWN
	PIPE TEE UP
	UNION
	BALL VALVE
	BUTTERFLY VALVE (MANUAL)
	BUTTERFLY VALVE (MOTORIZED)
	GATE VALVE
	OS&Y GATE VALVE
	GLOBE VALVE
	TRIPLE DUTY VALVE
	PLUG VALVE
	2-WAY DDC CONTROL VALVE
	3-WAY DDC CONTROL VALVE
	SOLENOID CONTROL VALVE
	BALANCING VALVE
	BALANCING VALVE WITH PRESSURE TAPS
	PRESSURE REDUCING VALVE
	PRESSURE RELIEF VALVE
	FLOW BALANCING VALVE
	MANUAL AIR RELIEF VENT
	AUTOMATIC AIR RELIEF VENT
	FLEXIBLE CONNECTION
	CHECK VALVE
	Y-STRAINER
	PRESSURE/TEMPERATURE TEST PORT
	PRESSURE GAUGE
	THERMOMETER
	FLOW METER
	PUMP
	BASKET STRAINER W/ CLAMPED COVER
	SUCTION DIFFUSER

NOTES:
1. THIS IS A GENERAL COMPILATION OF SYMBOLS AND NOT ALL SYMBOLS SHOWN MAY BE USED ON THE CONTRACT DRAWINGS.
2. SCREENED SYMBOLS OR TEXT (EXAMPLE) INDICATE EXISTING EQUIPMENT OR CONDITIONS.
3. SCREENED AND DASHED AND LINES INDICATE LINES HIDDEN IN VIEW.

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ARCHITECTURE
931 S. SEMORAN BLVD. #0948 WINTER PARK, FL 32792
321-972-8446 ARIZONA LICENSE NO. 74110

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Kyle J Cartier
Digitally signed by Kyle J Cartier
Date: 2022.08.31 17:27:54-04'00'

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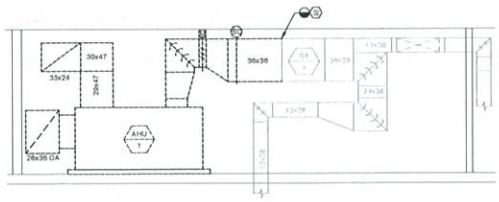
1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
LEGEND AND NOTES - MECHANICAL

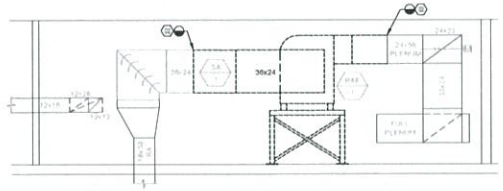
DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

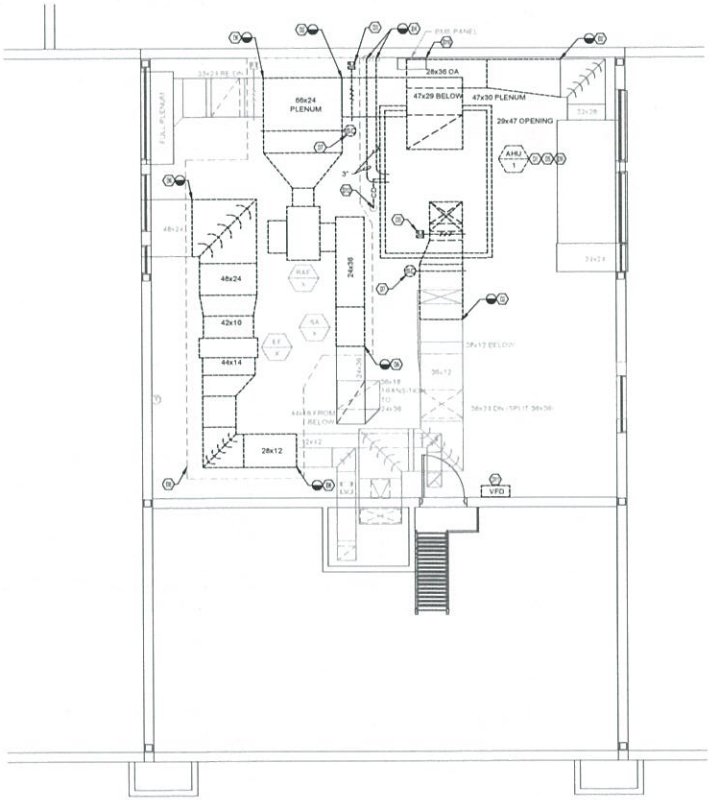
SHEET NO: M0.001



3 M0.010 DEMOLITION ELEVATION PLAN - BUILDING A - MECHANICAL
1/4"=1'-0"



2 M0.010 DEMOLITION ELEVATION PLAN - BUILDING A - MECHANICAL
1/4"=1'-0"



1 M0.010 DEMOLITION FLOOR PLAN - BUILDING A - MECHANICAL
1/4"=1'-0"

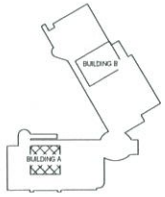
GENERAL NOTES

1. PRIOR TO THE START OF CONSTRUCTION, PERFORM A TEST AND BALANCE OF THE EXISTING AIR HANDLING UNIT AT FULL FLOW. MEASURE AND RECORD ENTERING AND LEAVING DRY BULB AND WET BULB AIR TEMPERATURES, ENTERING AND LEAVING CHILLED WATER TEMPERATURES, TOTAL SUPPLY AIRFLOW, TOTAL RETURN AIRFLOW, AND TOTAL OUTSIDE AIRFLOW. SUBMIT REPORT FOR REVIEW AND RECORD.
2. CONTRACTOR SHALL FIELD VERIFY ACCESS AND CLEARANCE FOR NEW EQUIPMENT PRIOR TO DEMOLITION OF EXISTING. EXTENT OF DEMOLITION SHALL INCREASE TO ALLOW FOR APPROPRIATE DUCT TRANSITIONS.
3. PROTECT ALL FINISHES PRIOR TO START OF CONSTRUCTION.
4. THE CONTRACTOR SHALL COORDINATE THE REMOVAL AND REPLACEMENT OF ALL COMPONENTS REQUIRED TO ACCOMPLISH THIS WORK.
5. INSPECT ALL EXISTING TO REMAIN DAMPERS IN OUTSIDE AIR AND/OR RETURN AIR DUCTWORK AND VERIFY DAMPERS ARE FULLY OPERATIONAL. REPORT ANY OPERATIONAL CONCERNS TO THE ARCHITECT FOR DIRECTION ON CORRECTIVE ACTION.

REFERENCE NOTES - DEMOLTION

- 01 REMOVE EXISTING AIR HANDLING UNIT AND ASSOCIATED CONCRETE HOUSEKEEPING PAD.
- 02 REMOVE SECTION OF DUCTWORK BACK TO POINT OF DISCONNECTION TO FACILITATE AIR HANDLING UNIT REMOVAL.
- 03 REMOVE EXISTING MOTORIZED DAMPER.
- 04 REMOVE SECTION OF PIPING BACK TO POINT OF DISCONNECTION AT THE FLOOR. REMOVE ALL PIPING APPURTENANCES INCLUDING UNIT ISOLATION VALVES AND CONTROL VALVE AND REPLACE WITH NEW.
- 05 REMOVE EXISTING BI-POLAR IONIZATION GENERATOR FROM AIR HANDLING UNIT TO BE DEMOLISHED AND RETAIN FOR REINSTALLATION.
- 06 REMOVE DUCTWORK, DAMPERS, AND EQUIPMENT BACK TO POINT OF DISCONNECTION. RETAIN DUCTWORK AND DAMPERS FOR REINSTALLATION.
- 07 REMOVE EXISTING SMOKE DETECTOR.
- 08 IT IS ANTICIPATED THE EQUIPMENT AND DUCTWORK LOCATED IN BOXED AREA WILL NEED TO BE TEMPORARILY REMOVED TO FACILITATE THE REMOVAL OF THE EXISTING AND INSTALLATION OF THE NEW CHILLED WATER AIR HANDLING UNIT. DESIGN INTENT IS TO DISCONNECT AND SAVE EXISTING EQUIPMENT AND DUCTWORK AND REINSTALL THE SAME ONCE THE CHILLED WATER AIR HANDLING UNIT IS REPLACED. THE CONTRACTOR MAY NOT NEED TO REMOVE ALL EQUIPMENT AND DUCTWORK SHOWN IF HE CAN DETERMINE A MORE EFFECTIVE ROUTE WITHIN THE ROOM TO REMOVE THE EQUIPMENT, BUT SHOULD INCLUDE IN HIS BID THE COSTS TO REMOVE ALL EQUIPMENT AND DUCTWORK INDICATED TO FACILITATE AND PERMIT INSTALLATION.
- 09 REMOVE AND REPLACE ALL ASSOCIATED BMS CONTROL END DEVICES ASSOCIATED WITH AIR HANDLING UNIT AHU-1. THIS SHALL INCLUDE END DEVICES NOT ONLY ON THE AIR SIDE BUT THE CHILLED WATER SIDE AS WELL. PROVIDE NEW END DEVICES AND NEW WIRING FROM END DEVICES TO EXISTING BMS PANEL. REFER TO NEW FLOOR PLAN AND CONTROLS SHEET M5.102 FOR ADDITIONAL REQUIREMENTS.
- 10 APPROXIMATE LOCATION OF EXISTING BMS PANEL.
- 11 REMOVE EXISTING AIR HANDLING UNIT AHU-1 VFD AND REPLACE WITH NEW.
- 12 REMOVE CONDENSATE PIPING FROM UNIT TO HUB DRAIN. RETAIN HUB DRAIN AND PROTECT FROM DAMAGE.

GRAPHIC SCALE
0 1 2 4



KEY PLAN

HOUSEMAN
ARCHITECTURE
931 S. SEMORAN BLVD. #604B WINTER PARK, FL 32792
321-972-6446 ARIZONA LICENSE NO. 74118

ALL IDEAS, DESIGNS, AND DETAILS REPRESENTED BY THIS DRAWING ARE OWNED BY AND THE PROPERTY OF HOUSEMAN ARCHITECTURE, LLC. AND WERE CREATED, EVALUVED, AND DEVELOPED FOR USE ON AND IN CONNECTION WITH THE SPECIFIED PROJECT. NONE OF THE IDEAS, DESIGNS, OR DETAILS SHALL BE USED BY OR DISCLOSED TO ANYONE FOR ANY PURPOSE WHATSOEVER WITHOUT THE WRITTEN PERMISSION OF HOUSEMAN ARCHITECTURE, LLC.

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

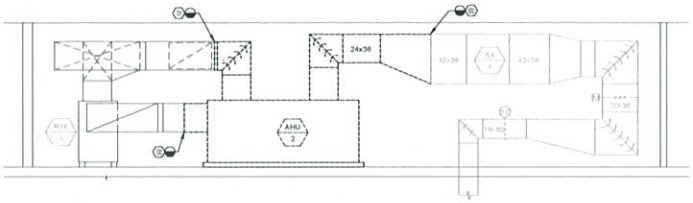
1155 Ce Rd 4139, DeLand, FL 32724

SHEET NAME:
DEMOLITION FLOOR PLAN - BUILDING A - MECHANICAL

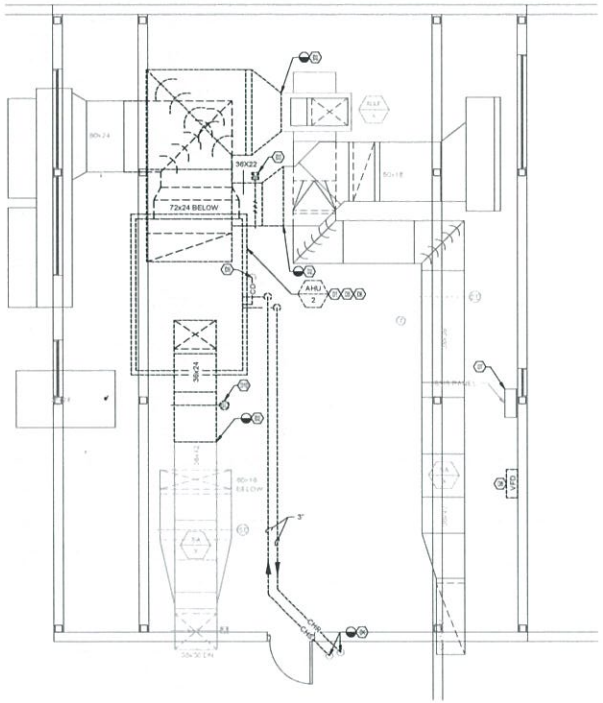
DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

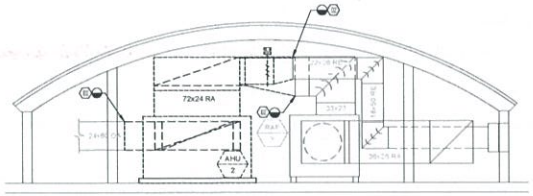
SHEET NO: M0.010



2 M0.011 DEMOLITION ELEVATION PLAN - BUILDING B - MECHANICAL 1/4"=1'-0"



1 M0.011 DEMOLITION FLOOR PLAN - BUILDING B - MECHANICAL 1/4"=1'-0"



3 M0.011 DEMOLITION ELEVATION PLAN - BUILDING B - MECHANICAL 1/4"=1'-0"

GRAPHIC SCALE

0 1 2 4

KEY PLAN

GENERAL NOTES

1. PRIOR TO THE START OF CONSTRUCTION, PERFORM A TEST AND BALANCE OF THE EXISTING AIR HANDLING UNIT AT FULL FLOW. MEASURE AND RECORD ENTERING AND LEAVING DRY BULB AND WET BULB AIR TEMPERATURES, ENTERING AND LEAVING CHILLED WATER TEMPERATURES, TOTAL SUPPLY AIRFLOW, TOTAL RETURN AIRFLOW, AND TOTAL OUTSIDE AIRFLOW. SUBMIT REPORT FOR REVIEW AND RECORD.
2. CONTRACTOR SHALL FIELD VERIFY ACCESS AND CLEARANCE FOR NEW EQUIPMENT PRIOR TO DEMOLITION OF EXISTING. EXTENT OF DEMOLITION SHALL INCREASE TO ALLOW FOR APPROPRIATE DUCT TRANSITIONS.
3. PROTECT ALL FINISHES PRIOR TO START OF CONSTRUCTION.
4. THE CONTRACTOR SHALL COORDINATE THE REMOVAL AND REPLACEMENT OF ALL COMPONENTS REQUIRED TO ACCOMPLISH THIS WORK.
5. INSPECT ALL EXISTING TO REMAIN DAMPERS IN OUTSIDE AIR AND/OR RETURN AIR DUCTWORK AND VERIFY DAMPERS ARE FULLY OPERATIONAL. REPORT ANY OPERATIONAL CONCERNS TO THE ARCHITECT FOR DIRECTION ON CORRECTIVE ACTION.

REFERENCE NOTES - DEMOLTION

- (D1) REMOVE EXISTING AIR HANDLING UNIT AND ASSOCIATED CONCRETE HOUSEKEEPING PAD.
- (D2) REMOVE SECTION OF DUCTWORK BACK TO POINT OF DISCONNECTION TO FACILITATE AIR HANDLING UNIT REMOVAL.
- (D3) REMOVE EXISTING MOTORIZED DAMPER.
- (D4) REMOVE SECTION OF PIPING BACK TO POINT OF DISCONNECTION AT THE FLOOR. REMOVE ALL PIPING APPURTENANCES INCLUDING UNIT ISOLATION VALVES AND CONTROL VALVE AND REPLACE WITH NEW.
- (D5) REMOVE EXISTING BI-POLAR IONIZATION GENERATOR FROM AIR HANDLING UNIT TO BE DEMOLISHED AND RETAIN FOR REINSTALLATION.
- (D6) REMOVE AND REPLACE ALL ASSOCIATED BMS CONTROL END DEVICES ASSOCIATED WITH AIR HANDLING UNIT AHU-2. THIS SHALL INCLUDE END DEVICES NOT ONLY ON THE AIR SIDE BUT THE CHILLED WATER SIDE AS WELL. PROVIDE NEW END DEVICES AND NEW WIRING FROM END DEVICES TO EXISTING BMS PANEL. REFER TO NEW FLOOR PLAN AND CONTROLS SHEET M5.102 FOR ADDITIONAL INFORMATION.
- (D7) APPROXIMATE LOCATION OF EXISTING BMS PANEL.
- (D8) REMOVE EXISTING AIR HANDLING UNIT AHU-2 VFD AND REPLACE WITH NEW.
- (D9) REMOVE CONDENSATE PIPING FROM UNIT TO HUB DRAIN. RETAIN HUB DRAIN AND PROTECT FROM DAMAGE.
- (D10) REMOVE EXISTING SMOKE DETECTOR.

HOUSEMAN
ARCHITECTURE
931 S. SEMORAN BLVD. #604B WINTER PARK, FL 32792
321-972-8446 ARIZONA LICENSE NO. 74110

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Kyle J Cartier

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22-807

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

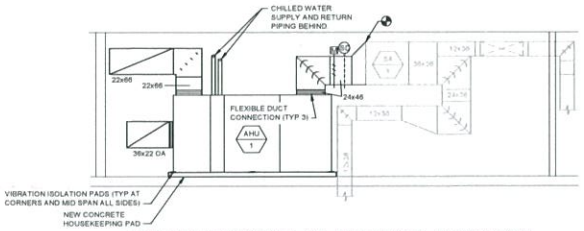
1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
DEMOLITION FLOOR PLAN - BUILDING B - MECHANICAL

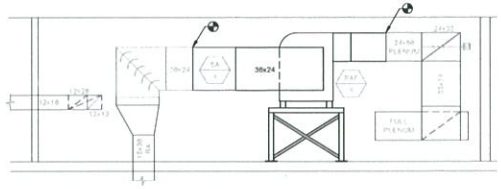
DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

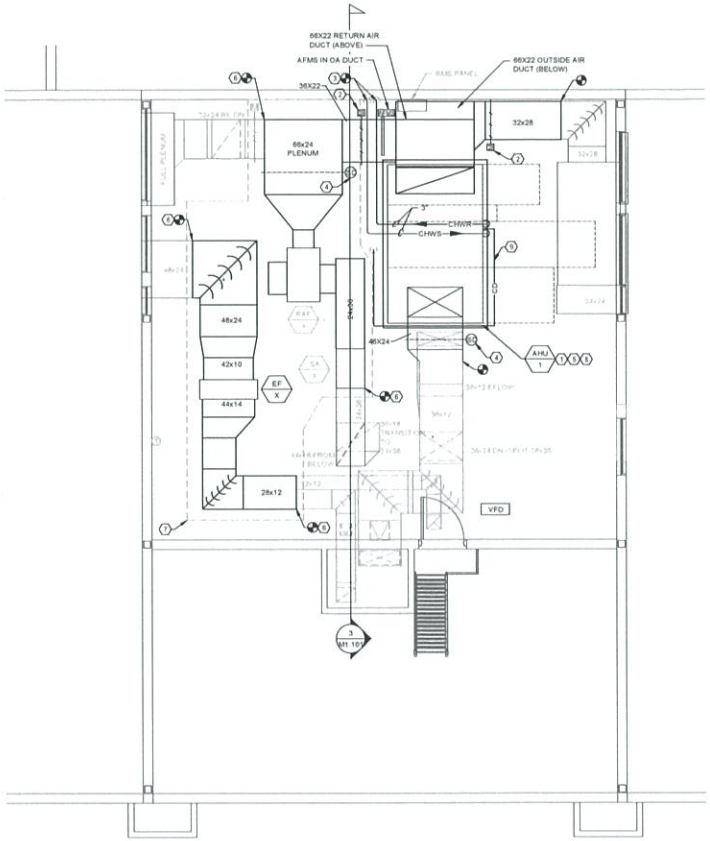
SHEET NO: M0.011



3 M1.101 NEW ELEVATION PLAN - BUILDING A - MECHANICAL
1/4"=1'-0"



2 M1.101 NEW ELEVATION PLAN - BUILDING A - MECHANICAL
1/4"=1'-0"



1 M1.101 NEW FLOOR PLAN - BUILDING A - MECHANICAL
1/4"=1'-0"

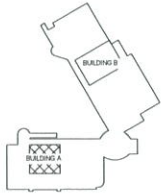
GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR PROVIDING MANUFACTURER'S PUBLISHED CLEARANCE REQUIREMENTS FOR ACCESS AND MAINTENANCE OF THE NEW UNIT. MODIFY DUCTWORK, CONDUITS, AND PIPING AS REQUIRED TO OBTAIN THE REQUIRED CLEARANCE.
2. REPAIR ANY DAMAGED AND/OR DISTURBED DUCTWORK INSULATION AS NECESSARY.

REFERENCE NOTES - NEW

1. NEW CHILLED WATER AIR HANDLING UNIT. INSTALL UNIT ON NEW CONCRETE HOUSEKEEPING PAD. CONNECT NEW DUCTWORK TO NEW AIR HANDLING UNIT. PROVIDE DUCT TRANSITIONS FROM FULL SIZE OF UNIT AS NECESSARY.
2. PROVIDE NEW MOTORIZED DAMPER IN DUCTWORK.
3. NEW CHILLED WATER PIPING. CONNECT TO EXISTING CHILLED WATER SYSTEM. PROVIDE NEW CHILLED WATER ISOLATION VALVES (CHWS / CHWR). CONTROL VALVE AND PIPING AND COIL APPURTENANCES. REFER TO SHEET M5.101 FOR CHILLED WATER COIL DETAILS.
4. PROVIDE NEW SMOKE DETECTOR IN SUPPLY AIR DUCTWORK. CONNECT TO EXISTING FIRE ALARM SYSTEM.
5. INSTALL EXISTING BI-POLAR IONIZATION GENERATOR IN NEW AIR HANDLING UNIT. RECONNECT POWER. PROVIDE FUNCTIONAL TEST AND MAKE FULLY OPERATIONAL.
6. REINSTALL EXISTING DUCTWORK, DAMPERS, AND EQUIPMENT.
7. AFTER NEW CHILLED WATER AIR HANDLING UNIT INSTALLATION, RE-INSTALL EQUIPMENT AND DUCTWORK IN THIS GENERAL AREA BACK TO ORIGINAL CONDITION. THE DESIGN INTENT IS TO REUSE AS MUCH OF THE EXISTING DUCTWORK AS POSSIBLE AND TO REINSTALL ALL EQUIPMENT TO EXISTING CONDITIONS. PROVIDE CHECK OUT OF ALL REMOVED EQUIPMENT TO ENSURE EQUIPMENT IS FULLY FUNCTIONAL AND OPERATIONAL. PROVIDE GALVANIZED STEEL SPOOL PIECES TO RECONNECT DUCTWORK AS NEEDED AND PROVIDE NEW INSULATION OF THICKNESS AND TYPE MATCHING EXISTING. REPAIR ALL INSULATION TEARS OR DAMAGE WITH NEW INSULATION OF THICKNESS AND TYPE MATCHING EXISTING.
8. PROVIDE NEW CONTROLS END DEVICES FOR BOTH THE AIR AND WATER SYSTEMS ASSOCIATED WITH AIR HANDLING UNIT AHU-1. REFER TO SHEET M5.102 FOR CONTROL POINTS. ROUTE ALL CONTROLS IN RIGID GALVANIZED STEEL CONDUITS FROM END DEVICE TO EXISTING BMS CONTROL PANEL.
9. ROUTE NEW 1-1/4" DIAMETER CONDENSATE PIPING TO EXISTING HUB DRAIN AND TERMINATE INDIRECTLY. MAINTAIN PIPE SLOPE FOR POSITIVE DRAINAGE.

GRAPHIC SCALE
0 1 2 4



KEY PLAN

HOUSEMAN
ARCHITECTURE
931 S. SEMORAN BLVD. #0948 WINTER PARK, FL 32792
321-972-8446 ARIZONA LICENSE NO 74110

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

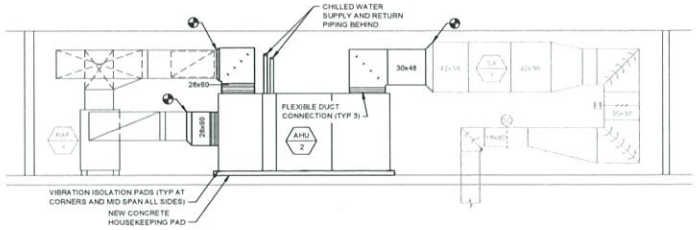
1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
NEW FLOOR PLAN - BUILDING A - MECHANICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

SHEET NO: M1.101



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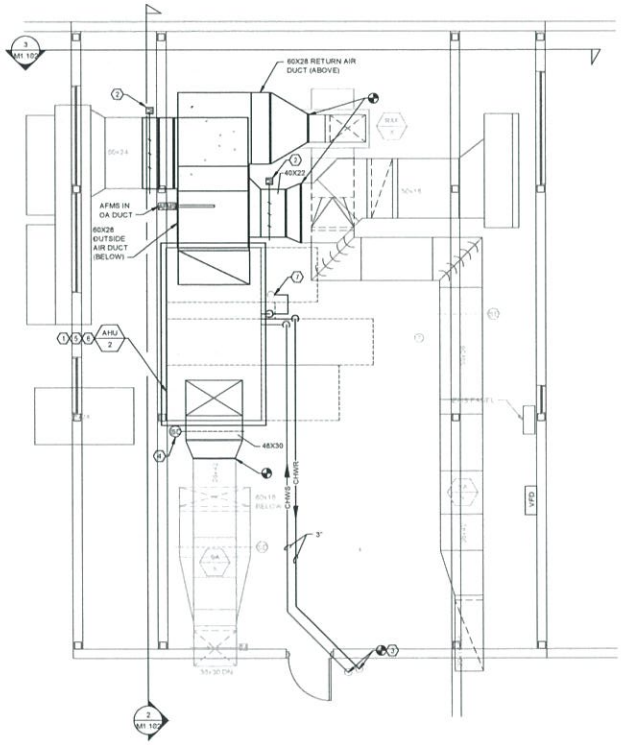
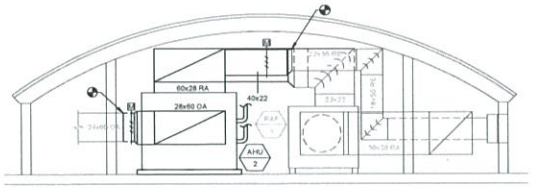


1 M1.102 NEW FLOOR PLAN - BUILDING B - MECHANICAL 1/4"=1'-0"



3 M1.102 NEW ELEVATION PLAN - BUILDING B - MECHANICAL 1/4"=1'-0"

GRAPHIC SCALE

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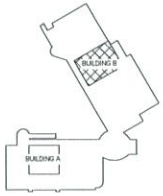

KEY PLAN

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR PROVIDING MANUFACTURER'S PUBLISHED CLEARANCE REQUIREMENTS FOR ACCESS AND MAINTENANCE OF THE NEW UNIT. MODIFY DUCTWORK, CONDUITS, AND PIPING AS REQUIRED TO OBTAIN THE REQUIRED CLEARANCE
2. REPAIR ANY DAMAGED AND/OR DISTURBED DUCTWORK INSULATION AS NECESSARY

REFERENCE NOTES - NEW

1. NEW CHILLED WATER AIR HANDLING UNIT. INSTALL UNIT ON NEW CONCRETE HOUSEKEEPING PAD. CONNECT NEW DUCTWORK TO NEW AIR HANDLING UNIT. PROVIDE DUCT TRANSITIONS FROM FULL SIZE OF UNIT AS NECESSARY
2. PROVIDE NEW MOTORIZED DAMPER IN DUCTWORK
3. NEW CHILLED WATER PIPING. CONNECT TO EXISTING CHILLED WATER SYSTEM. PROVIDE NEW CHILLED WATER ISOLATION VALVES (CHWS / CHWR). CONTROL VALVE AND PIPING AND COIL APPURTENANCES. REFER TO SHEET M5.101 FOR CHILLED WATER COIL DETAILS
4. PROVIDE NEW SMOKE DETECTOR IN SUPPLY AIR DUCTWORK. CONNECT TO EXISTING FIRE ALARM SYSTEM
5. INSTALL EXISTING BI-POLAR IONIZATION GENERATOR IN NEW AIR HANDLING UNIT. RECONNECT POWER. PROVIDE FUNCTIONAL TEST AND MAKE FULLY OPERATIONAL
6. PROVIDE NEW CONTROLS END DEVICES FOR BOTH THE AIR AND WATER SYSTEMS ASSOCIATED WITH AIR HANDLING UNIT AHU-2. REFER TO SHEET M5.102 FOR CONTROL POINTS. ROUTE ALL CONTROLS IN RIGID GALVANIZED STEEL CONDUITS FROM END DEVICE TO EXISTING BMS CONTROL PANEL
7. ROUTE NEW 1-1/4" DIAMETER CONDENSATE PIPING TO EXISTING HUB DRAIN AND TERMINATE INDIRECTLY. MAINTAIN PIPE SLOPE FOR POSITIVE DRAINAGE

HOUSEMAN
ARCHITECTURE
931 S. SEMORAN BLVD. #0948 WINTER PARK, FL 32792
321.972.8446 ARIZONA LICENSE NO. 74110

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Kyle J Cartier Digitally signed by Kyle J Cartier Date: 2022.08.31 17:28:58-04'00'

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

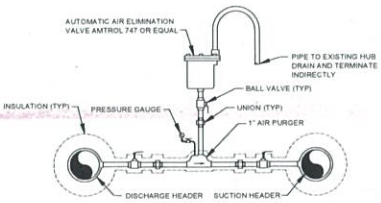
1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
NEW FLOOR PLAN - BUILDING B - MECHANICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

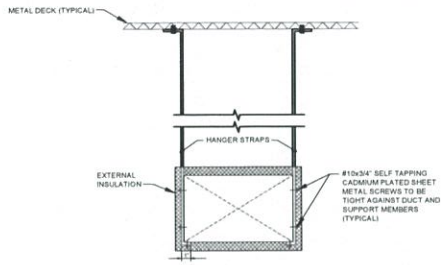
PROJECT NO: 22-807

SHEET NO: M1.102



1 / M5.101 CHILLED WATER AUTOMATIC AIR ELIMINATOR

NOT TO SCALE



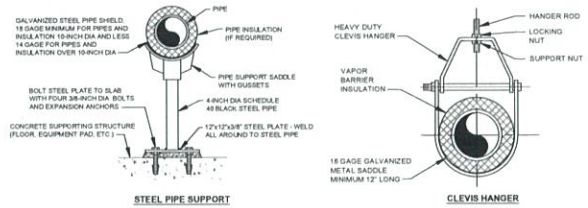
DUCT WITH STRAP HANGERS

HANGER SIZES FOR RECTANGULAR DUCT			
MAXIMUM SIDE	HANGER	HORIZONTAL SUPPORT MEMBER	MAXIMUM SPACING
30"	1" x 18 GAGE STRAP	NONE REQUIRED	10'-0"
36"	1/4" ALL-THREAD ROD	1-1/2" x 1-1/2" x 1/8"	8'-0"
48"	1/4" ALL-THREAD ROD	2" x 2" x 1/8"	8'-0"
60"	5/16" ALL-THREAD ROD	2" x 2" x 1/8"	8'-0"
84"	3/8" ALL-THREAD ROD	2" x 2" x 1/8"	8'-0"

NOTES
1. NO POP RIVETS ALLOWED
2. DUCTS SHALL BE INSULATED AS REQUIRED BY THE SPECIFICATIONS.

6 / M5.101 METAL DUCT HUNG FROM JOISTS

NOT TO SCALE



STEEL PIPE SUPPORT

CLEVIS HANGER

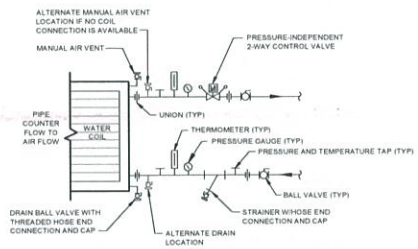
NOTES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND LOCATION OF ALL PIPING AND EQUIPMENT SUPPORTS AS REQUIRED TO PROVIDE A RIGID AND VIBRATION-FREE INSTALLATION. THE SUPPORTS AND HANGERS SHOWN ON THE CONTRACT DRAWINGS ARE FOR GENERAL GUIDANCE AS TO TYPE AND LOCATION.

IN GENERAL, THE FOLLOWING SHALL APPLY:

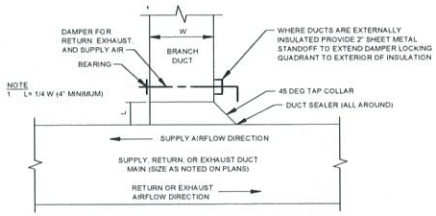
3 / M5.101 PIPE SUPPORT - DETAILS

NOT TO SCALE



7 / M5.101 AHU - WATER COIL WITH 2-WAY CONTROL VALVE

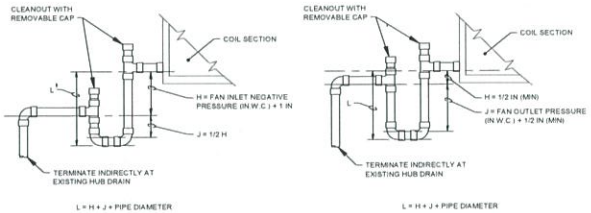
NOT TO SCALE



NOTE
1. L= 1/4 W (4" MINIMUM)

5 / M5.101 TYPICAL DUCT BRANCH CONNECTION

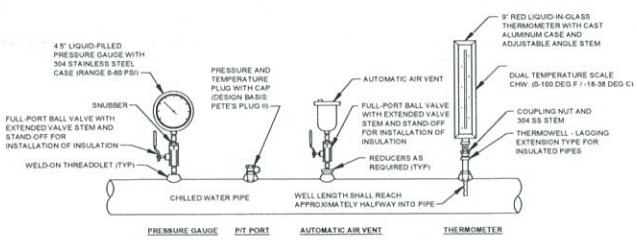
NOT TO SCALE



NOTE
1. FILL TRAP MANUALLY ON INITIAL START-UP

2 / M5.101 CONDENSATE - DRAIN P-TRAP DETAIL

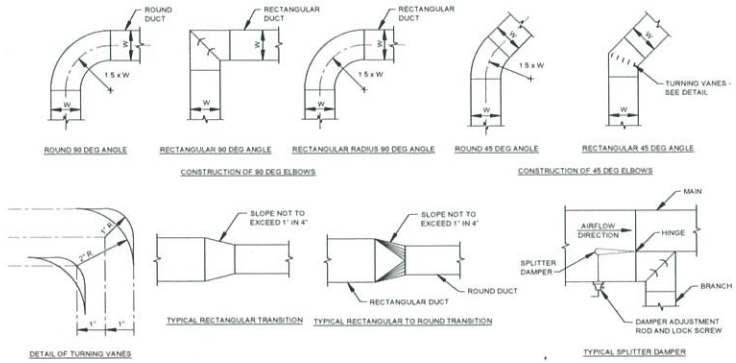
NOT TO SCALE



NOTES
1. ALL CHILLED WATER PIPE SHALL BE INSULATED AND JACKETED. INSULATION IS NOT SHOWN FOR CLARITY. PROVIDE EXTENDED NECK VALVE STEMS AND EXTENDED FITTINGS FOR INSULATED PIPES.
2. ALL GAUGES SHALL BE MOUNTED IN THE VERTICAL POSITION. PROVIDE ELBOWS FOR PRESSURE GAUGES LOCATED IN VERTICAL PIPES AND ROTATE THERMOMETER STEMS AS REQUIRED SO THAT ALL GAUGES AND THERMOMETERS ARE INSTALLED VERTICALLY REGARDLESS OF THE ORIENTATION OF THE CHILLED WATER PIPE.

4 / M5.101 TYPICAL PIPE ACCESSORY INSTALLATIONS

NOT TO SCALE



1 / M5.101 TYPICAL DUCTWORK INSTALLATION DETAILS

NOT TO SCALE

HOUSEMAN ARCHITECTURE
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Kyle J Cartier

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:

DETAILS - MECHANICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

SHEET NO: M5.101

GENERAL NOTE

ALL CONTROLS SHALL BE MANUFACTURED BY JOHNSON CONTROLS, INC. (JCI) AND SHALL BE FULLY COMPATIBLE WITH THE EXISTING CAMPUS WIDE JCI METASYS CONTROL SYSTEM. PROVIDE ALL HARDWARE, SOFTWARE, PROGRAMMING AND GRAPHICS UPDATES TO FULLY INCORPORATE ALL OF THE NEW CONTROLS END DEVICES, MONITORING POINTS, ALARMS, AND CONTROL POINTS OF EACH NEW CHILLED WATER AIR HANDLING UNIT INTO THE EXISTING JCI METASYS SYSTEM.

TYPICAL VAV AHU SEQUENCE OF OPERATION

SEQUENCE OF OPERATION - VARIABLE AIR VOLUME AIR HANDLING UNIT WITH AIR TERMINAL UNITS

SUPPLY FANS

THE AHU SUPPLY FAN SHALL BE STARTED AND STOPPED BY THE BUILDING MANAGEMENT SYSTEM (BMS) BASED ON AN OCCUPANCY SCHEDULE. THE FAN START SHALL BE SUBJECT TO SAFETIES SUCH AS FREEZESTATS, SMOKE DETECTORS, OVERLOADS, ETC. SUPPLY FAN SPEED SHALL BE BASED ON DUCT STATIC PRESSURE AND SHALL INCORPORATE THE DUCT STATIC RESET SEQUENCE OF OPERATION.

OCCUPIED MODE

WHEN THE AHU IS IN THE OCCUPIED MODE, ANY EXISTING INTERLOCKED EXHAUST FANS SHALL OPERATE CONTINUOUSLY. THE AHU SUPPLY FAN SPEED SHALL BE MODULATED TO MAINTAIN THE DUCT STATIC PRESSURE AT SET POINT (REFER TO DUCT STATIC PRESSURE RESET SEQUENCE BELOW). THE RETURN AIR AND OUTDOOR AIR DAMPERS SHALL MODULATE TO MAINTAIN THE REQUIRED OUTDOOR AIR FLOW RATE MEASURED BY THE AIRFLOW MONITORING STATION, AND THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE COOLING COIL DISCHARGE AIR TEMPERATURE.

UNOCCUPIED MODE

IN THE UNOCCUPIED MODE THE AHU SUPPLY FAN AND INTERLOCKED EXHAUST FANS SHALL BE OFF. THE CHILLED WATER VALVE SHALL BE CLOSED, AND THE OUTSIDE AIR DAMPER SHALL BE CLOSED.

IF THE "CRITICAL ZONE" TEMPERATURE SENSOR ("CRITICAL ZONE" TEMPERATURE SENSOR TO BE SELECTED BY OWNER'S REPRESENTATIVE) RISES ABOVE THE UNOCCUPIED TEMPERATURE SET POINT, THE AHU SUPPLY FAN SHALL BE STARTED AND MODULATED TO MAINTAIN THE DUCT STATIC PRESSURE SET POINT. THE OUTDOOR AIR DAMPER SHALL REMAIN CLOSED. THE INTERLOCKED EXHAUST FANS SHALL REMAIN OFF, AND THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE COOLING COIL DISCHARGE AIR TEMPERATURE SET POINT. THE TERMINAL UNITS SHALL OPERATE TO ACHIEVE THE UNOCCUPIED ZONE TEMPERATURE SET POINTS AND THE AHU SUPPLY FAN SHALL BE STOPPED WHEN THE "CRITICAL" ROOM TEMPERATURE SET POINT IS ACHIEVED.

IF THE "CRITICAL ZONE" TEMPERATURE SENSOR (CRITICAL ZONE TEMPERATURE SENSOR TO BE SELECTED BY OWNER'S REPRESENTATIVE) FALLS BELOW THE UNOCCUPIED TEMPERATURE SET POINT, THE AHU SUPPLY FAN SHALL BE STARTED AND MODULATED TO MAINTAIN THE DUCT STATIC PRESSURE SET POINT. THE OUTDOOR AIR DAMPER SHALL REMAIN CLOSED. THE INTERLOCKED EXHAUST FANS SHALL REMAIN OFF, AND THE CHILLED WATER VALVE SHALL REMAIN CLOSED. THE TERMINAL UNITS SHALL OPERATE THEIR ELECTRIC HEATERS TO ACHIEVE THE UNOCCUPIED ZONE TEMPERATURE SET POINTS AND THE AHU SUPPLY FAN SHALL BE STOPPED WHEN THE "CRITICAL" ROOM TEMPERATURE SET POINT IS ACHIEVED.

IF THE AVERAGE SPACE HUMIDITY RISES ABOVE 60% (USER ADJUSTABLE) DURING THE UNOCCUPIED PERIOD, THE AHU SUPPLY FAN SHALL BE STARTED AND RAMPED UP TO 100% (60 HZ). THE RETURN AIR DAMPER SHALL OPEN FULLY. THE OUTDOOR AIR DAMPER SHALL REMAIN CLOSED. AND THE CHILLED WATER VALVE SHALL BE MODULATED TO MAINTAIN THE LEAVING COIL TEMPERATURE SET POINT. ONCE THE AVERAGE SPACE HUMIDITY FALLS BELOW 55% THE COOLING COIL SHALL CLOSE AND THE AHU SUPPLY FAN SHALL STOP.

SAFETY SHUTDOWN

FIRE ALARM — THE AHU SUPPLY FAN SHALL STOP UPON ACTIVATION OF THE DUCT MOUNTED SMOKE DETECTOR OR GENERAL FIRE ALARM.

FREEZESTAT — THE AHU CHILLED WATER VALVE SHALL OPEN 25% WHEN THE FREEZESTAT SENSOR INDICATES THE OUTSIDE AIR TEMPERATURE IS 38 DEGREES (ADJUSTABLE) OR LESS TO ENSURE ADEQUATE FLOW THROUGH THE COIL TO PREVENT FREEZING.

DUCT STATIC PRESSURE RESET

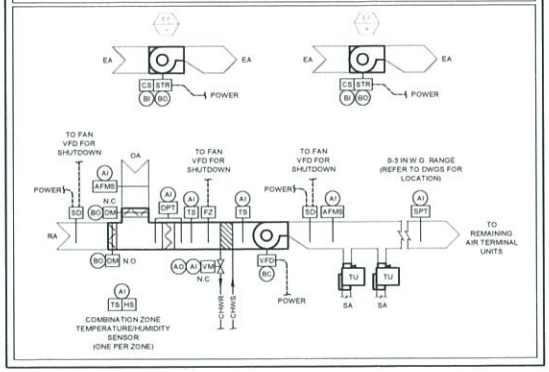
SUPPLY FAN SPEED CONTROL VIA AIR DUCT STATIC PRESSURE CONTROL - OPTIMIZED. THE CONTROLLER SHALL MEASURE DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN AN OPTIMIZED DUCT STATIC PRESSURE SET POINT.

1. THE INITIAL DUCT STATIC PRESSURE SET POINT SHALL BE 0.75 IN-H2O (ADJUSTABLE).
2. EACH AHU CONTROLLER SHALL BE NETWORKED WITH ALL ASSOCIATED VAV TERMINAL UNITS TO OBTAIN AIRFLOW REQUESTS. THE STATIC PRESSURE SET POINT SHALL BE RESET BASED ON ZONE AIRFLOW REQUESTS, DERIVED FROM DAMPER POSITION AND MEETING AIRFLOW AND SPACE TEMPERATURE REQUIREMENTS AS DESCRIBED BELOW.
3. WHEN THERE ARE NO ZONE AIRFLOW REQUESTS, (WHEN ALL ZONE DAMPERS ARE THROTTLING CLOSED - BELOW 95% OPEN AND ACTUAL/SET POINT AIRFLOW RATIO IS GREATER THAN 95%), THE DUCT STATIC PRESSURE SET POINT SHALL BE INCREMENTALLY RESET DOWN BY 0.10 IN-H2O AT A FIXED TIME INTERVAL UNTIL THE VFD SPEED OUTPUT FALLS BELOW 90% OR UNTIL THE VFD HAS REACHED ITS LOWEST OPERATING SPEED LIMIT.
4. AS AIRFLOW REQUESTS INCREASE, WHEN AT LEAST ONE ZONE DAMPER IS GREATER THAN 90% OPEN AND ACTUAL/SET POINT AIRFLOW RATIO IS LESS THAN 90% AND SPACE TEMPERATURE IS NOT SATISFIED, THE REVERSE SHALL OCCUR AND THE DUCT STATIC PRESSURE SET POINT SHALL INCREMENTALLY RESET UP BY 0.10 IN-H2O AT A FIXED TIME INTERVAL UNTIL THE VFD SPEED OUTPUT RISES ABOVE 90% OR UNTIL THE VFD HAS REACHED ITS HIGHEST OPERATING SPEED LIMIT.
5. THE SUPPLY FAN VFD MINIMUM SPEED SETTING WITHIN THE VFD ITSELF SHALL BE OPTIMIZED IN THE FIELD DURING SYSTEM BALANCING AND COMMISSIONING TO BE AS LOW AS POSSIBLE WHILE AVOIDING INERTIAL STALLING OF FAN, APPROXIMATELY 5% ABOVE THE FIELD OBSERVED STALL SPEED OF THE FAN OPERATING IN THE SYSTEM.
6. AN AIRFLOW MEASURING STATION SHALL CONTINUOUSLY MONITOR THE TOTAL SUPPLY AIR FAN VOLUME IN CFM AND SEND OUTPUT TO THE BAS.

SET POINTS (USER ADJUSTABLE)

AHU DISCHARGE AIR TEMPERATURE	55 DEG F
DUCT STATIC PRESSURE SET POINT	TBD DURING TAB
OCCUPIED SPACE COOLING TEMPERATURE SET POINT	75 DEG F
OCCUPIED SPACE HEATING TEMPERATURE SET POINT	72 DEG F
CRITICAL ZONE UNOCCUPIED SPACE COOLING SET POINT	80 DEG F
CRITICAL ZONE HEATING UNOCCUPIED SPACE HEATING SET POINT	60 DEG F

CONTROL SCHEMATIC



AIR HANDLING UNITS

AHU MARK	AHU 1	AHU 2					

TYPICAL CONTROL POINTS LIST

CONTROL POINT	INPUT ANALOG	INPUT BINARY	OUTPUT ANALOG	OUTPUT BINARY	TYPE
	BMS COMMUNICATION CARD				
SUPPLY FAN STATUS	-	X	-	-	1
SUPPLY FAN VFD ALARM	-	X	-	-	1
BI-POLAR ION GENERATOR STATUS	-	X	-	-	1
SAFETY STATUS (HIGH AND LOW DUCT STATIC, FREEZESTAT)	-	X	-	-	2
FILTER STATUS	-	X	-	-	1
DISCHARGE AIR TEMPERATURE	X	-	-	-	4
DISCHARGE STATIC AIR PRESSURE	X	-	-	-	3
MIXED AIR TEMPERATURE	X	-	-	-	4
RETURN AIR TEMPERATURE AND HUMIDITY	X	-	-	-	3 4
OUTSIDE AIR DAMPER POSITION	X	-	-	-	3
RETURN AIR DAMPER POSITION	X	-	-	-	3
SUPPLY FAN COMMAND	-	-	-	X	5
BI-POLAR IONIZATION GENERATOR CONTROL	-	-	-	X	5
CHILLED WATER VALVE	-	-	X	-	3
SUPPLY FAN VFD	-	-	X	-	3
OUTSIDE AIR DAMPER	-	-	X	-	3
RETURN AIR DAMPER	-	-	X	-	3
SUPPLY AIR AIRFLOW MONITORING STATION	X	-	-	-	3
OUTSIDE AIR AIRFLOW MONITORING STATION	X	-	-	-	3
EXISTING EXHAUST FAN INTERLOCKS/COMMAND	-	-	-	X	1

NOTES:
* DENOTES FULL COMMUNICATION WITH DEVICE VIA COMMUNICATION CARD COORDINATED WITH BMS SYSTEM

THIS SCHEDULE SHOWS THE MINIMUM POINTS REQUIRED. PROVIDE ALL POINTS AS REQUIRED FOR THE MECHANICAL EQUIPMENT TO PERFORM THE SEQUENCE OF OPERATIONS.

TYPE DEFINITION:
1 DRY CONTACT
2 RELAY CONTACT
3 1-10 VDC
4 NICKLE ELEMENT (1K)
5 24 VAC

1 M5.102 TYPICAL VARIABLE AIR VOLUME AHU WITH TERMINAL UNITS CONTROLS
NOT TO SCALE

HOUSEMAN ARCHITECTURE
931 S. SEMORAN BLVD. #604B WINTER PARK, FL 32792
321-972-8446 ARIZONA LICENSE NO. 74110

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SHEET NAME:
CONTROL SCHEMATICS - MECHANICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807
SHEET NO: M5.102

AIR HANDLING UNITS

MARK	AHU-1	AHU-2
LOCATION	BUILDING A - MECH ROOM	BUILDING B - MECH ROOM
MANUFACTURER	TRANE	TRANE
MODEL	CSAA021	CSAA025
FAN		
TOTAL AIR FLOW (CFM)	9560	12105
OUTSIDE AIR FLOW (CFM)	2485	2725
ESP/TSP (IN W.G.)	1.8/3.4	1.8/3.6
FAN SIZE AND TYPE	DIRECT DRIVE	DIRECT DRIVE
HP/RPM	10/1813	15/1849
VOLTS/PHASE/HZ	460/3/60	460/3/60
COOLING COIL		
ENTERING AIR TEMP (DB/WB)	80.0/66.8	79.5/66.2
LEAVING AIR TEMP (DB/WB) OFF COIL	51.6/51.5	52.0/51.9
SENSIBLE/TOTAL CAPACITY (MBH)	299.2/438.5	297.5/519.1
MIN FACE AREA (SF)	20.8	24.9
ROWS/MIN/FINS (MAX)/FT	6/138	8/112
MAXIMUM FACE VELOCITY (FPM)	459	485
MAX AIR PRESSURE DROP (IN.W.G.)	0.94	0.95
ENT/LVG WATER TEMP (DEG F)	44.0/59.0	44.0/59.0
WATER FLOW (GPM)	58.2	68.9
MAX WATER PRESS DROP (FT-H2O)	7.5	16.9
FILTERS		
AREA (SF)	33.3	50.0
TYPE/EFFICIENCY	THROWAWAY / MERV 8	THROWAWAY / MERV 8
UNIT REQUIREMENTS		
VOLTS/PHASE/HZ	460/3/60	460/3/60
MCA	8	12
MOCP	15	20
OPERATING WEIGHT (LBS)	2750	3250
ACCESSORIES	1-10	1-10
NOTES	1	1

ACCESSORIES (PROVIDE THE FOLLOWING)

1. SINGLE POINT POWER CONNECTION
2. VARIABLE FREQUENCY DRIVE FOR FAN MOTOR. WITH INTEGRAL DISCONNECT AND BYPASS. VFD SHALL BE MOUNTED ON WALL AND NOT ON THE UNIT
3. HIGH EFFICIENCY OPEN DRIP PROOF FAN MOTOR RATED FOR VFD OPERATION
4. GROUNDED SHAFT FOR MOTORS POWERED BY A VFD
5. DOUBLE WALL INSULATED SECTIONS
6. STAINLESS STEEL INSULATED CONDENSATE DRAIN PAN
7. SUPPLY AIR DUCT SMOKE DETECTORS AND ACCESS DOORS
8. OUTDOOR AIR DAMPER SHALL BE A TRAQ-DAMPER FOR MEASURING AIRFLOW AND CONTROLLING VOLUME. IF AN ALTERNATE AIR HANDLING UNIT MANUFACTURER IS CHOSEN, THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING AN AIRFLOW MEASURING STATION MOUNTED IN THE DUCTWORK.
9. UNIT MOUNTED ON 8" BASE RAIL
10. COORDINATE WITH JOHNSON CONTROLS CONTROLS CONTRACTOR TO FACTORY MOUNT NEW JOHNSON CONTROLS CONTROLLER TO NEW TERMINAL UNIT

NOTES

1. UNIT CONSISTS OF A REDUCED LENGTH MIXING BOX WITH WITH 2" AND 4" FILTER RACKS, A CHILLED WATER COIL, AN ACCESS SECTION, AND A PLENUM FAN WITH TOP DISCHARGE. THE RETURN AIR DAMPER AND OUTDOOR AIR DAMPER ARE TO BE OMITTED FROM THE UNITS AND BE PROVIDED BY THE CONTROLS CONTRACTOR FOR MOUNTING IN THE DUCTWORK.

HOUSEMAN
ARCHITECTURE
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SHEET NAME:
SCHEDULES - MECHANICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

SHEET NO: M6.101

DIVISION 23 TABLE OF CONTENTS

- 230000 - GENERAL REQUIREMENTS
- 230900 - INSTRUMENTATION AND CONTROL
- 232113 - HYDRONIC PIPING
- 232600 - PIPING INSULATION
- 239100 - DUCTWORK ACCESSORIES

230000 - GENERAL REQUIREMENTS

1.1 GENERAL

A. THE AIA DOCUMENT A201, THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION SHALL FORM A PART OF THE CONTRACT. A COPY OF THIS DOCUMENT MAY BE OBTAINED FROM THE A.I.A.

B. THE CONTRACT DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT. DO NOT SCALE THE DRAWINGS. CONSULT THE ARCHITECTURAL DRAWINGS AND DETAILS FOR THE EXACT LOCATION OF STRUCTURE AND EQUIPMENT, WHERE SAME ARE NOT DEFINITELY LOCATED. OBTAIN THIS INFORMATION FROM THE ARCHITECT.

C. PERFORMANCE AND LABOR AND MATERIAL PAYMENT BONDS IN THE VALUE OF 100% OF THE CONTRACT AMOUNT MAY BE REQUIRED FROM THE SUCCESSFUL BIDDER(S) AT THE OPTION OF THE OWNER. EACH BIDDER SHALL NAME HIS SURETY COMPANY AND QUOTE SEPARATELY THE LUMP SUM COST OF THE PREMIUM.

D. ALL WORK SHALL COMPLY WITH THE APPLICABLE CODES AND THE RECOMMENDATIONS OF NFPA AND UL.

E. THE CONTRACTOR GUARANTEES BY ACCEPTANCE OF THE CONTRACT THAT ALL WORK SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR AFTER RECEIPT OF FINAL PAYMENT. ALL WORK UNSATISFACTORY BY THE ENGINEER INCLUDING DAMAGE TO EXISTING FINISHES SHALL BE CORRECTED AT NO COST TO THE OWNER. THE CONTRACTOR SHALL SERVICE AND ADJUST ALL EQUIPMENT AS DIRECTED AND AS REQUIRED DURING THE ONE-YEAR GUARANTEE PERIOD AT NO CHARGE. NECESSARY PARTS SHALL BE PROVIDED AT NO CHARGE.

F. AS A MINIMUM, ONE FIVE POUND CO2 EXTINGUISHER SHALL BE PROVIDED WITH EACH WORK CREW AT ALL TIMES WHEN WORKING WITHIN THE BUILDING.

G. ALL MATERIALS SHALL BE NEW, THE BEST OF THEIR RESPECTIVE KINDS, SUITABLE FOR THE CONDITIONS AND DUTIES IMPOSED ON THEM AT THE BUILDING AND SHALL BE OF REPUTABLE MANUFACTURERS. THE DESCRIPTION, CHARACTERISTICS, AND REQUIREMENTS OF MATERIALS TO BE USED SHALL BE IN ACCORDANCE WITH QUALIFYING CONDITIONS ESTABLISHED IN THE SECTIONS FOLLOWING.

H. THOROUGHLY CLEAN ALL EXPOSED SURFACES OF EQUIPMENT AND MATERIAL AND LEAVE IN A NEAT, CLEAN CONDITION READY FOR PAINTING, RESTORE AND TOUCH-UP FACTORY FINISHES WHICH WERE DAMAGED IN THE PERFORMANCE OF THE NEW WORK.

I. LOCATE ALL EQUIPMENT WHICH MUST BE SERVICED, OPERATED OR MAINTAINED IN FULLY ACCESSIBLE POSITIONS. EQUIPMENT SHALL INCLUDE, BUT NOT BE LIMITED TO, VALVES, CLEANOUTS, MOTORS, CONTROLLERS, DAMPERS, DRAINPOINTS, ETC. WHERE REQUIRED AND WHERE DIRECTED BY THE ARCHITECT, PROVIDE 14 GAUGE STEEL ACCESS PANELS, MILCOR OR EQUAL, TO SUIT MATERIAL IN WHICH INSTALLED. MINIMUM SIZE OF ACCESS PANELS SHALL BE 12" X 18".

J. ALL ELECTRICAL WORK SHALL MEET THE REQUIREMENTS AS SET FORTH IN THE NATIONAL ELECTRICAL CODE (NEC) AND ALL APPLICABLE LOCAL CODES.

K. THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS AND CERTIFICATES.

L. PROVIDE ALL TEMPERATURE CONTROL WIRING BOTH LINE AND LOW VOLTAGE.

M. CONTRACTOR SHALL VERIFY ALL CONDITIONS IN THE FIELD AND SHALL NOTIFY SALAS O'BRIEN OF ANY DISCREPANCIES, OMISSIONS, AND/OR ANY OTHER CONFLICTS OR IRREGULARITIES PRIOR TO THE COMMENCEMENT OF ANY WORK.

1.2 EXISTING CONDITIONS

A. WHEN WORKING IN AND AROUND THE BUILDING, EXTREME CARE SHALL BE EXERCISED WITH REGARD TO PROTECTION OF THE EXISTING STRUCTURE AND MECHANICAL SYSTEMS. REPAIR OR REPLACE TO THE SATISFACTION OF THE ARCHITECT ANY EXISTING WORK DAMAGED IN THE PERFORMANCE OF THE NEW WORK.

B. THE CONTRACTOR SHALL THOROUGHLY EXAMINE PREMISES AND OBSERVE ALL CONDITIONS UNDER WHICH THE WORK WILL BE PERFORMED. NO ALLOWANCE WILL BE MADE FOR ERRORS OR NEGLIGENCE IN THIS RESPECT.

C. PERFORM ALL CUTTING AND PATCHING ASSOCIATED WITH THE NEW WORK. STRUCTURAL MEMBERS SHALL NOT BE CUT. PATCHING SHALL MATCH EXISTING ADJACENT SURFACES AS TO MATERIAL, TEXTURE AND QUALITY.

D. UNDER NO CIRCUMSTANCES SHALL WATERPROOFING BE DAMAGED OR PENETRATED. SHOULD CONDITIONS ARISE WHICH INDICATE SUCH IS NECESSARY, NOTIFY THE ARCHITECT.

E. NOTIFY OWNER PRIOR TO ALL SERVICE OUTAGES AND OBTAIN APPROVAL BEFORE PROCEEDING.

F. WHEN THE USE OR REUSE OF EXISTING SYSTEMS OR MATERIALS IS INDICATED, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR OR REPLACE THE SYSTEMS OR MATERIALS SUCH THAT THEY COMPLY WITH THE REQUIREMENTS OF THIS SPECIFICATION.

G. THE CONTRACTOR SHALL COORDINATE THE REMOVAL AND REPLACEMENT OF CEILINGS REQUIRED TO ACCOMPLISH THIS WORK.

1.3 SUBMITTALS

A. SUBMIT FOR APPROVAL ONE (1) PDF SET OF SHOP DRAWINGS ON THE ITEMS OF EQUIPMENT AS DIRECTED BY THE ARCHITECT.

B. CONTRACTOR SHALL FURNISH TO THE ARCHITECT TWO (2) COMPLETE BOUND SETS OF TYPEWRITTEN OR PORTABLE DOCUMENT FORMAT (PDF) INSTRUCTIONS FOR OPERATING AND MAINTAINING ALL SYSTEMS AND EQUIPMENT INCLUDED IN THIS CONTRACT. EACH SET OF INSTRUCTIONS SHALL BE CONTAINED IN A HARD-BACK RING BINDER PROPERLY INDEXED AND LABELED. ALSO PROVIDE TWO (2) COMPLETE SETS OF APPROVED SHOP DRAWINGS FOR ALL ITEMS OF EQUIPMENT UTILIZED ON THE PROJECT. ALL INSTRUCTIONS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FINAL ISSUE. MANUFACTURER'S ADVERTISING LITERATURE OR CATALOGS WILL NOT BE ACCEPTABLE FOR OPERATING AND MAINTENANCE INSTRUCTIONS.

C. DURING THE GUARANTEE PERIOD, THE CONTRACTOR SHALL SERVICE ALL EQUIPMENT, EXCLUDING FILTER REPLACEMENTS, PROVIDED UNDER THIS CONTRACT. PRIOR TO THE START OF THE GUARANTEE PERIOD, THE CONTRACTOR SHALL PROVIDE THE OWNER WITH A SCHEDULE OF REQUIRED MAINTENANCE OPERATIONS FOR EACH SYSTEM AND ITEM OF EQUIPMENT. SUBMIT SCHEDULE TO THE ARCHITECT FOR APPROVAL.

PART 2 - BASIC MATERIALS AND METHODS

2.1 GENERAL

A. THE GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND GENERAL REQUIREMENTS APPLY TO THE WORK SPECIFIED IN THIS SECTION.

2.2 TESTS AND ADJUSTMENTS

A. THE CONTRACTOR SHALL FURNISH LABOR, INSTRUMENTS, EQUIPMENT, AND MATERIALS REQUIRED TO PERFORM TESTS PRESCRIBED IN THE SECTIONS DESCRIBING THE VARIOUS SYSTEMS.

B. REPLACE OR REPAIR DEFECTS FOUND DURING INSPECTION OR TESTS WITH NEW MATERIALS. CAULKING OF SCREWED JOINTS, CRACKS, OR HOLES IS NOT ACCEPTABLE. CORRECT LEAKS IN SCREWED FITTINGS BY REMAKING JOINTS. REPEAT TESTS AFTER DEFECTS HAVE BEEN ELIMINATED.

C. WHERE REASONABLE DOUBT EXISTS AS TO A SYSTEMS ABILITY TO COMPLY WITH CONTRACT REQUIREMENTS, PERFORM ANY REASONABLE TEST REQUIRED BY THE ARCHITECT.

D. USE TEST INSTRUMENTS TESTED FOR ACCURACY BY AN APPROVED LABORATORY OR BY THE INSTRUMENT MANUFACTURER AND FURNISH CERTIFICATES SHOWING DEGREE OF ACCURACY TO THE ARCHITECT WHEN REQUESTED. MAKE CALIBRATION HISTORIES FOR EACH INSTRUMENT AVAILABLE FOR EXAMINATION.

2.3 AIR DISTRIBUTION

A. THIS SECTION INCLUDES AIR SYSTEMS DUCTWORK AND ACCESSORIES. THE REQUIREMENTS OF SECTION "GENERAL PROVISIONS MECHANICAL" SHALL APPLY TO THE WORK SPECIFIED UNDER THIS SECTION.

B. GALVANIZED STEEL DUCTWORK.

1. THE DUCTWORK MANUAL AS HEREIN REFERENCED SHALL MEAN THE SMACNA MANUAL "HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE", THIRD EDITION-2005, AS PUBLISHED BY THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. DUCTWORK SHALL BE CONSTRUCTED OF PRIME, FIRST QUALITY GALVANIZED STEEL OF GAUGES AS CALLED FOR IN THE DUCT MANUAL. LONGITUDINAL AND CROSS JOINTS, ELBOW, TRANSITIONS, ETC., SHALL BE FURNISHED AS REQUIRED IN DUCT MANUAL, INCLUDING RECOMMENDED DUCT SUPPORTS TO SUIT JOB CONDITIONS.
2. ALL UNINSULATED RECTANGULAR DUCTWORK SHALL BE CROSS BROKEN ON ALL FOUR SIDES OF EACH PANEL SECTION. ALL VERTICAL AND HORIZONTAL SHEET METAL BARRIERS, DUCT OFFSETS AND ELBOWS, AS WELL AS THE PANELS OF STRAIGHT SECTIONS OF DUCTS, SHALL BE CROSS BROKEN. CROSS BREAKING SHALL BE APPLIED BETWEEN THE STANDING SEAMS OR REINFORCING ANGLES. THE CENTER OF THE CROSS BREAK SHALL BE OF THE REQUIRED HEIGHT TO ASSURE EACH PANEL SECTION BEING RIGID, TO PREVENT VIBRATIONS AND "BREATHING"
3. FLEXIBLE DUCT CONNECTIONS WHERE INDICATED OR REQUIRED SHALL BE "VENTGLASS" DUCT FABRIC AS MANUFACTURED BY VENTFABRICS, INC.
4. DUCTWORK CONSTRUCTION SHALL CONFORM TO THE FOLLOWING SMACNA STANDARDS
   a. MATERIAL GAUGES (GALVANIZED STEEL) AND GENERAL CONSTRUCTION: SUPPLY, EXCEPT AS SPECIFIED BELOW. TABLES 2-3 THROUGH 2-7, SEAL CLASS B.
   b. LONGITUDINAL SEAMS: FIG. #2-2. TYPES L-1, L-3 AND L-
   c. CORNER CLOSURES: FIG. #2-14, 2-16 & 2-17
   d. HANGERS: FIG. #5-1 THRU 5-5 & TABLES 5-1 THRU 5-3
   e. RADIUS ELBOWS: FIG #4-1
   f. VANED ELBOWS (APPLIED TO SQUARE ELBOWS): FIG #4-2 THRU 4-5. SQUARE ELBOWS DOUBLE VANES ONLY WITH BLADE ALIGNMENT ASSEMBLY.
   g. TAPERS & OFFSETS: FIG #4-7
   h. VOLUME DAMPERS, UP TO 18" AND UP TO 48": FIG. #7-4 & #7-5. FIGS. A&B W/VENTLOK #555 QUADRANT
   i. ACCESS DOORS: VENTLOK W/#140 VENTLOK LATCH, INSULATED.
5. SEAL ALL TRANSVERSE JOINTS AND FITTINGS WITH UNITED DUCT SEALER.
6. PROVIDE STAND-OFFS ON VOLUME DAMPERS INSTALLED IN ALL INSULATED DUCTWORK.
7. SUPPORT ALL DUCTS IN ACCORDANCE WITH DUCT MANUAL, CHAPTER 5.
8. CLEAN THE INSIDE OF DUCTWORK OF DEBRIS, DIRT, AND OTHER FOREIGN MATTER BEFORE FAN IS OPERATED FOR ANY REASON.

2.4 DUCTWORK INSULATION

A. DUCTWORK SHALL BE EXTERNALLY INSULATED USING 2.2 INCH THICK NON-COMBUSTIBLE FLEXIBLE BLANKET.

B. K VALVE SHALL BE 0.29 AT 75 DEG. F, MEETING ASTM C518.

C. MAXIMUM SERVICE TEMPERATURE SHALL BE 250F.

D. MAXIMUM MOISTURE ABSORPTION SHALL BE 0.20 PERCENT BY VOLUME.

E. DENSITY SHALL BE 1.9 LB/CU. FT. WITH AN R VALUE OF 6.

F. VAPOR BARRIER JACKET SHALL BE KRAFT PAPER REINFORCED WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM
   1. MOISTURE VAPOR TRANSMISSION SHALL MEET ASTM E96 AND BE 0.04 PERM.
   2. JACKET SHALL BE SECURED WITH MASTIC CLOSURE SYSTEM MEETING UL 181 (MASTIC-PLUS-EMBEDDED FABRIC SYSTEM). TAPING OF JOINTS IS NOT PERMITTED.

2.5 CHILLED WATER AIR HANDLING UNITS

A. GENERAL
   1. THE AIR HANDLING UNITS SHALL CONSIST OF SECTIONS LISTED IN THE AIR HANDLING UNIT SCHEDULE

B. UNIT CASING:
   1. FORMING: FORM WALLS, ROOFS, AND FLOORS WITH AT LEAST TWO BREAKS AT EACH JOINT.
      a. CASING JOINTS: SHEET METAL SCREWS OR POP RIVETS.
      b. SEALING: SEAL ALL JOINTS WITH WATER-RESISTANT SEALANT.
      c. FACTORY FINISH FOR GALVANIZED-STEEL CASINGS: IMMEDIATELY AFTER CLEANING AND PRETREATING, APPLY MANUFACTURER'S STANDARD TWO-COAT, BAKED-ON ENAMEL FINISH, CONSISTING OF PRIME COAT AND THERMOSETTING TOPCOAT.
      d. AIRSTREAM SURFACES: SURFACES IN CONTACT WITH THE AIRSTREAM SHALL COMPLY WITH REQUIREMENTS IN ASHRAE 62.1.
   2. CASING INSULATION AND ADHESIVE
      a. MATERIALS: ASTM C 1071, TYPE II
      b. LOCATION AND APPLICATION: ENCASED BETWEEN OUTSIDE AND INSIDE CASING.
   3. ACCESS DOORS:
      a. PANEL AND DOOR FABRICATION: FORMED AND REINFORCED, SINGLE- OR DOUBLE-WALL AND INSULATED PANELS OF SAME MATERIALS AND THICKNESS AS CASING.
      b. HINGES: A MINIMUM OF TWO BALL-BEARING HINGES OR STAINLESS-STEEL PIANO HINGE AND TWO WEDGE-LEVER-TYPE LATCHES, OPERABLE FROM INSIDE AND OUTSIDE. ARRANGE DOORS TO BE OPENED AGAINST AIR-PRESSURE DIFFERENTIAL.
      c. GASKET: NEOPRENE, APPLIED AROUND ENTIRE PERIMETERS OF PANEL FRAMES.

C. CONDENSATE DRAIN PANS:
   1. FABRICATED WITH SLOPE IN AT LEAST TWO PLANES TO COLLECT CONDENSATE FROM COOLING COILS AND TO DIRECT WATER TOWARD DRAIN CONNECTION.
   2. DOUBLE-WALL, STAINLESS-STEEL SHEET WITH SPACE BETWEEN WALLS FILLED WITH FOAM INSULATION AND MOISTURE-TIGHT SEAL.
   3. DRAIN CONNECTION: LOCATED AT LOWEST POINT OF PAN AND SIZED TO PREVENT OVERFLOW. TERMINATE WITH THREADED NIPPLE ON ONE END OF PAN

D. AIR-HANDLING-UNIT MOUNTING FRAME: FORMED GALVANIZED-STEEL CHANNEL OR STRUCTURAL CHANNEL SUPPORTS. DESIGNED FOR LOW DEFLECTION, WELDED WITH INTEGRAL LIFTING LUGS

E. FAN, DRIVE, AND MOTOR SECTION:
   1. STATICALLY AND DYNAMICALLY BALANCED AND DESIGNED FOR CONTINUOUS OPERATION AT MAXIMUM-RATED FAN SPEED AND MOTOR HORSEPOWER. FAN SHALL BE PLENUM TYPE, DIRECT DRIVE.
   2. BELT GUARDS: COMPLY WITH REQUIREMENTS SPECIFIED BY OSHA AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS".
   3. MOTOR: COMPLY WITH NEMA DESIGNATION, TEMPERATURE RATING, SERVICE FACTOR, ENCLOSURE TYPE, AND EFFICIENCY REQUIREMENTS FOR MOTORS SPECIFIED IN DIVISION 23 SECTION "COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT."
      a. NEMA PREMIUM (TM) EFFICIENT MOTORS AS DEFINED IN NEMA MG 1.
      b. MOTOR SIZES: MINIMUM SIZE AS INDICATED. IF NOT INDICATED, LARGE ENOUGH SO DRIVEN LOAD WILL NOT REQUIRE MOTOR TO OPERATE IN SERVICE FACTOR RANGE ABOVE 1.0.
      c. CONTROLLERS, ELECTRICAL DEVICES, AND WIRING: COMPLY WITH REQUIREMENTS FOR ELECTRICAL DEVICES AND CONNECTIONS SPECIFIED IN DIVISION 26 SECTIONS.
      d. FANS SHALL BE PROVIDED WITH FACTORY-MOUNTED VARIABLE FREQUENCY DRIVES. REFER TO VARIABLE FREQUENCY DRIVE SPECIFICATION FOR MORE INFORMATION.

F. COIL SECTION:
   1. COMPLY WITH ARI 410.
   2. FABRICATE COIL SECTION TO ALLOW REMOVAL AND REPLACEMENT OF COIL FOR MAINTENANCE AND TO ALLOW IN-PLACE ACCESS FOR SERVICE AND MAINTENANCE OF COIL(S).
   3. COILS SHALL NOT ACT AS STRUCTURAL COMPONENT OF UNIT
   4. COILS SHALL BE COPPER TUBE, ALUMINUM FINS.

G. AIR FILTRATION SECTION:
   1. COMPLY WITH NFPA 90A.
   2. PROVIDE MINIMUM ARRESTANCE ACCORDING TO ASHRAE 52.1. AND A MINIMUM EFFICIENCY REPORTING VALUE (MERV) ACCORDING TO ASHRAE 52.2.
   3. PROVIDE FILTER HOLDING FRAMES ARRANGED FOR FLAT OR ANGULAR ORIENTATION, WITH ACCESS DOORS ON BOTH SIDES OF UNIT. FILTERS SHALL BE REMOVABLE FROM ONE SIDE OR FROM OUTSIDE ACCESS PLENUM.

H. CONTROLS: THE AIR HANDLING UNITS SHALL BE MONITORED AND ADJUSTABLE THROUGH THE BUILDING MANAGEMENT SYSTEM. SCHEDULING AND MONITORING CAPABILITIES SHALL ALSO BE MADE AVAILABLE THROUGH THE BUILDING MANAGEMENT SYSTEM.

I. INSTALLATION
   1. THE AIR HANDLING UNITS MUST BE RIGGED, LIFTED, AND INSTALLED IN STRICT ACCORDANCE WITH THE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL. THE UNITS ARE ALSO TO BE INSTALLED IN STRICT ACCORDANCE WITH THE SPECIFICATIONS. UNITS MAY BE SHIPPED FULLY ASSEMBLED OR DISASSEMBLED TO THE MINIMUM FUNCTIONAL SECTION SIZE IN ACCORDANCE WITH SHIPPING AND JOB SITE REQUIREMENTS.
   2. INDOOR UNITS SHALL BE SHIPPED ON AN INTEGRAL BASE FRAME PROVIDING ENOUGH HEIGHT TO PROPERLY TRAP CONDENSATE FROM THE UNIT.
   3. ALL UNITS WILL BE SHIPPED WITH AN INTEGRAL BASE FRAME DESIGNED WITH THE NECESSARY NUMBER OF LIFT POINTS FOR SAFE INSTALLATION. ALL LIFTING LUGS ARE TO BE UTILIZED DURING LIFT. THE LIFT POINTS WILL BE DESIGNED TO ACCEPT STANDARD RIGGING DEVICES AND BE REMOVABLE AFTER INSTALLATION. UNITS SHIPPED IN SECTIONS WILL HAVE A MINIMUM OF FOUR POINTS OF LIFT.
   4. PER ASHRAE 62.1 RECOMMENDATION, INDOOR AIR HANDLING UNITS WILL BE SHIPPED AND STORED IN STRETCH-WRAP TO PROTECT UNIT FROM RAIN AND DEBRIS.
   5. INSTALLING CONTRACTOR IS RESPONSIBLE FOR LONG TERM STORAGE IN ACCORDANCE WITH THE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL.
   6. THE CONTRACTOR SHALL DISASSEMBLE AIR HANDLING UNITS TO FIT THROUGH THE MECHANICAL EQUIPMENT PENTOUSE DOORWAY. THE UNIT SECTIONS SHALL THEN BE REASSEMBLED INSIDE THE ROOM AND CONNECTED TOGETHER FOR AN AIR-TIGHT INSTALLATION.
   7. OWNER SHALL WITNESS THE AHU OPERATION BEFORE PROJECT COMPLETION AND PERFORM A LEAK OBSERVATION. ALL AIR LEAKS OBSERVED SHALL BE SEALED BY THE CONTRACTOR AND THE LEAK OBSERVATION SHALL BE REPEATED UNTIL SATISFACTORY OPERATION OF THE UNIT IS OBSERVED.

2.6 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. NAMEPLATES: LAMINATED THREE-LAYER PLASTIC WITH ENGRAVED LETTERS.
   1. INSTALLATION: DEGREASE AND CLEAN SURFACES TO RECEIVE ADHESIVE FOR IDENTIFICATION MATERIALS. INSTALL PLASTIC NAMEPLATES WITH CORROSIVE-RESISTANT MECHANICAL FASTENERS, OR ADHESIVE. APPLY WITH SUFFICIENT ADHESIVE TO ENSURE PERMANENT ADHESION AND SEAL WITH CLEAR LACQUER.
   2. SCHEDULE
      a. HVAC EQUIPMENT (WHITE LETTERS ON BLACK BACKGROUND): INDICATE EQUIPMENT MARK CORRESPONDING WITH THE CONTRACT DOCUMENTS.
      b. CONTROL PANELS (WHITE LETTERS ON BLACK BACKGROUND): INDICATE MARK CORRESPONDING WITH THE SUBMITTED AND APPROVED CONTROL DRAWINGS.
      c. THERMOSTATS/HUMIDISTATS/COMBINATION SENSORS (WHITE LETTERS ON BLACK BACKGROUND): INDICATE THE EQUIPMENT MARK SERVED BY DEVICE
      e. DAMPERS: PLACE TAG ON ACCESS DOOR.
         1) FIRE, SMOKE, OR FIRE/SMOKE DAMPERS (WHITE LETTERS ON RED BACKGROUND): "FD", "SD", OR "FSD"

B. ROUND PLASTIC TAGS: LAMINATED THREE-LAYER PLASTIC WITH ENGRAVED WHITE LETTERS ON BLACK BACKGROUND COLOR. TAG SIZE MINIMUM 1-1/2 INCH DIAMETER.
   1. CONTROL VALVES SHALL BE MARKED TO MATCH THE NAMING CONVENTION ON THE CONTRACT DRAWINGS.
   2. INSTALLATION: INSTALL TAGS WITH CORROSION RESISTANT CHAIN.
   3. SCHEDULE
      a. HOT WATER VALVES
      b. CHILLED WATER VALVES

C. STENCILS
   1. INSTALLATION: IDENTIFY DUCTWORK WITH STENCILED PAINTING. CLEAN SURFACES TO RECEIVE STENCIL PAINTING AND PROVIDE 2-1/2 INCH HIGH CLEAN CUT SYMBOLS. PAINT SHALL BE SEMI-GLOSS ENAMEL WITH COLORS CONFORMING TO ASME A13.1. IDENTIFY WITH AIR HANDLING UNIT IDENTIFICATION NUMBER. LOCATE IDENTIFICATION AT POINT, AT EACH SIDE OF PENETRATION OF STRUCTURE OR ENCLOSURE, AND AT EACH OBSTRUCTION.

D. PIPE MARKERS
   1. COLOR: REQUIREMENTS FOR MANUFACTURED PIPE LABELS. PREPRINTED, COLOR-CODED, WITH LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION.
   2. SELF-ADHESIVE PIPE LABELS: PRINTED PLASTIC WITH CONTACT-TYPE, PERMANENT-ADHESIVE BACKING
   3. INSTALLATION: INSTALL PLASTIC PIPE MARKERS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS IN CLEAR VIEW AND ALIGN WITH AXIS OF PIPING. LOCATE IDENTIFICATION NOT TO EXCEED 20 FEET ON STRAIGHT RUNS INCLUDING RISERS AND DROPS, ADJACENT TO EACH VALVE AND TEE, AT EACH SIDE OF PENETRATION OF STRUCTURE OR ENCLOSURE, AND AT EACH OBSTRUCTION.
   4. SCHEDULE
      a. HOT WATER (WHITE LETTERS ON GREEN BACKGROUND)
      b. CHILLED WATER (WHITE LETTERS ON GREEN BACKGROUND)

2.7 HVAC PIPING INSULATION

A. INSULATION MATERIALS
   1. PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.
   2. FOAM INSULATION MATERIALS SHALL NOT USE CFC OR HCFC BLOWING AGENTS IN THE MANUFACTURING PROCESS.
   3. FLEXIBLE ELASTOMERIC INSULATION: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS.

B. ADHESIVES
   1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED UNLESS OTHERWISE INDICATED.
   2. CELLULAR-GLASS ADHESIVE: TWO-COMPONENT, THERMOSETTING URETHANE ADHESIVE CONTAINING NO FLAMMABLE SOLVENTS, WITH A SERVICE TEMPERATURE RANGE OF MINUS 100 TO PLUS 200 DEG F.
   3. FLEXIBLE ELASTOMERIC: COMPLY WITH MIL-A-24179A, TYPE II, CLASS I.
   4. ASJ ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS.
   5. PVC JACKET ADHESIVE: COMPATIBLE WITH PVC JACKET.

C. MASTICS
   1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES. COMPLY WITH MIL-PRF-19565C, TYPE II.
   2. VAPOR-BARRIER MASTIC: WATER BASED. SUITABLE FOR INDOOR USE ON BELOW-AMBIENT SERVICES.
      a. WATER-VAPOR PERMEANCE: ASTM E 96/E 96M, PROCEDURE B, 0.013 PERM AT 43-MIL DRY FILM THICKNESS.
      b. SERVICE TEMPERATURE RANGE: MINUS 20 TO PLUS 180 DEG F.
      c. SOLIDS CONTENT: ASTM D 1644, 58 PERCENT BY VOLUME AND 70 PERCENT BY WEIGHT.
   3. COLOR: WHITE.

D. SEALANTS
   1. JOINT SEALANTS
      c. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
      d. PERMANENTLY FLEXIBLE, ELASTOMERIC SEALANT.
      e. SERVICE TEMPERATURE RANGE: MINUS 100 TO PLUS 300 DEG F.
      f. COLOR: WHITE OR GRAY.
   2. METAL JACKET FLASHING SEALANTS
      a. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
      b. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
      c. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
   3. COLOR: ALUMINUM.
   4. ASJ FLASHING SEALANTS:
      a. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
      b. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
      c. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
      d. COLOR: WHITE.

E. FACTORY-APPLIED JACKETS
   3. INSULATION SYSTEM SCHEDULES INDICATE FACTORY-APPLIED JACKETS ON VARIOUS APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE FOLLOWING:
      a. ASJ: WHITE, KRAFT-PAPER, FIBERGLASS-REINFORCED SCRIM WITH ALUMINUM-FOIL BACKING; COMPLYING WITH ASTM C 1136, TYPE I.
      b. ASJ-SSL: ASJ WITH SELF-SEALING, PRESSURE-SENSITIVE, ACRYLIC-BASED ADHESIVE COVERED BY A REMOVABLE PROTECTIVE STRIP; COMPLYING WITH ASTM C 1136, TYPE I.

F. FIELD-APPLIED JACKETS
   1. FIELD-APPLIED JACKETS SHALL COMPLY WITH ASTM C 921, TYPE I, UNLESS OTHERWISE INDICATED.
   2. PVC JACKET: HIGH-IMPACT-RESISTANT, UV-RESISTANT PVC COMPLYING WITH ASTM D 1784, CLASS 16354C. THICKNESS AS SCHEDULED. ROLL STOCK READY FOR SHOP OR FIELD CUTTING AND FORMING. THICKNESS IS INDICATED IN FIELD-APPLIED JACKET SCHEDULES.
      a. ADHESIVE: AS RECOMMENDED BY JACKET MATERIAL MANUFACTURER.
      b. COLOR: COLOR-CODE JACKETS BASED ON SYSTEM.
      c. FACTORY-FABRICATED FITTING COVERS TO MATCH JACKET IF AVAILABLE, OTHERWISE, FIELD FABRICATE.
         1) SHAPES: 45- AND 90-DEGREE, SHORT- AND LONG-RADIUS ELBOWS, TEES, VALVES, FLANGES, UNIONS, REDUCERS, END CAPS, SOR-PIPE HUBS, TRAPS, MECHANICAL JOINTS, AND P-TRAP AND SUPPLY COVERS FOR LAVATORIES.
   3. ALUMINUM JACKET: COMPLY WITH ASTM B 209, ALLOY 3003, 3005, 3105, OR 5005, TEMPER H-14.
      a. MOISTURE BARRIER FOR INDOOR APPLICATIONS: 1-MIL-THICK, HEAT-BONDED POLYETHYLENE AND KRAFT PAPER.
      b. FACTORY-FABRICATED FITTING COVERS
         1) SAME MATERIAL, FINISH, AND THICKNESS AS JACKET.
         2) PREFORMED 2-PIECE OR GORE, 45- AND 90-DEGREE, SHORT- AND LONG-RADIUS ELBOWS.
         3) TEE COVERS.
         4) FLANGE AND UNION COVERS.
         5) END CAPS.
         6) BEVELED COLLARS.
         7) VALVE COVERS.
         8) FIELD FABRICATE FITTING COVERS ONLY IF FACTORY-FABRICATED FITTING COVERS ARE NOT AVAILABLE

G. TAPES
   1. ASJ TAPE: WHITE VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE; COMPLYING WITH ASTM C 1136.
      a. WIDTH: 3 INCHES.
      b. THICKNESS: 11.5 MIL.
      c. ADHESION: 50 OUNCES FORCE/INCH IN WIDTH.
      d. ELONGATION: 2 PERCENT.
      e. TENSILE STRENGTH: 40 LBF/INCH IN WIDTH.
      f. ASJ TAPE DISKS AND SQUARES: PRECUT DISKS OR SQUARES OF ASJ TAPE.
   2. PVC TAPE: WHITE VAPOR-RETARDER TAPE MATCHING FIELD-APPLIED PVC JACKET WITH ACRYLIC ADHESIVE; SUITABLE FOR INDOOR AND OUTDOOR APPLICATIONS.
      a. WIDTH: 2 INCHES.
      b. THICKNESS: 6 MILS.
      c. ADHESION: 64 OUNCES FORCE/INCH IN WIDTH.
      d. ELONGATION: 500 PERCENT.
      e. TENSILE STRENGTH: 18 LBF/INCH IN WIDTH.

H. PIPING INSULATION SCHEDULE
   1. CHILLED WATER, ABOVE 40 DEG F: INSULATION SHALL BE THE FOLLOWING.
      a. PIPE 2-1/2" AND SMALLER: FLEXIBLE ELASTOMERIC: 1 INCH THICK.
      b. PIPE LARGER THAN 2-1/2": CELLULAR GLASS: 2 INCHES THICK.

2.8 AIR BALANCING

A. AIR BALANCE SHALL BE PERFORMED BY THE MECHANICAL CONTRACTOR, SUBJECT TO THE PRIOR APPROVAL OF THE ENGINEER. ALL INSTRUMENTS USED SHALL BE ACCURATELY CALIBRATED AND MAINTAINED IN GOOD WORKING ORDER.

B. THE BALANCING AGENCY SHALL PREPARE A WRITTEN REPORT WHICH SHALL INCLUDE DIAGRAMS AND DESCRIPTION OF PROCEDURES TOGETHER WITH ALL RECORDED TEST DATA. SUBMIT THREE COPIES OF THE FINAL TEST DATA FOR APPROVAL.

C. CONDUCT BALANCING AND TESTING IN ACCORDANCE WITH TECHNICAL PORTIONS OF THE ASSOCIATED AIR BALANCING COUNCIL (AABC) – "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE" - CURRENT EDITION OR NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB) - "PROCEDURAL STANDARD FOR TESTING ADJUSTING AND BALANCING OF ENVIRONMENTAL SYSTEMS" - CURRENT EDITION. TEST PROCEDURES NOT IN ACCORDANCE OR NOT DESCRIBED IN THE STANDARDS SHALL BE APPROVED BY THE ENGINEER IN WRITING.

D. PERMANENTLY MARK THE SETTINGS OF DAMPERS, AND OTHER ADJUSTMENT

1.4 SUBMITTALS

A. PRODUCT DATA: INCLUDE MANUFACTURER'S TECHNICAL LITERATURE FOR EACH CONTROL DEVICE. INDICATE DIMENSIONS, CAPACITIES, PERFORMANCE CHARACTERISTICS, ELECTRICAL CHARCTERISTICS, FINISHES FOR MATERIALS, AND INSTALLATION AND STARTUP INSTRUCTIONS FOR EACH TYPE OF PRODUCT INDICATED.
1. DDC SYSTEM HARDWARE: BILL OF MATERIALS OF EQUIPMENT INDICATING QUANTITY, MANUFACTURER, AND MODEL NUMBER. INCLUDE TECHNICAL DATA FOR OPERATOR WORKSTATION EQUIPMENT, INTERFACE EQUIPMENT, CONTROL UNITS, TRANSDUCERS/TRANSMITTERS, SENSORS, ACTUATORS, VALVES, RELAYS/SWITCHES, CONTROL PANELS, AND OPERATOR INTERFACE EQUIPMENT.
2. CONTROL SYSTEM SOFTWARE: INCLUDE TECHNICAL DATA FOR OPERATING SYSTEM SOFTWARE, OPERATOR INTERFACE, COLOR GRAPHICS, AND OTHER THIRD-PARTY APPLICATIONS.
3. CONTROLLED SYSTEMS: INSTRUMENTATION LIST WITH ELEMENT NAME, TYPE OF DEVICE, MANUFACTURER, MODEL NUMBER, AND PRODUCT DATA. INCLUDE WRITTEN DESCRIPTION OF SEQUENCE OF OPERATION INCLUDING SCHEMATIC DIAGRAM.

B. SHOP DRAWINGS: DETAIL EQUIPMENT ASSEMBLIES AND INDICATE DIMENSIONS, WEIGHTS, LOADS, REQUIRED CLEARANCES, METHOD OF FIELD ASSEMBLY, COMPONENTS, AND DESCRIPTION AND SIZE OF EACH FIELD CONNECTION.
1. BILL OF MATERIALS OF EQUIPMENT INDICATING QUANTITY, MANUFACTURER, AND MODEL NUMBER.
2. SCHEMATIC FLOW DIAGRAMS SHOWING FANS, COILS, DAMPERS, VALVES, AND CONTROL DEVICES.
3. WIRING DIAGRAMS: POWER, SIGNAL, AND CONTROL WIRING.
4. DETAILS OF CONTROL PANEL FACES, INCLUDING CONTROLS, INSTRUMENTS, AND LABELING.
5. WRITTEN DESCRIPTION OF SEQUENCE OF OPERATION.
6. SCHEDULE OF DAMPERS INCLUDING SIZE, LEAKAGE, AND FLOW CHARACTERISTICS.
7. SCHEDULE OF VALVES INCLUDING FLOW CHARACTERISTICS.
8. DDC SYSTEM HARDWARE:
   e. WIRING DIAGRAMS FOR CONTROL UNITS WITH TERMINATION NUMBERS.
   f. SCHEMATIC DIAGRAMS AND FLOOR PLANS FOR FIELD SENSORS AND CONTROL HARDWARE.
   g. SCHEMATIC DIAGRAMS FOR CONTROL, COMMUNICATION, AND POWER WIRING, SHOWING TRUNK DATA CONDUCTORS AND WIRING BETWEEN OPERATOR WORKSTATION AND CONTROL UNIT LOCATIONS.
9. CONTROL SYSTEM SOFTWARE: LIST OF COLOR GRAPHICS INDICATING MONITORED SYSTEMS, DATA (CONNECTED AND CALCULATED) POINT ADDRESSES, OUTPUT SCHEDULE, AND OPERATOR NOTATIONS.
10. CONTROLLED SYSTEMS:
   a. SCHEMATIC DIAGRAMS OF EACH CONTROLLED SYSTEM WITH CONTROL POINTS LABELED AND CONTROL ELEMENTS GRAPHICALLY SHOWN, WITH WIRING.
   b. SCALED DRAWINGS SHOWING MOUNTING, ROUTING, AND WIRING OF ELEMENTS INCLUDING BASES AND SPECIAL CONSTRUCTION.
   c. WRITTEN DESCRIPTION OF SEQUENCE OF OPERATION INCLUDING SCHEMATIC DIAGRAM.
   d. COMPLETE POINTS LIST INDICATING ALL DEVICES NEEDED TO ACCOMPLISH THE SEQUENCE OF OPERATIONS.

C. DATA COMMUNICATIONS PROTOCOL CERTIFICATES: CERTIFY THAT EACH PROPOSED DDC SYSTEM COMPONENT COMPLIES WITH ASHRAE 135.

D. SOFTWARE AND FIRMWARE OPERATIONAL DOCUMENTATION: INCLUDE THE FOLLOWING:
1. SOFTWARE OPERATING AND UPGRADE REQUIREMENTS.
2. PROGRAM SOFTWARE BACKUP: ON A MAGNETIC MEDIA OR COMPACT DISC, COMPLETE WITH DATA FILES.
3. DEVICE ADDRESS LIST.
4. PRINTOUT OF SOFTWARE APPLICATION AND GRAPHIC SCREENS.
5. SOFTWARE LICENSE REQUIRED BY AND INSTALLED FOR DDC WORKSTATIONS AND CONTROL SYSTEMS.

E. OPERATION AND MAINTENANCE DATA: FOR HVAC INSTRUMENTATION AND CONTROL SYSTEM TO INCLUDE IN EMERGENCY, OPERATION, AND MAINTENANCE MANUALS. IN ADDITION TO ITEMS SPECIFIED IN DIVISION 01 SECTION "OPERATION AND MAINTENANCE DATA," INCLUDE THE FOLLOWING:
1. MAINTENANCE INSTRUCTIONS AND LISTS OF SPARE PARTS FOR EACH TYPE OF CONTROL DEVICE.
2. INTERCONNECTION WIRING DIAGRAMS WITH IDENTIFIED AND NUMBERED SYSTEM COMPONENTS AND DEVICES.
3. KEYBOARD ILLUSTRATIONS AND STEP-BY-STEP PROCEDURES INDEXED FOR EACH OPERATOR FUNCTION.
4. INSPECTION PERIOD, CLEANING METHODS, CLEANING MATERIALS RECOMMENDED, AND CALIBRATION TOLERANCES.
5. CALIBRATION RECORDS AND LIST OF SET POINTS.

1.6 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: AUTOMATIC CONTROL SYSTEM MANUFACTURER'S AUTHORIZED REPRESENTATIVE WHO IS TRAINED AND APPROVED FOR INSTALLATION OF SYSTEM COMPONENTS REQUIRED FOR THIS PROJECT.

B. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, ARTICLE 100, BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, AND MARKED FOR INTENDED USE.

C. COMPLY WITH ASHRAE 135 FOR DDC SYSTEM COMPONENTS.

1.6 DELIVERY, STORAGE, AND HANDLING

A. FACTORY-MOUNTED COMPONENTS: WHERE CONTROL DEVICES SPECIFIED IN THIS SECTION ARE INDICATED TO BE FACTORY MOUNTED ON EQUIPMENT, ARRANGE FOR SHIPPING OF CONTROL DEVICES TO EQUIPMENT MANUFACTURER.

B. SYSTEM SOFTWARE: UPDATE TO LATEST VERSION OF SOFTWARE AT PROJECT COMPLETION.

1.7 COORDINATION

A. COORDINATE LOCATION OF THERMOSTATS, HUMIDISTATS, AND OTHER EXPOSED CONTROL SENSORS WITH PLANS AND ROOM DETAILS BEFORE INSTALLATION.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS: CONTROLS SHALL BE PROVIDED BY JOHNSON CONTROLS, INC. (JCI) METASYS SYSTEM TO PROVIDE FULL COMMUNICATION WITH THE EXISTING CAMPUS WIDE JCI CONTROL SYSTEM. NO SUBSTITUTIONS WILL BE ALLOWED.

2.2 CONTROL SYSTEM

A. GENERAL:
1. CONTROL SYSTEM SHALL CONSIST OF SENSORS, INDICATORS, ACTUATORS, FINAL CONTROL ELEMENTS, INTERFACE EQUIPMENT, OTHER APPARATUS, ACCESSORIES, ALL REQUIRED HARDWARE, SOFTWARE AND REQUIRED PROGRAMMING CONNECTED TO DISTRIBUTED CONTROLLERS OPERATING IN MULTIUSER, MULTITASKING ENVIRONMENT ON TOKEN-PASSING NETWORK AND PROGRAMMED TO CONTROL MECHANICAL SYSTEMS TO PROVIDE A COMPLETE AND OPERABLE SYSTEM.

2.3 DDC EQUIPMENT

A. THE BMS CONTRACTOR SHALL PROVIDE SYSTEM SOFTWARE BASED ON A SERVER/THIN-CLIENT ARCHITECTURE, DESIGNED AROUND THE OPEN STANDARDS OF WEB TECHNOLOGY. THE BMS SERVER SHALL COMMUNICATE USING ASHRAE'S BACNET/IP PROTOCOL, AND IN ADDITION, OFFER CONCURRENT SUPPORT OVER THE SAME DATA-LINK OF THE FOLLOWING PROTOCOLS: LONWORKS, MODBUS, AND SNMP. SERVER SHALL BE ACCESSED USING A WEB BROWSER OVER THE ST. LUCIE COUNTY INTRANET AND REMOTELY OVER THE INTERNET. SYSTEM SHALL FULLY COMMUNICATE OVER AND WITH THE COUNTY SYSTEM.

B. THE INTENT OF THE THIN-CLIENT ARCHITECTURE IS TO PROVIDE THE OPERATOR(S) COMPLETE ACCESS TO THE BMS SYSTEM VIA A WEB BROWSER. THE THIN-CLIENT WEB BROWSER GRAPHICAL USER INTERFACE (GUI) SHALL BE BROWSER AND OPERATING SYSTEM AGNOSTIC, MEANING IT WILL SUPPORT MICROSOFT AND NETSCAPE NAVIGATOR BROWSERS, AND WINDOWS AS WELL AS NON-WINDOW OPERATING SYSTEMS. NO SPECIAL SOFTWARE, (ACTIVE-X COMPONENTS OR FAT JAVA CLIENTS) SHALL BE REQUIRED TO BE INSTALLED ON THE PCS / PDAS USED TO ACCESS THE BMS VIA A WEB BROWSER.

C. THE BMS SERVER SOFTWARE SHALL BE DEVELOPED AND TESTED BY THE MANUFACTURER OF THE SYSTEM STANDALONE CONTROLLERS AND NETWORK CONTROLLERS/ROUTERS. THIRD PARTY MANUFACTURED AND DEVELOPED BMS SOFTWARE IS NOT ACCEPTABLE.

THE WEB BROWSER GUI SHALL PROVIDE A COMPLETELY INTERACTIVE USER INTERFACE AND MUST OFFER THE FOLLOWING FEATURES AS A MINIMUM:
1. TRENDING
2. SCHEDULING
3. DOWNLOADING MEMORY TO FIELD DEVICES
4. REAL TIME LIVE GRAPHIC PROGRAMS
5. TREE NAVIGATION
6. PARAMETER CHANGE OF PROPERTIES
7. SETPOINT ADJUSTMENTS
8. ALARM / EVENT INFORMATION
9. CONFIGURATION OF OPERATORS
10. EXECUTION OF GLOBAL COMMANDS

2.4 NETWORK ROUTERS & BRIDGES: THE CONTROLLER NETWORK SHALL USE BACNET AS ITS NATIVE COMMUNICATION PROTOCOL. NETWORK BRIDGES AND ROUTERS MUST BE OF A MODULAR DESIGN TO ENSURE RELIABILITY AND SYSTEM PERFORMANCE.

A. BACNET ROUTER: THE CENTRAL SYSTEM SHALL USE THE BUILDING LOCAL AREA NETWORK (LAN) FOR COMMUNICATION. THE COMMUNICATION BETWEEN THE CENTRAL SERVER AND THE CONTROLLERS SHALL BE BACNET/IP. A ROUTER SHALL BE PROVIDED, AS REQUIRED, TO BRIDGE BACNET/IP AND THE DATA LINK USED BETWEEN THE CONTROLLERS (BACNET OVER ARCNET OR MS/TP). PROPRIETARY PROTOCOLS ARE NOT ACCEPTABLE. THE BACNET ROUTER SHALL UTILIZE FLASH MEMORY TO ALLOW FIRMWARE UPDATES TO BE PERFORMED REMOTELY.

B. CONTROL UNITS: MODULAR, COMPRISING PROCESSOR BOARD WITH PROGRAMMABLE, NONVOLATILE, RANDOM-ACCESS MEMORY; LOCAL OPERATOR ACCESS AND DISPLAY PANEL; INTEGRAL INTERFACE EQUIPMENT; AND BACKUP POWER SOURCE.
1. UNITS MONITOR OR CONTROL EACH I/O POINT: PROCESS INFORMATION, EXECUTE COMMANDS FROM OTHER CONTROL UNITS, DEVICES, AND OPERATOR STATIONS, AND DOWNLOAD FROM OR UPLOAD TO OPERATOR WORKSTATION OR DIAGNOSTIC TERMINAL UNIT.
2. STAND-ALONE MODE CONTROL FUNCTIONS OPERATE REGARDLESS OF NETWORK STATUS. FUNCTIONS INCLUDE THE FOLLOWING:
   a. GLOBAL COMMUNICATIONS.
   b. DISCRETE/DIGITAL, ANALOG, AND PULSE I/O.
   c. MONITORING, CONTROLLING, OR ADDRESSING DATA POINTS.
   d. SOFTWARE APPLICATIONS, SCHEDULING, AND ALARM PROCESSING.
   e. TESTING AND DEVELOPING CONTROL ALGORITHMS WITHOUT DISRUPTING FIELD HARDWARE AND CONTROLLED ENVIRONMENT.
3. STANDARD APPLICATION PROGRAMS:
   a. ELECTRIC CONTROL PROGRAMS: DEMAND LIMITING, DUTY CYCLING, AUTOMATIC TIME SCHEDULING, START/STOP TIME OPTIMIZATION, NIGHT SETBACK/SETUP, ON-OFF CONTROL WITH DIFFERENTIAL SEQUENCING, STAGGERED START, ANTISHORT CYCLING, PID CONTROL, DDC WITH FINE TUNING, AND TREND LOGGING.
   b. HVAC CONTROL PROGRAMS: OPTIMAL RUN TIME, SUPPLY AIR RESET, AND ENTHALPY SWITCHOVER.
   c. PROGRAMMING APPLICATION FEATURES: INCLUDE TREND POINT, ALARM PROCESSING AND MESSAGING, WEEKLY, MONTHLY, AND ANNUAL SCHEDULING, ENERGY CALCULATIONS, RUN-TIME TOTALIZATION, AND SECURITY ACCESS.
   d. REMOTE COMMUNICATIONS.
   e. MAINTENANCE MANAGEMENT.
   f. UNITS OF MEASURE: INCH-POUND.
4. ASHRAE 135 COMPLIANCE: CONTROL UNITS SHALL USE ASHRAE 135 PROTOCOL AND COMMUNICATE USING ISO 8802-3 (ETHERNET) DATALINK/PHYSICAL LAYER PROTOCOL.

C. LOCAL CONTROL UNITS: MODULAR, COMPRISING PROCESSOR BOARD WITH ELECTRONically PROGRAMMABLE, NONVOLATILE, READ-ONLY MEMORY; AND BACKUP POWER SOURCE.
1. UNITS MONITOR OR CONTROL EACH I/O POINT: PROCESS INFORMATION, AND DOWNLOAD FROM OR UPLOAD TO OPERATOR WORKSTATION OR DIAGNOSTIC TERMINAL UNIT.
2. STAND-ALONE MODE CONTROL FUNCTIONS OPERATE REGARDLESS OF NETWORK STATUS. FUNCTIONS INCLUDE THE FOLLOWING:
3. GLOBAL COMMUNICATIONS.
4. DISCRETE/DIGITAL, ANALOG, AND PULSE I/O.
5. MONITORING, CONTROLLING, OR ADDRESSING DATA POINTS.
6. LOCAL OPERATOR INTERFACE PROVIDES FOR DOWNLOAD FROM OR UPLOAD TO OPERATOR WORKSTATION OR DIAGNOSTIC TERMINAL UNIT.
7. ASHRAE 135 COMPLIANCE: CONTROL UNITS SHALL USE ASHRAE 135 PROTOCOL AND COMMUNICATE USING ISO 8802-3 (ETHERNET) DATALINK/PHYSICAL LAYER PROTOCOL.

D. I/O INTERFACE: HARDWIRED INPUTS AND OUTPUTS MAY TIE INTO SYSTEM THROUGH CONTROLLERS. PROTECT POINTS SO THAT SHORTING WILL CAUSE NO DAMAGE TO CONTROLLERS.
1. BINARY INPUTS: ALLOW MONITORING OF ON-OFF SIGNALS WITHOUT EXTERNAL POWER.
2. PULSE ACCUMULATION INPUTS: ACCEPT UP TO 16 PULSES PER SECOND.
3. ANALOG INPUTS: ALLOW MONITORING OF LOW-VOLTAGE (0- TO 10-V DC), CURRENT (4 TO 20 MA), OR RESISTANCE SIGNALS.
4. BINARY OUTPUTS: PROVIDE ON-OFF OR PULSED LOW-VOLTAGE SIGNAL, SELECTABLE FOR NORMALLY OPEN OR NORMALLY CLOSED OPERATION WITH THREE-POSITION (ON-OFF-AUTO) OVERRIDE SWITCHES AND STATUS LIGHTS.
5. ANALOG OUTPUTS: PROVIDE MODULATING SIGNAL, EITHER LOW VOLTAGE (0- TO 10-V DC) OR CURRENT (4 TO 20 MA) WITH STATUS LIGHTS, TWO-POSITION (AUTO-MANUAL) SWITCH, AND MANUALLY ADJUSTABLE POTENTIOMETER.
6. TRI-STATE OUTPUTS: PROVIDE TWO COORDINATED BINARY OUTPUTS FOR CONTROL OF THREE-POINT, FLOATING-TYPE ELECTRONIC ACTUATORS.
7. UNIVERSAL I/OS: PROVIDE SOFTWARE SELECTABLE BINARY OR ANALOG OUTPUTS.

E. POWER SUPPLIES: TRANSFORMERS WITH CLASS 2 CURRENT-LIMITING TYPE OR OVERCURRENT PROTECTION; LIMIT CONNECTED LOADS TO 80 PERCENT OF RATED CAPACITY. DC POWER SUPPLY SHALL MATCH OUTPUT CURRENT AND VOLTAGE REQUIREMENTS AND BE FULL-WAVE RECTIFIER TYPE WITH THE FOLLOWING:
1. OUTPUT RIPPLE OF 5.0 MV MAXIMUM PEAK TO PEAK.
2. COMBINED TRANSIENT LINE AND LOAD REGULATION WITH 100-MIC SEC. RESPONSE TIME FOR 50 PERCENT LOAD CHANGES.
3. BUILT-IN OVERVOLTAGE AND OVERCURRENT PROTECTION AND BE ABLE TO WITHSTAND 150 PERCENT OVERLOAD FOR AT LEAST 3 SECONDS WITHOUT FAILURE.

F. POWER LINE FILTERING: INTERNAL OR EXTERNAL TRANSIENT VOLTAGE AND SURGE SUPPRESSION FOR WORKSTATIONS OR CONTROLLERS WITH THE FOLLOWING:
1. MINIMUM DIELECTRIC STRENGTH OF 1000 V.
2. MAXIMUM RESPONSE TIME OF 10 NANOSECONDS.
3. MINIMUM TRANSVERSE-MODE NOISE ATTENUATION OF 65 DB.
4. MINIMUM COMMON-MODE NOISE ATTENUATION OF 150 DB AT 40 TO 100 HZ.

2.5 UNITARY CONTROLLERS

A. UNITIZED, STAND-ALONE OPERATION WITH SUFFICIENT MEMORY AND INPUT AND OUT POINTS TO SUPPORT ITS OPERATING SYSTEM, DATABASE, AND PROGRAMMING REQUIREMENTS, AND WITH SUFFICIENT I/O CAPACITY FOR THE APPLICATION.
1. CONFIGURATION: LOCAL KEYPAD AND DISPLAY; DIAGNOSTIC LEDS FOR POWER, COMMUNICATION, AND PROCESSOR; WIRING TERMINATION TO TERMINAL STRIP OR CARD CONNECTED WITH RIBBON CABLE; MEMORY WITH BIOS; AND 72-HOUR BATTERY BACKUP.
2. OPERATING SYSTEM: MANAGE I/O COMMUNICATION TO ALLOW DISTRIBUTED CONTROLLERS TO SHARE REAL AND VIRTUAL OBJECT INFORMATION AND ALLOW CENTRAL MONITORING AND ALARMS. PERFORM SCHEDULING WITH REAL-TIME CLOCK. PERFORM AUTOMATIC SYSTEM DIAGNOSTICS; MONITOR SYSTEM AND REPORT FAILURES.
3. ASHRAE 135 COMPLIANCE: COMMUNICATE USING READ (EXECUTE AND INITIATE) AND WRITE (EXECUTE AND INITIATE) PROPERTY SERVICES DEFINED IN ASHRAE 135. RESIDE ON NETWORK USING MS/TP DATALINK/PHYSICAL LAYER PROTOCOL AND HAVE SERVICE COMMUNICATION PORT FOR CONNECTION TO DIAGNOSTIC TERMINAL UNIT.
4. ENCLOSURE: DUSTPROOF RATED FOR OPERATION AT 32 TO 120 DEG F.

2.6 ELECTRONIC SENSORS

A. DESCRIPTION: VIBRATION AND CORROSION RESISTANT; FOR WALL, IMMERSION, OR DUCT MOUNTING AS REQUIRED.

B. THERMISTOR TEMPERATURE SENSORS AND TRANSMITTERS:
1. AVAILABLE MANUFACTURERS:
   a. BEC CONTROLS CORPORATION.
   b. EBTRON, INC.
   c. MAMAC SYSTEMS, INC.
2. ACCURACY: PLUS OR MINUS 0.36 DEG F AT CALIBRATION POINT.
3. WIRE: TWISTED, SHIELDED-PAIR CABLE.
4. INSERTION ELEMENTS IN DUCTS: SINGLE POINT, 18 INCHES LONG; USE WHERE NOT AFFECTED BY TEMPERATURE STRATIFICATION OR WHERE DUCTS ARE SMALLER THAN 9 SQ. FT.
5. AVERAGING ELEMENTS IN DUCTS: 12 FEET LONG, FLEXIBLE; USE WHERE PRONE TO TEMPERATURE STRATIFICATION OR WHERE DUCTS ARE LARGER THAN 10 SQ. FT.
6. INSERTION ELEMENTS FOR LIQUIDS: BRASS OR STAINLESS-STEEL SOCKET WITH MINIMUM INSERTION LENGTH OF 2-1/2 INCHES.
7. ROOM SENSOR COVER CONSTRUCTION: MANUFACTURER'S STANDARD LOCKING COVERS. NO MANUFACTURER'S NAME.
   a. SET-POINT ADJUSTMENT: CONCEALED.
   b. SET-POINT INDICATION: EXPOSED.
   c. THERMOMETER: CONCEALED.
   d. COLOR: PROVIDE COLOR CHOICES, FINAL COLOR BY ARCHITECT.
   e. ORIENTATION: VERTICAL.
8. OUTSIDE-AIR SENSORS: WATERTIGHT INLET FITTING, SHIELDED FROM DIRECT SUNLIGHT.

C. RTDS AND TRANSMITTERS:
1. AVAILABLE MANUFACTURERS:
2. BEC CONTROLS CORPORATION.
3. MAMAC SYSTEMS, INC.
4. RDF CORPORATION.
5. ACCURACY: PLUS OR MINUS 0.2 PERCENT AT CALIBRATION POINT.
6. WIRE: TWISTED, SHIELDED-PAIR CABLE.
7. INSERTION ELEMENTS IN DUCTS: SINGLE POINT, 18 INCHES LONG; USE WHERE NOT AFFECTED BY TEMPERATURE STRATIFICATION OR WHERE DUCTS ARE SMALLER THAN 9 SQ. FT.
8. AVERAGING ELEMENTS IN DUCTS: 24 FEET LONG, FLEXIBLE; USE WHERE PRONE TO TEMPERATURE STRATIFICATION OR WHERE DUCTS ARE LARGER THAN 9 SQ. FT.; LENGTH AS REQUIRED.
9. INSERTION ELEMENTS FOR LIQUIDS: BRASS SOCKET WITH MINIMUM INSERTION LENGTH OF 2-1/2 INCHES.
10. ROOM SENSOR COVER CONSTRUCTION: MANUFACTURER'S STANDARD LOCKING COVERS.
11. SET-POINT ADJUSTMENT: CONCEALED.
12. SET-POINT INDICATION: EXPOSED.
13. THERMOMETER: CONCEALED.
14. COLOR: PROVIDE COLOR CHOICES, FINAL COLOR BY ARCHITECT.
15. ORIENTATION: VERTICAL.
16. OUTSIDE-AIR SENSORS: WATERTIGHT INLET FITTING, SHIELDED FROM DIRECT SUNLIGHT.

D. HUMIDITY SENSORS: BULK POLYMER SENSOR ELEMENT.
1. AVAILABLE MANUFACTURERS:
   a. BEC CONTROLS CORPORATION.
   b. MAMAC SYSTEMS, INC.
   c. ROTRONIC INSTRUMENT CORP.
2. ACCURACY: 2 PERCENT FULL RANGE WITH LINEAR OUTPUT.
3. ROOM SENSOR RANGE: 20 TO 80 PERCENT RELATIVE HUMIDITY.
4. ROOM SENSOR COVER CONSTRUCTION: MANUFACTURER'S STANDARD LOCKING COVERS.
   a. SET-POINT ADJUSTMENT: CONCEALED.
   b. SET-POINT INDICATION: EXPOSED.
   c. THERMOMETER: CONCEALED.
   d. COLOR: PROVIDE COLOR CHOICES, FINAL COLOR BY ARCHITECT.
   1). ORIENTATION: VERTICAL.
5. OUTSIDE-AIR SENSOR: 20 TO 80 PERCENT RELATIVE HUMIDITY RANGE WITH MOUNTING ENCLOSURE, SUITABLE FOR OPERATION AT OUTDOOR TEMPERATURES OF MINUS 22 TO PLUS 185 DEG F.

E. PRESSURE TRANSMITTERS/TRANSDUCERS:
1. AVAILABLE MANUFACTURERS:
   a. BEC CONTROLS CORPORATION.
   b. MAMAC SYSTEMS, INC.
   c. ROTRONIC INSTRUMENT CORP.
2. STATIC-PRESSURE TRANSMITTER: NONDIRECTIONAL SENSOR WITH SUITABLE RANGE FOR EXPECTED INPUT, AND TEMPERATURE COMPENSATED.
   a. ACCURACY: 2 PERCENT OF FULL SCALE WITH REPEATABILITY OF 0.5 PERCENT.
   b. OUTPUT: 4 TO 20 MA.
   c. BUILDING STATIC-PRESSURE RANGE: 0- TO 0.25-INCH WG.
   d. DUCT STATIC-PRESSURE RANGE: 0- TO 5-INCH WG.
3. WATER PRESSURE TRANSDUCERS: STAINLESS-STEEL DIAPHRAGM CONSTRUCTION, SUITABLE FOR SERVICE, MINIMUM 150-PSIG OPERATING PRESSURE, LINEAR OUTPUT 4 TO 20 MA.
4. WATER DIFFERENTIAL-PRESSURE TRANSDUCERS: STAINLESS-STEEL DIAPHRAGM CONSTRUCTION, SUITABLE FOR SERVICE, MINIMUM 150-PSIG OPERATING PRESSURE AND TESTED TO 300-PSIG, LINEAR OUTPUT 4 TO 20 MA.
5. DIFFERENTIAL-PRESSURE SWITCH (AIR OR WATER): SNAP ACTING, WITH PILOT-DUTY RATING AND WITH SUITABLE SCALE RANGE AND DIFFERENTIAL.
6. PRESSURE TRANSMITTERS: DIRECT ACTING FOR GAS, LIQUID, OR STEAM SERVICE, RANGE SUITABLE FOR SYSTEM; LINEAR OUTPUT 4 TO 20 MA.

F. ROOM SENSOR COVER CONSTRUCTION: MANUFACTURER'S STANDARD LOCKING COVERS.
1. SET-POINT ADJUSTMENT: CONCEALED.
2. SET-POINT INDICATION: EXPOSED.
3. THERMOMETER: CONCEALED.
4. COLOR: PROVIDE COLOR CHOICES, FINAL COLOR BY ARCHITECT.
5. ORIENTATION: VERTICAL.

G. ROOM SENSOR ACCESSORIES INCLUDE THE FOLLOWING:
1. INSULATING BASES: FOR SENSORS LOCATED ON EXTERIOR WALLS.

2.7 STATUS SENSORS

A. STATUS INPUTS FOR FANS: DIFFERENTIAL-PRESSURE SWITCH WITH PILOT-DUTY RATING AND WITH ADJUSTABLE RANGE OF 0- TO 5-INCH WG.

B. STATUS INPUTS FOR ELECTRIC MOTORS: COMPLY WITH ISA 50.00.01, CURRENT-SENSING FIXED- OR SPLIT-CORE TRANSFORMERS WITH SELF-POWERED TRANSMITTER, ADJUSTABLE AND SUITABLE FOR 175 PERCENT OF RATED MOTOR CURRENT.

C. VOLTAGE TRANSMITTER (100- TO 600-V AC): COMPLY WITH ISA 50.00.01, SINGLE-LOOP, SELF-POWERED TRANSMITTER, ADJUSTABLE, WITH SUITABLE RANGE AND 1 PERCENT FULL-SCALE ACCURACY.

D. POWER MONITOR: 3-PHASE TYPE WITH DISCONNECT/SHORTING SWITCH ASSEMBLY, LISTED VOLTAGE AND CURRENT TRANSFORMERS, WITH PULSE KILOWATT HOUR OUTPUT AND 4- TO 20-MA KW OUTPUT, WITH MAXIMUM 2 PERCENT ERROR AT 1.8 POWER FACTOR AND 2.5 PERCENT ERROR AT 0.5 POWER FACTOR.

E. CURRENT SWITCHES: SELF-POWERED, SOLID-STATE WITH ADJUSTABLE TRIP CURRENT, SELECTED TO MATCH CURRENT AND SYSTEM OUTPUT REQUIREMENTS.

F. ELECTRONIC VALVE/DAMPER POSITION INDICATOR: VISUAL SCALE INDICATING PERCENT OF TRAVEL AND 2- TO 10-V DC, FEEDBACK SIGNAL.

G. WATER-FLOW SWITCHES: BELLOWS-ACTUATED MERCURY OR SNAP-ACTING TYPE WITH PILOT-DUTY RATING, STAINLESS-STEEL OR BRONZE PADDLE, WITH APPROPRIATE RANGE AND DIFFERENTIAL ADJUSTMENT, IN NEMA 250, TYPE 1 ENCLOSURE.
1. AVAILABLE MANUFACTURERS:
   a. BEC CONTROLS CORPORATION.
   b. I.T.M. INSTRUMENTS INC.

2.8 FLOW MEASURING STATIONS

A. DUCT AIRFLOW STATION: COMBINATION OF AIR STRAIGHTENER AND MULTIPORT, SELF-AVERAGING PITOT TUBE STATION.
1. AVAILABLE MANUFACTURERS:
   a. AIR MONITOR CORPORATION.
   b. WETMASTER CO., LTD.
   c. EBTRON.
2. CASING: GALVANIZED-STEEL FRAME.
3. FLOW STRAIGHTENER: ALUMINUM HONEYCOMB, 3/4-INCH PARALLEL CELL, 3 INCHES DEEP.
4. SENSING MANIFOLD: COPPER MANIFOLD WITH BULLET-NOSED STATIC PRESSURE SENSORS POSITIONED ON EQUAL AREA BASIS.

2.9 THERMOSTATS

A. AVAILABLE MANUFACTURERS:
1. DANFOSS INC., AIR-CONDITIONING AND REFRIGERATION DIV.
2. SAUTER CONTROLS CORPORATION.
3. TEKMAR CONTROL SYSTEMS, INC.

B. AIRSTREAM THERMOSTATS: TWO-PIPE, FULLY PROPORTIONAL, SINGLE-TEMPERATURE TYPE WITH ADJUSTABLE SET POINT IN MIDDLE OF RANGE, ADJUSTABLE THROTTLING RANGE, PLUG-IN TEST FITTING OR PERMANENT PRESSURE GAGE, REMOTE BULB, BIMETAL ROD AND TUBE, OR AVERAGING ELEMENT.

C. ELECTRIC, LOW-LIMIT DUCT THERMOSTAT: SNAP-ACTING, SINGLE-POLE, SINGLE-THROW, MANUAL-OR AUTOMATIC-RESET SWITCH THAT TRIPS IF TEMPERATURE SENSED ACROSS ANY 12 INCHES OF BULB LENGTH IS EQUAL TO OR BELOW SET POINT.
1. BULB LENGTH: MINIMUM 20 FEET.
2. QUANTITY: ONE THERMOSTAT FOR EVERY 20 SQ. FT. OF COIL SURFACE.

2.10 HUMIDISTATS

A. AVAILABLE MANUFACTURERS:
1. MAMAC SYSTEMS, INC.
2. ROTRONIC INSTRUMENT CORP.

B. ROOM HUMIDISTATS: MEASUREMENT RANGE SHALL BE 10% TO 90% RELATIVE HUMIDITY. ACCURACY SHALL BE +/-3% RELATIVE HUMIDITY. OPERATING TEMPERATURE RANGE SHALL BE 30 DEGREES F TO 100 DEGREES F. WITH HARD PLASTIC SENSOR CAP. STABILITY SHALL BE +/-2% RH OVER TWO YEARS.

2.11 ACTUATORS

A. ELECTRIC MOTORS: SIZE TO OPERATE WITH SUFFICIENT RESERVE POWER TO PROVIDE SMOOTH MODULATING ACTION OR TWO-POSITION ACTION.
1. COMPLY WITH REQUIREMENTS IN DIVISION 23 SECTION "COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT."
2. PERMANENT SPLIT-CAPACITOR OR SHADED-POLE TYPE. GEAR TRAINS COMPLETELY OIL IMMERSED AND SEALED. EQUIP SPRING-RETURN MOTORS WITH INTEGRAL SPIRAL-SPRING MECHANISM IN HOUSINGS DESIGNED FOR EASY REMOVAL FOR SERVICE OR ADJUSTMENT OF LIMIT SWITCHES, AUXILIARY SWITCHES, OR FEEDBACK POTENTIOMETER.
3. NONSPRING-RETURN MOTORS FOR VALVES LARGER THAN NPS 2-1/2: SIZE FOR RUNNING TORQUE OF 150 IN. X LBF AND BREAKAWAY TORQUE OF 300 IN. X LBF.
4. SPRING-RETURN MOTORS FOR VALVES LARGER THAN NPS 2-1/2: SIZE FOR RUNNING AND BREAKAWAY TORQUE OF 150 IN. X LBF.
5. NONSPRING-RETURN MOTORS FOR DAMPERS LARGER THAN 25 SQ. FT.: SIZE FOR RUNNING TORQUE OF 150 IN. X LBF AND BREAKAWAY TORQUE OF 300 IN. X LBF.
6. SPRING-RETURN MOTORS FOR DAMPERS LARGER THAN 25 SQ. FT.: SIZE FOR RUNNING AND BREAKAWAY TORQUE OF 150 IN. X LBF.

B. ELECTRONIC ACTUATORS: DIRECT-COUPLED TYPE DESIGNED FOR MINIMUM 60,000 FULL-STROKE CYCLES AT RATED TORQUE.
1. AVAILABLE MANUFACTURERS:
   a. BELIMO AIRCONTROLS (USA), INC.
2. VALVES: SIZE FOR TORQUE REQUIRED FOR VALVE CLOSE OFF AT MAXIMUM PUMP DIFFERENTIAL PRESSURE.
3. DAMPERS: SIZE FOR RUNNING TORQUE CALCULATED AS FOLLOWS:
   a. PARALLEL-BLADE DAMPER WITH EDGE SEALS: 7 INCH-LB/SQ. FT. OF DAMPER.
   b. OPPOSED-BLADE DAMPER WITH EDGE SEALS: 5 INCH-LB/SQ. FT. OF DAMPER.
   c. PARALLEL-BLADE DAMPER WITHOUT EDGE SEALS: 4 INCH-LB/SQ. FT. OF DAMPER.
   d. OPPOSED-BLADE DAMPER WITHOUT EDGE SEALS: 3 INCH-LB/SQ. FT. OF DAMPER.
   e. DAMPERS WITH 2- TO 3-INCH WG OF PRESSURE DROP OR FACE VELOCITIES OF 1000 TO 2500 FPM: INCREASE RUNNING TORQUE BY 1.5.
   f. DAMPERS WITH 3- TO 4-INCH WG OF PRESSURE DROP OR FACE VELOCITIES OF 2500 TO 3000 FPM: INCREASE RUNNING TORQUE BY 2.0.
4. COUPLING: V-BOLT AND V-SHAPED, TOOTHED CRADLE.
5. OVERLOAD PROTECTION: ELECTRONIC OVERLOAD OR DIGITAL ROTATION-SENSING CIRCUITRY.
6. FAIL-SAFE OPERATION: MECHANICAL, SPRING-RETURN MECHANISM. PROVIDE EXTERNAL MANUAL GEAR RELEASE ON NONSPRING-RETURN ACTUATORS.
7. POWER REQUIREMENTS (TWO-POSITION SPRING RETURN): 24-V AC.
8. POWER REQUIREMENTS (MODULATING): MAXIMUM 10 VA AT 24-V AC OR 8 W AT 24-V DC.
9. PROPORTIONAL SIGNAL: 2- TO 10-V DC OR 4 TO 20 MA, AND 2- TO 10-V DC POSITION FEEDBACK SIGNAL.
10. TEMPERATURE RATING: MINUS 22 TO PLUS 122 DEG F.
11. TEMPERATURE RATING (SMO

PART 3 EXECUTION

3.1 EXAMINATION
A. VERIFY THAT POWER SUPPLY IS AVAILABLE TO CONTROL UNITS AND OPERATOR WORKSTATION.

3.2 INSTALLATION
A. INSTALL SOFTWARE IN CONTROL UNITS. IMPLEMENT ALL FEATURES OF PROGRAMS TO SPECIFIED REQUIREMENTS AND AS APPROPRIATE TO SEQUENCE OF OPERATION.
B. CONNECT AND CONFIGURE EQUIPMENT AND SOFTWARE TO ACHIEVE SEQUENCE OF OPERATION SPECIFIED.
C. VERIFY LOCATION OF THERMOSTATS, HUMIDISTATS, AND OTHER EXPOSED CONTROL SENSORS WITH DRAWINGS BEFORE INSTALLATION. INSTALL DEVICES 48 INCHES ABOVE THE FLOOR.
D. INSTALL AVERAGING ELEMENTS IN DUCTS AND PLENUMS IN CROSSING OR ZIGZAG PATTERN.
F. INSTALL AUTOMATIC DAMPERS.
F. INSTALL DAMPER MOTORS ON OUTSIDE OF DUCT IN WARM AREAS. NOT IN LOCATIONS EXPOSED TO OUTDOOR TEMPERATURES.
G. INSTALL LABELS AND NAMEPLATES TO IDENTIFY CONTROL COMPONENTS.
H. INSTALL HYDRONIC INSTRUMENT WELLS, VALVES, AND OTHER ACCESSORIES.
I. INSTALL DUCT VOLUME-CONTROL DAMPERS.
J. INSTALL ELECTRONIC AND FIBER-OPTIC CABLES ACCORDING TO INDUSTRY STANDARDS.
K. INSTALL RACEWAYS, BOXES, AND CABINETS.
L. INSTALL BUILDING WIRE AND CABLE IN RIGID CONDUIT.
M. INSTALL SIGNAL AND COMMUNICATION CABLE.
1. INSTALL ALL CONTROLS CABLING IN CONDUIT. PRIME AND PAINT ALL CONDUIT EXPOSED TO VIEW AND IN FINISHED, OCCUPIED AREAS COLOR SELECTED BY ARCHITECT.
2. INSTALL ALL CONTROLS CABLING INSIDE MECHANICAL ROOMS IN CONDUIT.
3. INSTALL ALL CONCEALED CONTROLS CABLING IN CONDUIT.
4. FASTEN FLEXIBLE CONDUCTORS, BRIDGING CABINETS AND DOORS, ALONG HINGE SIDE. PROTECT AGAINST ABRASION, TIE AND SUPPORT CONDUCTORS.
5. NUMBER-CODE OR COLOR-CODE CONDUCTORS FOR FUTURE IDENTIFICATION AND SERVICE OF CONTROL SYSTEM. EXCEPT LOCAL INDIVIDUAL ROOM CONTROL CABLES.
6. INSTALL WIRE AND CABLE WITH SUFFICIENT SLACK AND FLEXIBLE CONNECTIONS TO ALLOW FOR VIBRATION OF PIPING AND EQUIPMENT.
7. PROVIDE AND INSTALL ALL FIBER MODEM/BACKBONE HARDWARE NEEDED TO INTERFACE BETWEEN THE FIBER OPTIC CABLE AND CONTROLS SYSTEM FOR FULL FUNCTIONALITY OF THE BUILDING MANAGEMENT SYSTEM WITHIN, THE BUILDING.
N. CONNECT MANUAL-RESET LIMIT CONTROLS INDEPENDENT OF MANUAL-CONTROL SWITCH POSITIONS.
O. CONNECT HAND-OFF-AUTO SELECTOR SWITCHES TO OVERRIDE AUTOMATIC INTERLOCK CONTROLS WHEN SWITCH IS IN HAND POSITION.
P. PROVIDE AND INSTALL PLENUM RATED CABLE THROUGHOUT THE PROJECT.

3.3 ADJUSTING
A. CALIBRATING AND ADJUSTING
1. CALIBRATE INSTRUMENTS.
2. MAKE THREE-POINT CALIBRATION TEST FOR BOTH LINEARITY AND ACCURACY FOR EACH ANALOG INSTRUMENT.
3. CALIBRATE EQUIPMENT AND PROCEDURES USING MANUFACTURER'S WRITTEN RECOMMENDATIONS AND INSTRUCTION MANUALS. USE TEST EQUIPMENT WITH ACCURACY AT LEAST DOUBLE THAT OF INSTRUMENT BEING CALIBRATED.
4. CONTROL SYSTEM INPUTS AND OUTPUTS:
5. CHECK ANALOG INPUTS AT 0, 50, AND 100 PERCENT OF SPAN.
6. CHECK ANALOG OUTPUTS USING MILLIAMPERE METER AT 0, 50, AND 100 PERCENT OUTPUT.
7. CHECK DIGITAL INPUTS USING JUMPER WIRE.
8. CHECK DIGITAL OUTPUTS USING OHMMETER TO TEST FOR CONTACT MAKING OR BREAKING.
9. CHECK RESISTANCE TEMPERATURE INPUTS AT 0, 50, AND 100 PERCENT OF SPAN USING A PRECISION-RESISTANT SOURCE.
10. FLOW
11. SET DIFFERENTIAL PRESSURE FLOW TRANSMITTERS FOR 0 AND 100 PERCENT VALUES WITH 3-POINT CALIBRATION ACCOMPLISHED AT 50, 90, AND 100 PERCENT OF SPAN.
12. MANUALLY OPERATE FLOW SWITCHES TO VERIFY THAT THEY MAKE OR BREAK CONTACT.
13. PRESSURE
14. CALIBRATE PRESSURE TRANSMITTERS AT 0, 50, AND 100 PERCENT OF SPAN.
15. CHECK PRESSURE SWITCHES TO MAKE OR BREAK CONTACTS. WITH ADJUSTABLE DIFFERENTIAL SET AT MINIMUM.
16. TEMPERATURE
17. CALIBRATE RESISTANCE TEMPERATURE TRANSMITTERS AT 0, 50, AND 100 PERCENT OF SPAN USING A PRECISION-RESISTANCE SOURCE.
18. CALIBRATE TEMPERATURE SWITCHES TO MAKE OR BREAK CONTACTS.
19. STROKE AND ADJUST CONTROL VALVES AND DAMPERS WITHOUT POSITIONERS, FOLLOWING THE MANUFACTURER'S RECOMMENDED PROCEDURE, SO THAT VALVE OR DAMPER IS 100 PERCENT OPEN AND CLOSED.
20. STROKE AND ADJUST CONTROL VALVES AND DAMPERS WITH POSITIONERS, FOLLOWING MANUFACTURER'S RECOMMENDED PROCEDURE, SO THAT VALVE AND DAMPER IS 0, 50, AND 100 PERCENT CLOSED.
21. PROVIDE DIAGNOSTIC AND TEST INSTRUMENTS FOR CALIBRATION AND ADJUSTMENT OF SYSTEM.
22. PROVIDE WRITTEN DESCRIPTION OF PROCEDURES AND EQUIPMENT FOR CALIBRATING EACH TYPE OF INSTRUMENT. SUBMIT PROCEDURES REVIEW AND APPROVAL BEFORE INITIATING STARTUP PROCEDURES.
B. ADJUST INITIAL TEMPERATURE AND HUMIDITY SET POINTS.
C. OCCUPANCY ADJUSTMENTS. WITHIN 12 MONTHS OF DATE OF SUBSTANTIAL COMPLETION, PROVIDE ON-SITE ASSISTANCE IN ADJUSTING SYSTEM TO SUIT ACTUAL OCCUPIED CONDITIONS.

3.4 SYSTEMS TRAINING
A. PROVIDE A MINIMUM OF 4 HOURS OF SYSTEMS TRAINING BY THE CONTROLS SYSTEM MANUFACTURER'S REPRESENTATIVE TO THE DAYTONA STATE OPERATIONS AND MAINTENANCE PERSONNEL. TRAINING SHALL BE BROKEN INTO TWO (2) TWO (2) HOUR SESSIONS, EACH SESSION IDENTICAL IN NATURE, IN ORDER TO ACCOMMODATE PERSONNEL WORK SCHEDULES. TRAINING SHALL COVER THE COMPLETE SEQUENCES OF OPERATION AS WELL AS INSTRUCTION ON HOW TO FULLY OPERATE, MODIFY AND MAINTAIN ALL ASPECTS OF THE CONTROLS SYSTEM HARDWARE AND SOFTWARE.

232113 - HYDRONIC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS
A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY
A. THIS SECTION INCLUDES PIPE AND FITTING MATERIALS, JOINING METHODS, SPECIAL-DUTY VALVES, AND SPECIALTIES FOR THE FOLLOWING:
1. CHILLED-WATER PIPING.
2. CONDENSATE-DRAIN PIPING.
3. AIR-VENT PIPING.

1.3 PERFORMANCE REQUIREMENTS
A. HYDRONIC PIPING COMPONENTS AND INSTALLATION SHALL BE CAPABLE OF WITHSTANDING THE FOLLOWING MINIMUM WORKING PRESSURE AND TEMPERATURE:
1. CHILLED-WATER PIPING: 125 PSIG AT 250 DEG F.
2. CONDENSATE-DRAIN PIPING: 150 DEG F.
3. AIR-VENT PIPING: 200 DEG F.

1.4 SUBMITTALS
A. PRODUCT DATA: FOR EACH TYPE OF THE FOLLOWING:
1. PIPE AND FITTINGS.
2. VALVES. INCLUDE FLOW AND PRESSURE DROP CURVES BASED ON MANUFACTURER'S TESTING FOR CALIBRATED-ORIFICE BALANCING VALVES AND AUTOMATIC FLOW-CONTROL VALVES.
3. AIR CONTROL DEVICES.
4. HYDRONIC SPECIALTIES.
B. SHOP DRAWINGS: DETAIL AT 1/4 SCALE. THE PIPING LAYOUT, FABRICATION OF PIPE ANCHORS, HANGERS, SUPPORTS FOR MULTIPLE PIPES, ALIGNMENT GUIDES, AND ATTACHMENTS OF THE SAME TO THE BUILDING STRUCTURE. DETAIL LOCATION OF ANCHORS AND ALIGNMENT GUIDES.
C. OPERATION AND MAINTENANCE DATA: FOR AIR CONTROL DEVICES, HYDRONIC SPECIALTIES, AND VALVES TO INCLUDE IN OPERATION AND MAINTENANCE MANUALS.

PART 2 PRODUCTS

2.1 COPPER TUBE AND FITTINGS
A. ANNEALED-TEMPER COPPER TUBING: ASTM B 88, TYPE K. ALL COPPER PIPING USED ON THE PROJECT SHALL BE MANUFACTURED IN THE UNITED STATES. PROVIDE PROOF OF MANUFACTURED LOCATION IN SHOP DRAWINGS AND SUBMITTED PRODUCT DATA INFORMATION.
B. DWV COPPER TUBING: ASTM B 306. TYPE DWV. ALL COPPER TUBING FITTINGS USED ON THE PROJECT SHALL BE MANUFACTURED IN THE UNITED STATES. PROVIDE PROOF OF MANUFACTURED LOCATION IN SHOP DRAWINGS AND SUBMITTED PRODUCT DATA INFORMATION
C. WROUGHT-COPPER FITTINGS: ASME B16.22. ALL COPPER PIPING FITTINGS USED ON THE PROJECT SHALL BE MANUFACTURED IN THE UNITED STATES. PROVIDE PROOF OF MANUFACTURED LOCATION IN SHOP DRAWINGS AND SUBMITTED PRODUCT DATA INFORMATION
1. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
a. ANVIL INTERNATIONAL, INC.
b. S. P. FITTINGS, A DIVISION OF STAR PIPE PRODUCTS.
D. WROUGHT-COPPER UNIONS: ASME B16.22.

2.2 JOINING MATERIALS
A. PIPE-FLANGE GASKET MATERIALS: SUITABLE FOR CHEMICAL AND THERMAL CONDITIONS OF PIPING SYSTEM CONTENTS.
1. ASME B16.21, NONMETALLIC, FLAT, ASBESTOS-FREE, 1/8-INCH MAXIMUM THICKNESS UNLESS THICKNESS OR SPECIFIC MATERIAL IS INDICATED.
B. FLANGE BOLTS AND NUTS: ASME B18.2.1, CARBON STEEL, UNLESS OTHERWISE INDICATED.
C. SOLDER FILLER METALS: ASTM B 32. LEAD-FREE ALLOYS. INCLUDE WATER-FLUSHABLE FLUX ACCORDING TO ASTM B 813.
D. WELDING FILLER METALS: COMPLY WITH AWS D10.12 FOR WELDING MATERIALS APPROPRIATE FOR WALL THICKNESS AND CHEMICAL ANALYSIS OF STEEL PIPE BEING WELDED.
E. GASKET MATERIAL: THICKNESS, MATERIAL, AND TYPE SUITABLE FOR FLUID TO BE HANDLED AND WORKING TEMPERATURES AND PRESSURES.

2.3 DIELECTRIC FITTINGS
A. DESCRIPTION: COMBINATION FITTING OF COPPER-ALLOY AND FERROUS MATERIALS WITH THREADED, SOLDER-JOINT, PLAIN, OR WELD-NECK END CONNECTIONS THAT MATCH PIPING SYSTEM MATERIALS.
B. INSULATING MATERIAL: SUITABLE FOR SYSTEM FLUID, PRESSURE, AND TEMPERATURE.
C. DIELECTRIC UNIONS:
1. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
a. CAPITOL MANUFACTURING COMPANY.
b. CENTRAL PLASTICS COMPANY.
c. HART INDUSTRIES INTERNATIONAL, INC.
d. WATTS REGULATOR CO., A DIVISION OF WATTS WATER TECHNOLOGIES, INC.
e. ZURN PLUMBING PRODUCTS GROUP; AQUASPEC COMMERCIAL PRODUCTS DIVISION.
2. FACTORY-FABRICATED UNION ASSEMBLY, FOR 250-PSIG MINIMUM WORKING PRESSURE AT 180 DEG F.

2.4 VALVES
A. AUTOMATIC TEMPERATURE-CONTROL VALVES, ACTUATORS, AND SENSORS: COMPLY WITH REQUIREMENTS SPECIFIED IN DIVISION 23 SECTION "INSTRUMENTATION AND CONTROL FOR HVAC."

2.5 AIR CONTROL DEVICES
A. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
1. AMTROL, INC.
2. ARMSTRONG PUMPS, INC.
3. BELL & GOSSETT DOMESTIC PUMP: A DIVISION OF ITT INDUSTRIES.
4. TACO.
B. AUTOMATIC AIR VENTS:
1. BODY: BRONZE OR CAST IRON.
2. INTERNAL PARTS: NONFERROUS.
3. OPERATOR: NONCORROSIVE METAL FLOAT.
4. INLET CONNECTION: NPS 1/2.
5. DISCHARGE CONNECTION: NPS 1/4.
6. CWP RATING: 150 PSIG.
7. MAXIMUM OPERATING TEMPERATURE: 240 DEG F.

2.6 HYDRONIC PIPING SPECIALTIES
A. Y-PATTERN STRAINERS
1. BODY: ASTM A 126, CLASS B, CAST IRON WITH BOLTED COVER AND BOTTOM DRAIN CONNECTION.
2. END CONNECTIONS: THREADED ENDS FOR NPS 2 AND SMALLER; FLANGED ENDS FOR NPS 2-1/2 AND LARGER.
3. STRAINER SCREEN: 60-MESH STARTUP STRAINER, AND PERFORATED STAINLESS-STEEL BASKET WITH 50 PERCENT FREE AREA.
4. CWP RATING: 125 PSIG.

2.7 STEEL PIPE, FITTINGS, AND JOINTS
A. STEEL PIPE: ASTM A53, BLACK STEEL WITH PLAIN ENDS MANUFACTURED IN THE UNITED STATES.
B. FITTINGS: ASTM 16.3, MALLEABLE IRON OR ASTM A234, FORGED STEEL WELDING TYPE MANUFACTURED IN THE UNITED STATES. ALL ELBOWS SHALL BE LONG RADIUS TYPE.
C. JOINTS: AWS D1.1 WELDED OR FLANGED JOINTS.
D. PROVIDE PROOF OF MANUFACTURED LOCATION IN SHOP DRAWINGS AND SUBMITTED PRODUCT DATA.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS
A. CHILLED-WATER PIPING ABOVE GROUND, NPS 2-1/2" AND LARGER SHALL BE STEEL, ABOVEGROUND; NPS 2 AND SMALLER, SHALL BE COPPER.
1. PROVIDE PROOF OF MANUFACTURED LOCATION IN SHOP DRAWINGS AND SUBMITTED PRODUCT DATA INFORMATION.
2. PROOF OF MANUFACTURED LOCATION IN SHOP DRAWINGS AND SUBMITTED PRODUCT DATA INFORMATION.
B. CONDENSATE-DRAIN PIPING: COPPER PIPING.
C. AIR-VENT PIPING:
1. INLET AND OUTLET: COPPER PIPING.

3.2 VALVE APPLICATIONS
A. INSTALL SHUTOFF-DUTY VALVES AT EACH BRANCH CONNECTION TO SUPPLY MAINS, AND AT SUPPLY CONNECTION TO EACH PIECE OF EQUIPMENT.
B. INSTALL VALVES AT EACH BRANCH CONNECTION TO RETURN MAIN.
C. INSTALL UNIONS IN NPS 2 AND SMALLER SIZES TO ALLOW REMOVAL OF VALVE WITHOUT CUTTING PIPES.

3.3 PIPING INSTALLATIONS
A. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON COORDINATION DRAWINGS.
B. INSTALL PIPING INDICATED TO BE EXPOSED AT RIGHT ANGLES OR PARALLEL TO BUILDING WALLS. DIAGONAL RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE.
C. INSTALL PIPING TO PERMIT VALVE SERVICING.
D. INSTALL PIPING AT SLOPES.
E. INSTALL PIPING FREE OF SAGS AND BENDS.
F. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.
G. INSTALL PIPING TO ALLOW APPLICATION OF INSULATION.
H. SELECT SYSTEM COMPONENTS WITH PRESSURE RATING EQUAL TO OR GREATER THAN SYSTEM OPERATING PRESSURE.
I. INSTALL GROUPS OF PIPES PARALLEL TO EACH OTHER, SPACED TO PERMIT APPLYING INSULATION AND SERVICING OF VALVES.
J. INSTALL DRAINS, CONSISTING OF A TEE FITTING, NPS 3/4 BALL VALVE, AND SHORT NPS 3/4 THREADED NIPPLE WITH CAP, AT LOW POINTS IN PIPING SYSTEM MAINS AND ELSEWHERE AS REQUIRED FOR SYSTEM DRAINAGE.
K. INSTALL PIPING AT A UNIFORM GRADE OF 0.2 PERCENT UPWARD IN DIRECTION OF FLOW.
L. REDUCE PIPE SIZES USING ECCENTRIC REDUCER FITTING INSTALLED WITH LEVEL SIDE UP.
M. INSTALL BRANCH CONNECTIONS TO MAINS USING TEE FITTINGS IN MAIN PIPE, WITH THE BRANCH CONNECTED TO THE BOTTOM OF THE MAIN PIPE. FOR UP-FEED RISERS, CONNECT THE BRANCH TO THE TOP OF THE MAIN PIPE.
N. INSTALL UNIONS IN PIPING, NPS 2 AND SMALLER, ADJACENT TO VALVES, AT FINAL CONNECTIONS OF EQUIPMENT, AND ELSEWHERE AS INDICATED.
O. INSTALL FLANGES IN PIPING, NPS 2-1/2 AND LARGER, AT FINAL CONNECTIONS OF EQUIPMENT AND ELSEWHERE AS INDICATED.
P. INSTALL STRAINERS ON INLET SIDE OF EACH CONTROL VALVE, PRESSURE-REDUCING VALVE, AND ELSEWHERE AS INDICATED. INSTALL NPS 3/4 NIPPLE AND BALL VALVE WITH CAP AND CHAIN IN BLOW DOWN CONNECTION OF STRAINERS NPS 2 AND LARGER. MATCH SIZE OF STRAINER BLOWOFF CONNECTION FOR STRAINERS SMALLER THAN NPS 2.
Q. IDENTIFY PIPING AS SPECIFIED IN DIVISION 23 SECTION "IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT."

3.4 HANGERS AND SUPPORTS
A. HANGER, SUPPORT, AND ANCHOR DEVICES ARE SPECIFIED IN DIVISION 23 SECTION "HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT," COMPLY WITH THE FOLLOWING REQUIREMENTS FOR MAXIMUM SPACING OF SUPPORTS.
B. INSTALL THE FOLLOWING PIPE ATTACHMENTS:
1. ADJUSTABLE STEEL CLEVIS HANGERS FOR INDIVIDUAL HORIZONTAL PIPING LESS THAN 10 FEET LONG.
2. ADJUSTABLE ROLLER HANGERS AND SPRING HANGERS FOR INDIVIDUAL HORIZONTAL PIPING 10 FEET OR LONGER.
3. PIPE ROLLER: MSS SP-58, TYPE 44 FOR MULTIPLE HORIZONTAL PIPING 10 FEET OR LONGER, SUPPORTED ON A TRAPEZE.
4. SPRING HANGERS TO SUPPORT VERTICAL RUNS.
5. PROVIDE COPPER-CLAD HANGERS AND SUPPORTS FOR HANGERS AND SUPPORTS IN DIRECT CONTACT WITH COPPER PIPE.
C. INSTALL HANGERS FOR STEEL PIPING WITH THE FOLLOWING MAXIMUM SPACING AND MINIMUM ROD SIZES:
1. NPS 3/4: MAXIMUM SPAN, 7 FEET. MINIMUM ROD SIZE, 1/4 INCH.
2. NPS 1: MAXIMUM SPAN, 7 FEET. MINIMUM ROD SIZE, 1/4 INCH.
3. NPS 1-1/2: MAXIMUM SPAN, 9 FEET. MINIMUM ROD SIZE, 3/8 INCH.
4. NPS 2: MAXIMUM SPAN, 10 FEET. MINIMUM ROD SIZE, 3/8 INCH.
D. INSTALL HANGERS FOR DRAWN-TEMPER COPPER PIPING WITH THE FOLLOWING MAXIMUM SPACING AND MINIMUM ROD SIZES:
1. NPS 3/4: MAXIMUM SPAN, 5 FEET. MINIMUM ROD SIZE, 1/4 INCH.
2. NPS 1: MAXIMUM SPAN, 6 FEET. MINIMUM ROD SIZE, 1/4 INCH.
3. NPS 1-1/2: MAXIMUM SPAN, 8 FEET. MINIMUM ROD SIZE, 3/8 INCH.
4. NPS 2: MAXIMUM SPAN, 8 FEET. MINIMUM ROD SIZE, 3/8 INCH.

3.5 PIPE JOINT CONSTRUCTION
A. JOIN PIPE AND FITTINGS ACCORDING TO THE FOLLOWING REQUIREMENTS AND DIVISION 23 SECTIONS SPECIFYING PIPING SYSTEMS.
B. REAM ENDS OF PIPES AND TUBES AND REMOVE BURRS. BEVEL PLAIN ENDS OF STEEL PIPE.
C. REMOVE SCALE, SLAG, DIRT, AND DEBRIS FROM INSIDE AND OUTSIDE OF PIPE AND FITTINGS BEFORE ASSEMBLY.
D. SOLDERED JOINTS: APPLY ASTM B 813, WATER-FLUSHABLE FLUX, UNLESS OTHERWISE INDICATED, TO TUBE END. CONSTRUCT JOINTS ACCORDING TO ASTM B 828 OR CDA'S "COPPER TUBE HANDBOOK," USING LEAD-FREE SOLDER ALLOY COMPLYING WITH ASTM B 32.
E. THREADED JOINTS: THREAD PIPE WITH TAPERED PIPE THREADS ACCORDING TO ASME B1.20.1. CUT THREADS FULL AND CLEAN USING SHARP DIES. REAM THREADED PIPE ENDS TO REMOVE BURRS AND RESTORE FULL ID. JOIN PIPE FITTINGS AND VALVES AS FOLLOWS:
1. APPLY APPROPRIATE TAPE OR THREAD COMPOUND TO EXTERNAL PIPE THREADS UNLESS DRY SEAL THREADING IS SPECIFIED.
2. DAMAGED THREADS: DO NOT USE PIPE OR PIPE FITTINGS WITH THREADS THAT ARE CORRODED OR DAMAGED. DO NOT USE PIPE SECTIONS THAT HAVE CRACKED OR OPEN WELDS.
F. WELDED JOINTS: CONSTRUCT JOINTS ACCORDING TO AWS D10.12, USING QUALIFIED PROCESSES AND WELDING OPERATORS ACCORDING TO PART 1 "QUALITY ASSURANCE" ARTICLE.
G. FLANGED JOINTS: SELECT APPROPRIATE GASKET MATERIAL, SIZE, TYPE, AND THICKNESS FOR SERVICE APPLICATION. INSTALL GASKET CONCENTRICALLY POSITIONED. USE SUITABLE LUBRICANTS ON BOLT THREADS.

3.6 HYDRONIC SPECIALTIES INSTALLATION
A. INSTALL AUTOMATIC AIR VENTS AT HIGH POINTS OF SYSTEM PIPING WHERE INDICATED AND SPECIFIED OR DETAILED. PROVIDE AND INSTALL MANUAL VENTS AT HEAT-TRANSFER COILS AND ELSEWHERE AS REQUIRED FOR AIR VENTING.

3.7 FIELD QUALITY CONTROL
A. PREPARE HYDRONIC PIPING ACCORDING TO ASME B31.9 AND AS FOLLOWS:
1. LEAVE JOINTS, INCLUDING WELDS, UNINSULATED AND EXPOSED FOR EXAMINATION DURING TEST.
2. PROVIDE TEMPORARY RESTRAINTS FOR EXPANSION JOINTS THAT CANNOT SUSTAIN REACTIONS DUE TO TEST PRESSURE. IF TEMPORARY RESTRAINTS ARE IMPRACTICAL, ISOLATE EXPANSION JOINTS FROM TESTING.
3. FLUSH HYDRONIC PIPING SYSTEMS WITH CLEAN WATER. THEN REMOVE AND CLEAN OR REPLACE STRAINER SCREENS.
4. ISOLATE EQUIPMENT FROM PIPING. IF A VALVE IS USED TO ISOLATE EQUIPMENT, ITS CLOSURE SHALL BE CAPABLE OF SEALING AGAINST TEST PRESSURE WITHOUT DAMAGE TO VALVE. INSTALL BLINDS IN FLANGED JOINTS TO ISOLATE EQUIPMENT.
5. INSTALL SAFETY VALVE, SET AT A PRESSURE NO MORE THAN ONE-THIRD HIGHER THAN TEST PRESSURE, TO PROTECT AGAINST DAMAGE BY EXPANDING LIQUID OR OTHER SOURCE OF OVERPRESSURE DURING TEST.
B. PERFORM THE FOLLOWING TESTS ON HYDRONIC PIPING:
1. USE AMBIENT TEMPERATURE WATER AS A TESTING MEDIUM UNLESS THERE IS RISK OF DAMAGE DUE TO FREEZING.
2. WHILE FILLING SYSTEM, USE VENTS INSTALLED AT HIGH POINTS OF SYSTEM TO RELEASE AIR. USE DRAINS INSTALLED AT LOW POINTS FOR COMPLETE DRAINING OF TEST LIQUID.
3. SUBJECT PIPING SYSTEM TO HYDROSTATIC TEST PRESSURE THAT IS NOT LESS THAN 1.5 TIMES THE SYSTEM'S WORKING PRESSURE. TEST PRESSURE SHALL NOT EXCEED MAXIMUM PRESSURE FOR ANY VESSEL, PUMP, VALVE, OR OTHER COMPONENT IN SYSTEM UNDER TEST. VERIFY THAT STRESS DUE TO PRESSURE AT BOTTOM OF VERTICAL RUNS DOES NOT EXCEED 90 PERCENT OF SPECIFIED MINIMUM YIELD STRENGTH OR 1.7 TIMES "SE" VALUE IN APPENDIX A IN ASME B31.9, "BUILDING SERVICES PIPING."
4. AFTER HYDROSTATIC TEST PRESSURE HAS BEEN APPLIED FOR AT LEAST 60 MINUTES, EXAMINE PIPING, JOINTS, AND CONNECTIONS FOR LEAKAGE. ELIMINATE LEAKS BY TIGHTENING, REPAIRING, OR REPLACING COMPONENTS, AND REPEAT HYDROSTATIC TEST UNTIL THERE ARE NO LEAKS.
5. PREPARE WRITTEN REPORT OF TESTING.
C. PERFORM THE FOLLOWING BEFORE OPERATING THE SYSTEM:
1. OPEN MANUAL VALVES FULLY.
2. INSPECT AIR VENTS AT HIGH POINTS OF SYSTEM AND DETERMINE IF ALL ARE INSTALLED AND OPERATING FREELY (AUTOMATIC TYPE), OR INLETS ARE COMPLETELY (MANUAL TYPE).
3. SET TEMPERATURE CONTROLS SO ALL COILS ARE CALLING FOR FULL FLOW.
4. INSPECT AND SET OPERATING TEMPERATURES OF HYDRONIC EQUIPMENT TO SPECIFIED VALUES.
5. VERIFY LUBRICATION OF MOTORS AND BEARINGS.

3.9 PIPE FLUSHING
A. FLUSH ALL NEW CHILLED WATER PIPING PRIOR TO CONNECTION TO EXISTING CHILLED WATER SYSTEM.
B. ISOLATE ALL NEW PIPING FROM THE EXISTING CHILLED WATER PIPING SYSTEM AND NEW BLOWER COIL UNIT COOLING COILS DURING FLUSHING TO PREVENT THE INTRUSION OF DEBRIS INTO THE EXISTING SYSTEM OR NEW COILS.
C. ALL NEW PIPING SHALL BE CAPPED TO PREVENT SAND AND DIRT FROM ENTERING THE PIPING BEFORE CONNECTION.
D. FILL NEW PIPING WITH FRESH WATER AND ADD LIQUID ALKALINE COMPOUND WITH EMULSIFYING AGENTS AND DETERGENTS TO REMOVE GREASE AND PETROLEUM PRODUCTS FROM PIPING. CIRCULATE SOLUTION FOR A MINIMUM OF 15 MINUTES FOR EACH NEW BRANCH PIPING SECTION, THEN DRAIN AND REFILL WITH FRESH WATER.
E. FLUSHING SHALL OCCUR AFTER THE INSTALLATION OF PIPING AND EQUIPMENT FOR EACH PHASE OF THE PROJECT.

239100 - DUCTWORK ACCESSORIES

1.1 GENERAL
A. SUMMARY
1. SECTION INCLUDES:
a. DAMPERS
b. FLEX DUCT TAKE-OFFS
B. QUALITY ASSURANCE
1. COMPLY WITH NFPA 90A, "INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS," AND WITH NFPA 90B, "INSTALLATION OF WARM AIR HEATING AND AIR CONDITIONING SYSTEMS."

1.2 PRODUCTS
A. MATERIALS
1. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" FOR ACCEPTABLE MATERIALS, MATERIAL THICKNESSES, AND DUCT CONSTRUCTION METHODS UNLESS OTHERWISE INDICATED. SHEET METAL MATERIALS SHALL BE FREE OF PITTING, SEAM MARKS, ROLLER MARKS, STAINS, DISCOLORATIONS, AND OTHER IMPERFECTIONS.
2. GALVANIZED SHEET STEEL: COMPLY WITH ASTM A 653.
a. GALVANIZED COATING DESIGNATION: G90.
b. EXPOSED-SURFACE FINISH: MILL PHOSPHATIZED.
3. ALUMINUM SHEETS: COMPLY WITH ASTM B 209, ALLOY 3003, TEMPER H14; WITH MILL FINISH FOR CONCEALED DUCTS AND STANDARD, 1-SIDE BRIGHT FINISH FOR EXPOSED DUCTS.
4. EXTRUDED ALUMINUM: COMPLY WITH ASTM B 221, ALLOY 6063, TEMPER T6.
B. DAMPERS
1. RECTANGULAR BACKDRAFT DAMPERS: ALUMINUM CONSTRUCTION, PARALLEL ACTION, SINGLE THICKNESS BLADES, FELT BLADE SEALS, 1 IN.W.G. MAXIMUM PRESSURE, 2,500 FPM MAXIMUM VELOCITY, 200 DEG F MAXIMUM TEMPERATURE, VERTICAL MOUNT HORIZONTAL AIRFLOW, SELF-LUBRICATING HEAVY DUTY NYLON BEARINGS, MILL FINISH.
2. ROUND BACKDRAFT DAMPERS: GALVANIZED STEEL HOUSING, ALUMINUM SPRING LOADED BUTTERFLY DAMPER BLADES, NEOPRENE GASKET, 2000 FPM MAXIMUM VELOCITY, 180 DEG F MAXIMUM TEMPERATURE, REQUIRES MAXIMUM OF 0.08 IN.W.G. TO OPEN.
3. ROUND VOLUME CONTROL DAMPERS: GALVANIZED STEEL HOUSING AND 20 GAUGE DAMPER BLADE, SYNTHETIC BEARINGS, ZINC PLATED STEEL SHAFT, LOCKING INDICATING QUADRANT REGULATOR, 2,000 FPM MAXIMUM VELOCITY, AND MAXIMUM DIFFERENTIAL PRESSURE OF 2 IN.W.G. MOUNT QUADRANT REGULATORS ON STAND-OFF MOUNTING BRACKETS FOR INSULATED DUCTS. DESIGN BASIS: YOUNG REGULATOR MODEL 5020R.
4. RECTANGULAR VOLUME CONTROL DAMPERS: ALUMINUM CONSTRUCTION, OPPOSED BLADE MANUAL DAMPER, SYNTHETIC BLADE BUSHINGS, STAINLESS STEEL SLIDE, AND A LOCKING INDICATING QUADRANT REGULATOR. WHERE ROD LENGTHS EXCEED 30 INCHES PROVIDE REGULATOR AT BOTH ENDS. MOUNT QUADRANT REGULATORS ON STAND-OFF MOUNTING BRACKETS FOR INSULATED DUCTS. DESIGN BASIS: YOUNG REGULATOR MODEL 828ALN.
5. ROUND MOTORIZED OUTDOOR AIR DAMPERS: GALVANIZED STEEL CONSTRUCTION WITH 20 GAUGE GALVANIZED STEEL DAMPER BLADE, AND EPDM RUBBER GASKET. ACTUATOR SHALL BE POWERED OPEN WITH SPRING RETURN TO THE CLOSED POSITION. ACTUATOR SHALL BE 120V POWERED AND HAVE A VISIBLE BLADE POSITION INDICATOR. PROVIDE ALL ACCESSORIES AND RELAYS TO CONTROL THE DAMPER AS DETAILED ON THE CONTRACT DRAWINGS. DESIGN BASIS: YOUNG REGULATOR MODEL RDTF.
6. RECTANGULAR MOTORIZED OUTDOOR AIR DAMPERS: ALUMINUM FRAME AND BLADE CONSTRUCTION AND STAINLESS STEEL SLIDE. ACTUATOR SHALL BE POWERED OPEN WITH SPRING RETURN TO THE CLOSED POSITION. ACTUATOR SHALL BE 120V POWERED AND HAVE A VISIBLE BLADE POSITION INDICATOR. PROVIDE ALL ACCESSORIES AND RELAYS TO CONTROL THE DAMPER AS DETAILED ON THE CONTRACT DRAWINGS. DESIGN BASIS: YOUNG REGULATOR MODEL 5OTF.
C. FLEX DUCT TAKE-OFFS
1. METAL DUCT TAKE-OFFS: GALVANIZED STEEL, RECTANGULAR, MITERED TAKE-OFF WHICH TRANSITIONS TO A ROUND COLLAR WITH BALANCING DAMPER. DAMPER SHALL HAVE A LOCKING INDICATING QUADRANT REGULATOR. MOUNT QUADRANT REGULATORS ON STAND-OFF MOUNTING BRACKETS FOR INSULATED DUCTS.

1.3 EXECUTION
A. GENERAL
1. INSTALL ACCESSORIES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. PROVIDE BALANCING DAMPERS AT POINTS ON LOW PRESSURE SUPPLY, RETURN, AND OUTSIDE AIR SYSTEMS WHERE BRANCHES ARE TAKEN FROM LARGER DUCTS AS REQUIRED FOR AIR BALANC

POWER

	SIMPLEX RECEPTACLE, 20 AMP, WITH FLUSH WALL OUTLET BOX.	a, f
	DUPLEX RECEPTACLE, 20 AMP, WITH FLUSH WALL OUTLET BOX.	a, f
	DOUBLE DUPLEX RECEPTACLE, 20 AMPS EACH, WITH TWO-GANG FLUSH WALL OUTLET BOX.	a, f
	SPECIAL PURPOSE RECEPTACLE, AS NOTED ON PLANS, WITH FLUSH WALL OUTLET BOX.	a, f
WPG	WEATHERPROOF GFI DUPLEX RECEPTACLE, 20 AMP, WITH CAST ALUMINUM BELL BOX AND USE IN COVER.	a, f
	SURFACE MOUNTED JUNCTION BOX AND BLANK PLATE. WALL MTD. OR MTD. TO CEILING/STRUCTURE AS INDICATED.	e, f, h, i
WP	SURFACE MOUNTED WEATHERPROOF JUNCTION BOX AND BLANK PLATE. WALL MTD. OR MTD. TO CEILING/STRUCTURE AS INDICATED.	f, h, i
	JUNCTION BOX AND BLANK PLATE. ABOVE CEILING.	e, f
	FLUSH CEILING JUNCTION BOX AND BLANK PLATE.	e, f
	FLUSH WALL JUNCTION BOX AND BLANK PLATE.	f
	MOTOR, AS NOTED.	j
	DISCONNECT SWITCH. REFER TO EQUIPMENT FEEDER SCHEDULE FOR REQUIREMENTS (I.E. SIZE, FUSED, NON-FUSED, ETC.)	h, j
	MAGNETIC MOTOR STARTER OR CONTACTOR, AS NOTED.	h, j
VFD	VARIABLE FREQUENCY DRIVE. COORDINATE WITH DIVISION 15.	h, j
	120V CONNECTION TO MOTORIZED DAMPER. COORDINATE WITH DIVISION 15.	
	THERMOSTAT CONNECTION. PROVIDE AND INSTALL WALL OUTLET BOX AND RACEWAY AS REQUIRED BY DIVISION 15.	c, d
	CONTROL AND/OR POWER EQUIPMENT CONNECTION.	j
	RELAY. COIL VOLTAGE = 24VAC OR 120VAC, TYPE AS INDICATED ON DRAWINGS. (NO) = NORMALLY OPEN. (NC) = NORMALLY CLOSED.	
	120/208V BRANCH CIRCUIT PANELBOARD. FLUSH MOUNTED.	j
	120/208V BRANCH CIRCUIT PANELBOARD. SURFACE MOUNTED.	h, j
	277/480V BRANCH CIRCUIT PANELBOARD. SURFACE MOUNTED.	h, j
	TRANSFORMER. PAD MOUNTED (PROVIDE 4" CONCRETE HOUSEKEEPING PAD FOR ALL INDOOR APPLICATIONS.)	j
SPD	TRANSIENT VOLTAGE SURGE SUPPRESSION DEVICE.	
	BRANCH CIRCUIT CONDUIT CONCEALED ABOVE CEILING OR IN WALL. MINIMUM TWO CONDUCTORS PLUS GROUND. REFER TO SPECIFICATIONS AND EQUIPMENT FEEDER SCHEDULE FOR CONDUCTOR REQUIREMENTS. ARROWS INDICATE CIRCUIT CONNECTIONS AND HOMERUNS TO PANEL AS INDICATED ON PLANS. TYPICAL FOR ALL RACEWAY TYPES, U.O.N.	
	BRANCH CIRCUIT CONDUIT CONCEALED BELOW SLAB OR UNDERGROUND.	
	BRANCH CIRCUIT CONDUIT EXPOSED.	
	CONDUIT CONTINUED.	
	CONDUIT CAPPED OFF.	
	CONDUIT RUN UP.	
	CONDUIT RUN DOWN.	

FIRE ALARM

	SMOKE DETECTOR. CEILING SURFACE MOUNTED.	
	DUCT MOUNTED SMOKE DETECTOR. (S = SUPPLY; R = RETURN)	
R	OUTPUT CONTROL RELAY	
AH R	OUTPUT CONTROL RELAY "AIR HANDLING CONTROL"	
AIM	ADDRESSABLE INPUT MONITOR MODULE	
AOM	ADDRESSABLE OUTPUT MODULE/RELAY	

SYMBOL LEGEND NOTES:

1. THE COLOR OF ALL DEVICES SHALL BE SELECTED BY THE ARCHITECT. COVER PLATES SHALL BE UNBREAKABLE NYLON, STANDARD SIZE, UNLESS OTHERWISE NOTED.
2. SCREENED ELECTRICAL ITEM DENOTES EXISTING. DASHED ELECTRICAL ITEM IS TO BE REMOVED.
3. "R" BY DEVICE DENOTES EXISTING TO BE REMOVED COMPLETELY.
4. "H" BY DEVICE DENOTES DEVICE TO BE MOUNTED HORIZONTALLY.
5. ALL DIMENSIONS INDICATED ARE TO THE BOTTOM OF FIXTURE, OUTLET, OR EQUIPMENT AND SHALL BE THE DIMENSIONS USED UNLESS INDICATED OTHERWISE ON THE DRAWINGS. DIMENSIONS INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS ARE TO THE BOTTOM OF THE FIXTURE, OUTLET, OR EQUIPMENT UNLESS INDICATED OTHERWISE. ALL MOUNTING HEIGHTS SHALL COMPLY WITH ADA REQUIREMENTS. VERIFY AND COORDINATE THE EXACT HEIGHT AND LOCATION OF ALL FIXTURES, OUTLETS, AND EQUIPMENT WITH ALL DOCUMENTS AND DISCIPLINES (I.E., ARCHITECTURAL, STRUCTURAL, HVAC, PLUMBING, FIRE PROTECTION, KITCHEN EQUIPMENT, MILLWORK, ETC.) PRIOR TO ROUGH-IN. ADJUST TO MEET ALL REQUIREMENTS.
6. ALL SYMBOLS INDICATED IN THIS LEGEND MAY NOT BE USED ON THE PLANS.
7. ALL WIRING DEVICES SHALL BE PROVIDED WITH A GROUNDING TERMINAL SCREW.
8. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
9. U.O.N. = UNLESS OTHERWISE NOTED.
10. A.H.J. = AUTHORITY HAVING JURISDICTION.
11. A.F.F. = ABOVE FINISHED FLOOR.
12. ELECTRICAL CONTRACTOR TO PROVIDE PULL STRINGS IN ALL EMPTY CONDUIT(S).

REMARKS:

a. MOUNTED 18" ABOVE FINISHED FLOOR TO THE BOTTOM.
b. MOUNTED 44" ABOVE FINISHED FLOOR TO THE BOTTOM.
c. MOUNTED 50" ABOVE FINISHED FLOOR TO THE BOTTOM.
d. OUTLET BOX SHALL BE SIZED PER SYSTEM INSTALLERS REQUIREMENTS.
e. SUPPORT OUTLET BOX FROM STRUCTURE WITH (1) 3/8" ALL THREADS MINIMUM. BOXES LARGER THAN 25" SQUARE INCHES SHALL BE SUPPORTED WITH (2) 3/8" ALL THREADS MINIMUM.
f. JUNCTION/OUTLET BOX SHALL BE SIZED AS REQUIRED FOR CONDUCTOR/DEVICES FILL PER N.E.C.
g. THREADED CONDUIT HUBS SHALL BE SIZED AND CONFIGURED AS REQUIRED FOR APPLICATION.
h. PROVIDE KINDORF MOUNTING RACK FOR FREE STANDING APPLICATIONS. KINDORF SHALL BE PAINTED FOR EXTERIOR APPLICATIONS.
i. WHEN SURFACE JUNCTION BOX SYMBOL IS COMBINED WITH DEVICE SYMBOL, PROVIDE APPROPRIATE SURFACE PLATE FOR OUTLET APPLICATION.
j. MAINTAIN WORKING CLEARANCES IN STRICT ACCORDANCE WITH N.E.C. COORDINATE EXACT LOCATION OF EQUIPMENT WITH ALL DISCIPLINES (I.E. ARCHITECTURAL, STRUCTURAL, HVAC, PLUMBING, FIRE PROTECTION, KITCHEN EQUIPMENT, MILLWORK, ETC.) PRIOR TO ROUGH-IN TO MAINTAIN CLEARANCES.
k. "NL" INDICATES FIXTURE CONNECTED AHEAD OF ALL SWITCHES FOR 24 HOUR NIGHTLIGHT OPERATION.
l. MOUNTED 80" ABOVE FINISHED FLOOR TO BOTTOM.
m. ALL STROBES SHALL BE ADJUSTABLE INTENSITY TYPE SET AT 75cd UNLESS OTHERWISE NOTED.
n. MOUNTED 72" ABOVE FINISHED FLOOR TO THE TOP.

GENERAL NOTES

1. ALL 120V, 20A CIRCUIT HOMERUNS OVER 50FT. SHALL BE #10 CU. MINIMUM, UNLESS NOTED OTHERWISE.
2. ALL 120V, 20A CIRCUIT HOMERUNS OVER 150FT. SHALL BE #8 CU. MINIMUM, UNLESS NOTED OTHERWISE.
3. ALL 277V, 20A CIRCUIT HOMERUNS OVER 150FT. SHALL BE #10 CU MINIMUM, UNLESS NOTED OTHERWISE.
4. ALL 277V, 20 A CIRCUIT HOMERUNS OVER 300FT. SHALL BE #8 CU MINIMUM, UNLESS NOTED OTHERWISE.
5. ALL BRANCH CIRCUIT CONDUCTORS WILL BE SIZED PER NEC MINIMUM THE MINIMUM ALLOWABLE BRANCH CIRCUIT CONDUCTOR SIZE IS #12 AWG COPPER. INCREASE CONDUCTOR SIZE FOR APPLICATION PER NEC AND AS NOTED ON THE PLANS.
6. CONDUCTOR SIZES INDICATED ON CIRCUIT HOMERUNS OR IN SCHEDULES SHALL BE INSTALLED OVER THE ENTIRE LENGTH OF THE CIRCUIT UNLESS OTHERWISE NOTED ON THE DRAWINGS.
7. UP TO THREE PHASE CONDUCTORS, CORRESPONDING SWITCHLEGS AND NEUTRALS ARE ALLOWED IN THE SAME RACEWAY UNLESS INDICATED OTHERWISE ON THE DRAWINGS. DO NOT COMBINE HOMERUNS.
8. PROVIDE AN EQUIPMENT GROUNDING CONDUCTOR IN ALL FEEDERS AND BRANCH CIRCUITS.
9. COMPLY WITH ARTICLE 210 OF THE NEC. PROVIDE A DEDICATED NEUTRAL FOR ALL 120V AND 277V CIRCUITS OR PROVIDE CIRCUIT BREAKER HANDLE TIES TO CONNECT POLES SERVING MULTI-WIRE CIRCUITS.
10. VERIFY EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL INSTALLER PRIOR TO ROUGH-IN.
11. COORDINATE THE REQUIRED SIZE OF ALL CIRCUIT BREAKERS FEEDING EQUIPMENT, (I.E. MOTORS, HVAC, E.T.C.) WITH APPROVED EQUIPMENT SHOP DRAWINGS AND OWNER REPRESENTATIVES PRIOR TO ORDERING PANELBOARDS. BREAKERS SHALL BE SIZED PER THE NEC, THE EQUIPMENT NAME PLATE AND MANUFACTURERS RECOMMENDATIONS.
12. THE USE OF ANY PROCESS INVOLVING ASBESTOS OR PCB, AND THE INSTALLATION OF ANY PRODUCT, INSULATION, COMPOUND OF MATERIAL CONTAINING OR INCORPORATING ASBESTOS OR PCB, IS PROHIBITED. THE REQUIREMENTS OF THIS SPECIFICATION FOR A COMPLETE AND PROPERLY OPERATING ELECTRICAL SYSTEM SHALL BE MET WITHOUT THE USE OF ASBESTOS OR PCB.
13. VISIT THE EXISTING FACILITY AND CAREFULLY EXAMINE THOSE PORTIONS OF THE BUILDING AND SITE AFFECTED BY THIS WORK BEFORE SUBMITTING PROPOSALS, SO AS TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT EXECUTION OF THE WORK. SUBMISSION OF A PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH EXAMINATION HAS BEEN MADE AND LATER CLAIMS FOR LABOR, EQUIPMENT OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WILL NOT BE RECOGNIZED.
14. CONTRACTOR SHALL INCLUDE IN HIS BID THE TRANSPORT AND DISPOSAL OR RECYCLING OF ALL WASTE MATERIALS GENERATED BY THIS PROJECT IN ACCORDANCE WITH ALL RULES, REGULATIONS AND GUIDELINES APPLICABLE.
15. EXISTING CONDITIONS AND UTILITIES INDICATED ARE TAKEN FROM EXISTING CONSTRUCTION DOCUMENTS, VARIOUS SURVEYS AND FIELD INVESTIGATIONS. IT IS TO BE UNDERSTOOD THAT UNFORESEEN CONDITIONS PROBABLY EXIST AND NEW WORK MAY NOT BE FIELD LOCATED EXACTLY AS SHOWN ON THE DRAWINGS. COOPERATION WITH OTHER TRADES IN ROUTING AS DETERMINED DURING CONSTRUCTION AND AS DIRECTED BY THE ENGINEER MAY BE NECESSARY AND IT IS INTENDED THAT SUCH DEVIATIONS SHALL BE CONSIDERED A PART OF THIS CONTRACT. IT IS ALSO UNDERSTOOD THAT THE PLANS ARE NOT COMPLETELY TO SCALE. THE CONTRACTOR IS TO FIELD VERIFY DIMENSIONS OF ALL EXISTING CONDITIONS PRIOR TO BID AND INCLUDE ANY DEVIATIONS IN THE CONTRACT.
16. LOCATE ALL EXISTING UTILITIES AND PROTECT THEM FROM DAMAGE.
17. REMOVE EXISTING POWER, LIGHTING, SYSTEMS MATERIALS AND EQUIPMENT WHICH ARE MADE OBSOLETE OR WHICH INTERFERE WITH THE CONSTRUCTION OF THE PROJECT. REINSTALL ANY SUCH POWER LIGHTING, SYSTEMS MATERIALS AND EQUIPMENT WHICH ARE REQUIRED TO REMAIN ACTIVE FOR THE FACILITY TO BE FULLY FUNCTIONAL.
18. ALL RECEPTACLES, DEVICES, LIGHTING, SYSTEMS AND EQUIPMENT NOT SHOWN, AND IN AREAS OUTSIDE OF REMODELING SHALL REMAIN ACTIVE UNLESS OTHERWISE NOTED. FURNISH AND INSTALL ACCESSIBLE JUNCTION BOXES AND REWORK EXISTING CIRCUITS AS REQUIRED TO MAINTAIN CIRCUIT CONTINUITY TO RECEPTACLES, DEVICES, LIGHTING, SYSTEMS AND EQUIPMENT.
19. ALL CONDUIT TO BE CONCEALED UNLESS IMPOSSIBLE DUE TO EXISTING CONDITIONS (I.E. EXPOSED STRUCTURAL CEILINGS OR BUILDING EXTERIOR WALLS). CONCEAL ALL CONDUITS ABOVE CEILINGS OR WITHIN WALLS AND COUNTERS.
    A. ALL NEW DEVICES TO BE FLUSH MOUNTED UNLESS SPECIFICALLY NOTED OTHERWISE.
    B. INSTALL FLEXIBLE CONDUIT DOWN EXISTING WALLS TO NEW FLUSH OUTLETS. (IF EXISTING WALLS DO NOT CONTAIN HOLLOW VERTICAL CAVITIES AND IT IS NOT FEASIBLE TO CONCEAL THE CONDUIT THEN EXPOSED WIREMOLD PAINTED TO MATCH THE WALL SHALL BE USED.)
20. ALL ITEMS REMOVED AND NOT REUSED SHALL BE TURNED OVER TO OWNER. DISCARD COMPLETE ITEMS WHICH OWNER ELECTS TO REFUSE.
21. PROVIDE TEMPORARY WIRING AND CONNECTIONS TO MAINTAIN EXISTING SYSTEMS IN SERVICE DURING CONSTRUCTION. WHEN WORK MUST BE PERFORMED ON ENERGIZED EQUIPMENT OR CIRCUITS, USE PERSONNEL EXPERIENCED IN SUCH OPERATIONS AND USE APPROPRIATE PERSONNEL PROTECTION EQUIPMENT. FOLLOW ALL SAFETY PROCEDURES INCLUDED IN NFPA 70E.
22. MAINTAIN EXISTING ELECTRICAL SYSTEM IN SERVICE UNTIL NEW SYSTEM IS COMPLETE AND READY FOR SERVICE. DISABLE SYSTEM ONLY TO MAKE SWITCHOVERS AND CONNECTIONS. OBTAIN PERMISSION FROM OWNER AT LEAST 72 HOURS BEFORE PARTIALLY OR COMPLETELY DISABLING SYSTEM. MINIMIZE OUTAGE DURATION.
23. REMOVE EXPOSED ABANDONED CONDUIT, INCLUDING ABANDONED CONDUIT ABOVE ACCESSIBLE CEILING FINISHES.
24. CLEAN AND REPAIR EXISTING MATERIALS AND EQUIPMENT WHICH REMAIN OR ARE TO BE REUSED.
25. EXISTING PANELBOARDS. CLEAN EXPOSED SURFACES AND CHECK TIGHTNESS OF ELECTRICAL CONNECTIONS. REPLACE DAMAGED CIRCUIT BREAKERS AND PROVIDE CLOSURE PLATES FOR VACANT POSITIONS. PROVIDE TYPED CIRCUIT DIRECTORY SHOWING REVISED CIRCUITING ARRANGEMENT.
26. ALL NEW CIRCUIT BREAKERS WITHIN EACH EXISTING PANELBOARD SHALL BE THE SAME MANUFACTURER TYPE, STYLE AND A.I.C. RATING OF EXISTING PANELBOARD.
27. SCREENED ELECTRICAL INDICATES EXISTING TO REMAIN ACTIVE, UNLESS NOTED OTHERWISE.
28. ALL CONDUIT AND WIRE REMOVED SHALL BE TAKEN BACK TO THE SOURCE OF SUPPLY.
29. WHERE EXISTING EQUIPMENT OR MATERIALS ARE REMOVED OR CHANGED, ALL BRANCH CONDUITS, WHICH NO LONGER ARE IN SERVICE, SHALL BE REMOVED AS DIRECTED BY THE ARCHITECT. ALL BUILDING SURFACES DAMAGED, AND OPENINGS LEFT BY REMOVAL OF PIPING OR OTHER EQUIPMENT SHALL BE REPAIRED BY THE CONTRACTOR. ALL HOLES LEFT IN JUNCTION BOXES, SWITCHES, PANELS, ETC. SHALL BE CLOSED.
30. WHERE NEW OPENINGS ARE CUT IN EXISTING WALLS, FLOORS OR CEILINGS AND CONCEALED CONDUITS ARE ENCOUNTERED THEY SHALL BE REMOVED OR RELOCATED AS REQUIRED. WHERE CONDUIT TO BE REMOVED STUBS THROUGH FLOORS, WALLS AND CEILINGS, SUCH CONDUIT SHALL BE REMOVED TO THE POINT WHERE THE FINISH SURFACES CAN BE PATCHED ADEQUATELY SO THAT NO EVIDENCE OF THE FORMER INSTALLATION REMAINS.
31. CIRCUITING AND PANELS SHOWN ARE TAKEN FROM EXISTING CONSTRUCTION DRAWINGS, VARIOUS SURVEYS, AND FIELD INVESTIGATIONS OF READILY OBSERVABLE CONDITIONS. IT IS UNDERSTOOD THAT THE INSTALLED (CONCEALED) CIRCUITING MAY DIFFER FROM THE CONDITIONS SHOWN. THE ELECTRICAL CONTRACTOR SHALL TRACE ALL EXISTING CIRCUITS IN EXISTING PANELS ASSOCIATED WITH THIS SCOPE OF WORK AND UPDATE THE EXISTING PANEL SCHEDULE AS NEEDED. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
32. TEST FIRE ALARM SYSTEM AFTER ALL DEVICES HAVE BEEN RECONNECTED TO ENSURE SYSTEM FUNCTIONALITY. PROVIDE TEST REPORTS TO OWNER UPON COMPLETION.

DIV. 26 - ELECTRICAL SPECIFICATIONS

260500 BASIC ELECTRICAL REQUIREMENTS

A) ALL WORK AND EQUIPMENT UNDER THIS DIVISION SHALL BE IN STRICT COMPLIANCE WITH THE APPLICABLE PROVISIONS OF THE FOLLOWING CODES AND STANDARDS:

1. LIFE SAFETY CODE - NFPA 101
2. UNDERWRITERS LABORATORIES, INC. PUBLICATIONS
3. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
4. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
5. NATIONAL ELECTRICAL CODE - NFPA 70 - 2017 EDITION
6. INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)
7. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)
8. INTERNATIONAL POWER CABLE ENGINEER'S ASSOCIATION (IPECAC)
9. NATIONAL ELECTRICAL SAFETY CODE
10. REQUIREMENTS OF LOCAL POWER CORPORATION
11. AMERICANS WITH DISABILITIES ACT (ADA)
12. FLORIDA BUILDING CODE - 7th EDITION - 2020
13. LOCAL CITY AND COUNTY CODES

B) ALL MATERIALS SHALL BE NEW, FREE FROM DEFECTS AND SHALL BE EITHER UL LABELED, UL LISTED OR BEAR THE SEAL OF A NATIONALLY RECOGNIZED ELECTRICAL TESTING LABORATORY.

C) THE WORK REQUIRED UNDER THIS DIVISION SHALL INCLUDE ALL MATERIALS, LABOR AND AUXILIARIES REQUIRED TO INSTALL A COMPLETE AND PROPERLY OPERATING ELECTRICAL SYSTEM.

D) THE CONTRACTOR SHALL FURNISH, PERFORM, OR PROVIDE ALL LABOR INCLUDING PLANNING, PURCHASING, TRANSPORTING, STORING, INSTALLING, TESTING, CUTTING AND PATCHING, TRENCHING, EXCAVATING, BACKFILLING, COORDINATION, FIELD VERIFICATION, EQUIPMENT INSTALLATION AND SAFETY), SUPPLIES AND MATERIALS NECESSARY FOR THE CORRECT INSTALLATION OF COMPLETE ELECTRICAL SYSTEMS (AS DESCRIBED OR IMPLIED BY THESE SPECIFICATIONS AND THE APPLICABLE DRAWINGS) IN STRICT ACCORDANCE WITH APPLICABLE CODES, WHICH MAY NOT BE REPEATED IN THESE SPECIFICATIONS, BUT ARE EXPECTED TO BE COMMON KNOWLEDGE OF QUALIFIED BIDDERS. PRIOR TO SAW CUTTING OR CORE DRILLING, THE AREA SHALL BE CERTIFIED CLEAR OF EMBEDDED ELECTRICAL WIRING.

E) THE SPECIFICATIONS (DIVISION 26) AND CONTRACT DOCUMENTS REFERS TO WORK REQUIRED IN ADDITION TO (OR ABOVE) THE MINIMUM REQUIREMENTS OF THE NEC AND APPLICABLE LOCAL CODES. ALL WORK SHALL COMPLY WITH ALL APPLICABLE CODES AS A MINIMUM AND WITH THE ADDITIONAL REQUIREMENTS CALLED FOR IN THESE CONTRACT DOCUMENTS (PLANS AND SPECS).

F) SPECIAL REQUIREMENTS: SUBMIT TECHNICAL INFORMATION ON ALL EQUIPMENT. MARK UP PRINTS OF THE DESIGN DRAWINGS WITH RED PENCIL SHOWING AN ACCURATE "AS-BUILT" RECORD OF THE ENTIRE SYSTEM. TEST EACH ITEM OF EQUIPMENT.

260519 BUILDING WIRE AND CABLE

A) ALL BRANCH CIRCUITS SHALL BE COPPER WITH THWN/THHN INSULATION. MINIMUM SIZE #12 AWG.

B) FEEDERS SHALL BE THWN/THHN STRANDED COPPER. SEE FEEDER SCHEDULE FOR ADDITIONAL DETAILS.

C) COLOR CODING SHALL COMPLY WITH THE APPLICABLE NATIONAL ELECTRICAL CODE FOR GROUNDED CONDUCTORS. PHASE CONDUCTORS SHALL BE BLACK, RED, BLUE FOR 120/208V SYSTEMS AND BROWN, ORANGE, YELLOW FOR 277/480V SYSTEMS.

D) ALL FEEDERS AND BRANCH CIRCUITS SHALL BE PROVIDED WITH AN EQUIPMENT GROUNDING CONDUCTOR.

E) INTERIOR LOCATIONS:

ALL (NON-ELECTRONIC SYSTEMS) COPPER TAPS AND SPLICES IN #6 AWG AND SMALLER SHALL BE FASTENED TOGETHER BY MEANS OF SPRING TYPE WIRE NUT CONNECTORS. ALL COPPER TAPS AND SPLICES LARGER THAN #8 AWG SHALL BE MADE WITH COMPRESSION TYPE CONNECTORS OR SPLIT BOLT CONNECTORS AND PROVIDED WITH INSULATION EQUAL TO THE CONDUCTOR INSULATION.

F) CONDUCTOR INSULATION AND MULTI-CONDUCTOR CABLE APPLICATIONS AND WIRING METHODS:

1. FEEDER AND BRANCH CIRCUIT:

   TYPE THWN/THHN, SINGLE CONDUCTORS IN RACEWAY.

2. CLASS 1 CONTROL CIRCUITS:

   TYPE THWN/THHN, IN RACEWAY.

3. CLASS 2 CONTROL CIRCUITS:

   TYPE THWN, THHN, IN RACEWAY.

260529 SUPPORTING DEVICES

A) ALL EQUIPMENT SHALL BE FIRMLY MOUNTED USING APPROVED HANGERS ATTACHED TO STRUCTURAL PORTIONS OF THE BUILDING.

B) SUPPORTING WITH TIE WIRE IS PROHIBITED.

260533 RACEWAYS AND OUTLET BOXES

A) ALL WIRING SHALL BE INSTALLED IN APPROPRIATE RACEWAY SYSTEMS OF RIGID GALVANIZED CONDUIT, ELECTRICAL METALLIC TUBING, SCHEDULE 40 PVC, FLEXIBLE STEEL CONDUIT AND LIQUID-TITE FLEXIBLE CONDUIT AS CONDITIONS AND CODE DICTATE. EMT SHALL BE JOINED WITH STEEL SET SCREW TYPE FITTINGS. PVC SHALL BE USED BELOW GRADE OR IN SLABS ONLY.

B) ALL CONDUIT SHALL HAVE AN INSULATED COPPER EQUIPMENT GROUNDING CONDUCTOR THROUGHOUT THE ENTIRE LENGTH OF CIRCUIT WITHIN CONDUIT.

C) MINIMUM CONDUIT SIZE TO BE 1/2"C.

D) ALL PENETRATIONS THROUGH FIRE RESISTANCE RATED PARTITIONS AND OTHER ASSEMBLIES, INCLUDING EMPTY OPENINGS AND OPENINGS CONTAINING CABLES, CONDUITS AND OTHER PENETRATING ITEMS, SHALL BE FIRE-STOPPED TO PRESERVE THE FIRE RESISTANCE RATING OF THE ASSEMBLY. FIRE-STOPPING SHALL COMPLY WITH THE FOLLOWING:

1. COMPATIBILITY: PROVIDE FIRESTOPPING COMPOSED OF COMPONENTS THAT ARE COMPATIBLE WITH EACH OTHER, THE SUBSTRATES FORMING OPENINGS, AND THE ITEMS, IF ANY, PENETRATING THE FIRESTOPPING UNDER CONDITIONS OF SERVICE AND APPLICATION, AS DEMONSTRATED BY FIRESTOPPING MANUFACTURER BASED ON TESTING AND FIELD EXPERIENCE.
2. FIRESTOPPING SHALL BE LISTED IN THE UNDERWRITERS LABORATORIES FIRE RESISTANCE DIRECTORY AND INSTALLATION SHALL BE IDENTICAL TO THAT SHOWN IN THE DIRECTORY.

E) OUTLET BOXES SHALL BE GALVANIZED STEEL. BOXES SHALL BE 4" SQUARE AND 1-1/2" DEEP GENERALLY. LARGER BOXES WILL BE USED AS REQUIRED BY CODE. DO NOT INSTALL FLUSH MOUNTED BOXES BACK-TO-BACK IN WALLS.

F) INSTALL BOXES TO PRESERVE FIRE RESISTANCE RATING OF PARTITIONS AND OTHER ELEMENTS.

260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

A) PROVIDE WIRE MARKERS FOR NEW CONDUCTORS AT ALL PANELBOARDS, JUNCTION BOXES, WIREWAYS, ETC.

B) IDENTIFY ALL OUTLET AND JUNCTION BOXES WITH PERMANENT BLACK MARKER INDICATING PANEL AND CIRCUIT NUMBER, OR TYPE OF SYSTEMS (FIRE ALARM, TELECOMM, ETC.).

C) PROVIDE PHENOLIC NAMEPLATES FOR ALL NEW EQUIPMENT TO MATCH EXISTING EQUIPMENT IN ELECTRICAL ROOM.

264313 SURGE PROTECTION DEVICES

A) A COMPLETE SURGE SUPPRESSION SYSTEM SHALL BE PROVIDED FOR THE PROTECTION OF BUILDING ELECTRICAL AND ELECTRONIC SYSTEMS FROM THE EFFECTS OF LINE INDUCED TRANSIENT VOLTAGE SURGE AND LIGHTNING DISCHARGE. EACH ELECTRICAL SERVICE PANEL OR SWITCHBOARD AND BRANCH PANEL SHALL BE EQUIPPED AS NOTED ON THE DRAWINGS. SURGE DEVICES SHALL BE DESIGNED FOR THE SPECIFIC VOLTAGE, PHASES, AND ENVIRONMENT OF THE EQUIPMENT BEING PROTECTED, LISTED AND LABELED BY UNDERWRITERS LABORATORIES AND INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NFPA CODES INCLUDING NFPA 780 AND NFPA 70. PROTECTION SHALL ALSO BE PROVIDED FOR FIRE ALARM EQUIPMENT AND CONDUCTORS AS WELL AS COMMUNICATIONS AND CONTROL WIRING IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURERS INSTRUCTIONS FOR SURGE PROTECTION.

B) ALL PRODUCTS SHALL BE MANUFACTURED BY ONE OF THE FOLLOWING:

1. PQ PROTECTION
2. SQUARE D, SCHNEIDER ELECTRIC
3. SURGE SUPPRESSION INC.

HOUSEMAN
ARCHITECTURE
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DAYTONA STATE COLLEGE

AHU REPLACEMENT

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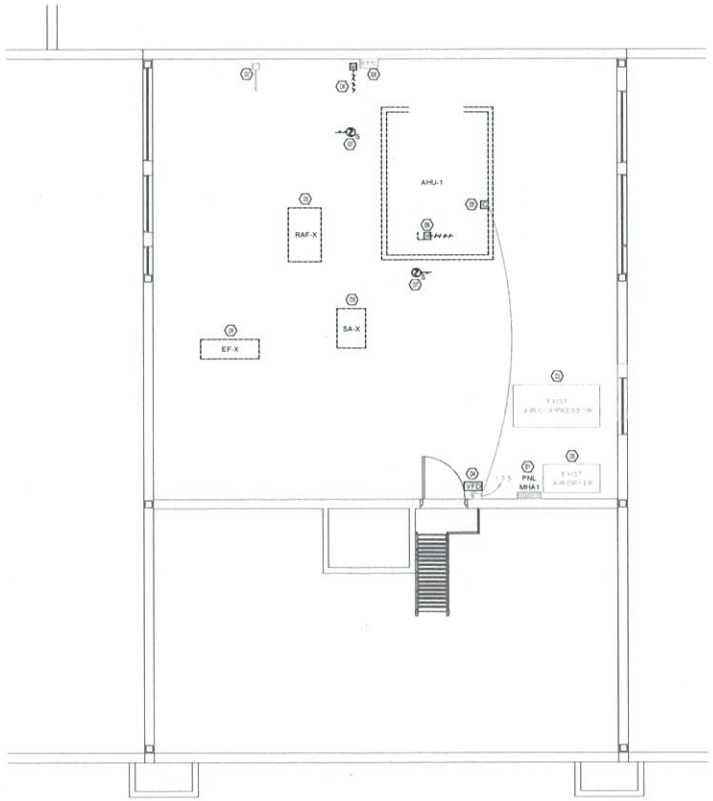
SHEET NAME:

SYMBOL LEGEND, GENERAL NOTES, AND SPECIFICATIONS - ELECTRICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

SHEET NO: E0.001



1 E0.010 **DEMOLITION FLOOR PLAN - BUILDING A - ELECTRICAL**
1/4"=1'-0"

GENERAL NOTES

1. SCREENED ELECTRICAL ITEM IS EXISTING TO REMAIN
2. BOLD AND DASHED ELECTRICAL ITEM IS TO BE REMOVED

REFERENCE NOTES

01 EXISTING PANELBOARD TO REMAIN

02 EXISTING MOTORIZED DAMPER TO REMAIN

03 EXISTING COMPRESSED AIR EQUIPMENT TO REMAIN.

04 EXISTING DISCONNECT SWITCH FOR AIR HANDLING UNIT "AHU-1" IS TO REMAIN

05 EXISTING AIR HANDLING UNIT "AHU-1" TO BE REMOVED. DISCONNECT UNIT AND REMOVE CONDUCTORS TO SOURCE. CUT BACK EXPOSED CONDUIT TO BEHIND FIRST 90 DEGREE ELBOW. EXISTING CONDUIT TO BE EXTENDED DURING RENOVATION.

06 DISCONNECT MOTORIZED DAMPER. DEVICE TO BE REMOVED BY MECHANICAL INSTALLER. MAINTAIN CONDUIT AND CIRCUITRY FOR CONNECTION OF NEW DURING RENOVATION.

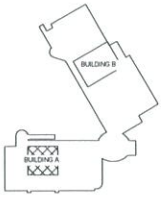
07 DISCONNECT DUCT MOUNTED SMOKE DETECTOR. DEVICE TO BE REMOVED BY MECHANICAL INSTALLER. MAINTAIN CONDUIT AND CIRCUITRY FOR CONNECTION OF NEW DURING RENOVATION.

08 EXISTING BMS CONTROL PANEL TO REMAIN

09 DISCONNECT EXISTING HVAC EQUIPMENT. EQUIPMENT TO BE REMOVED BY MECHANICAL INSTALLER TO FACILITATE REMOVAL OF "AHU-1". MAINTAIN EXISTING CIRCUITRY FOR RECONNECTION DURING RENOVATION. FIELD VERIFY SOURCE OF POWER.

10 DISCONNECT EXISTING VARIABLE FREQUENCY DRIVE FOR AIR HANDLING UNIT "AHU-1" AND REMOVE ALL CONDUCTORS TO SOURCE. MAINTAIN CONDUIT FOR CONNECTION OF NEW DURING RENOVATION.

GRAPHIC SCALE
0 1 2 4'



KEY PLAN

HOUSEMAN
ARCHITECTURE
931 S. SEMORAN BLVD. #094B WINTER PARK, FL 32792
321-972-6446 ARIZONA LICENSE NO. 74110

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

1155 Ce Rd 4139, DeLand, FL 32724

SHEET NAME:
DEMOLITION FLOOR PLAN - BUILDING A - ELECTRICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

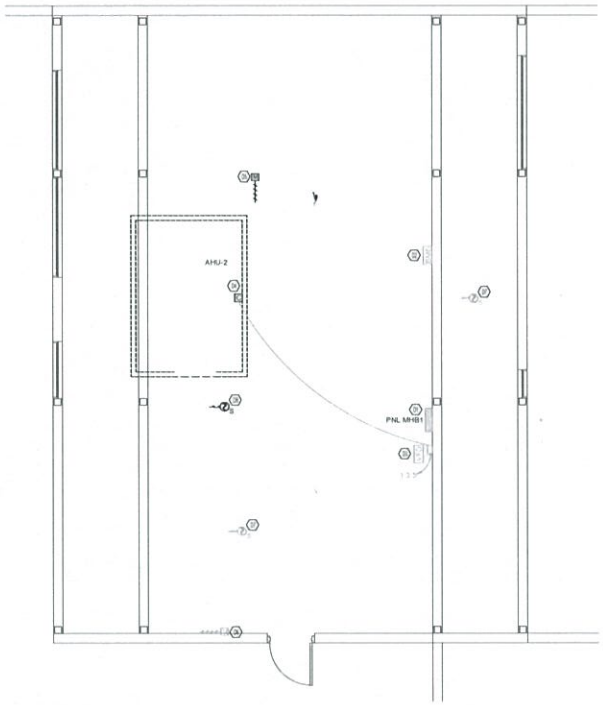
SHEET NO: E0.010

GENERAL NOTES

1. SCREENED ELECTRICAL ITEM IS EXISTING TO REMAIN.
2. BOLD AND DASHED ELECTRICAL ITEM IS TO BE REMOVED.

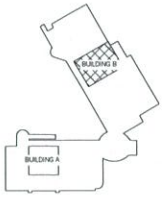
REFERENCE NOTES

01. EXISTING PANELBOARD TO REMAIN.
02. EXISTING BMS CONTROL PANEL TO REMAIN.
03. EXISTING DISCONNECT SWITCH FOR AIR HANDLING UNIT "AHU-2" IS TO REMAIN.
04. EXISTING AIR HANDLING UNIT "AHU-2" TO BE REMOVED. DISCONNECT UNIT AND REMOVE ALL CONDUCTORS TO SOURCE. CUT BACK EXPOSED CONDUIT TO BEHIND FIRST 90 DEGREE ELBOW. EXISTING CONDUIT TO BE EXTENDED DURING RENOVATION.
05. DISCONNECT MOTORIZED DAMPER. DEVICE TO BE REMOVED BY MECHANICAL INSTALLER. MAINTAIN CONDUIT AND CIRCUITRY FOR CONNECTION OF NEW DURING RENOVATION.
06. EXISTING MOTORIZED DAMPER TO REMAIN.
07. EXISTING DUCT MOUNTED SMOKE DETECTOR TO REMAIN.
08. DISCONNECT EXISTING VARIABLE FREQUENCY DRIVE FOR AIR HANDLING UNIT "AHU-2" AND REMOVE ALL CONDUCTORS TO SOURCE. MAINTAIN CONDUIT FOR CONNECTION OF NEW DURING RENOVATION.



1 DEMOLITION FLOOR PLAN - BUILDING B - ELECTRICAL
E0.011 1/4"=1'-0"

GRAPHIC SCALE
0 1 2 4



KEY PLAN

HOUSEMAN ARCHITECTURE
931 S. SEMORAN BLVD. #604B WINTER PARK, FL 32792
321-972-8446 ARIZONA LICENSE NO. 74110

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:

DEMOLITION FLOOR PLAN - BUILDING B - ELECTRICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

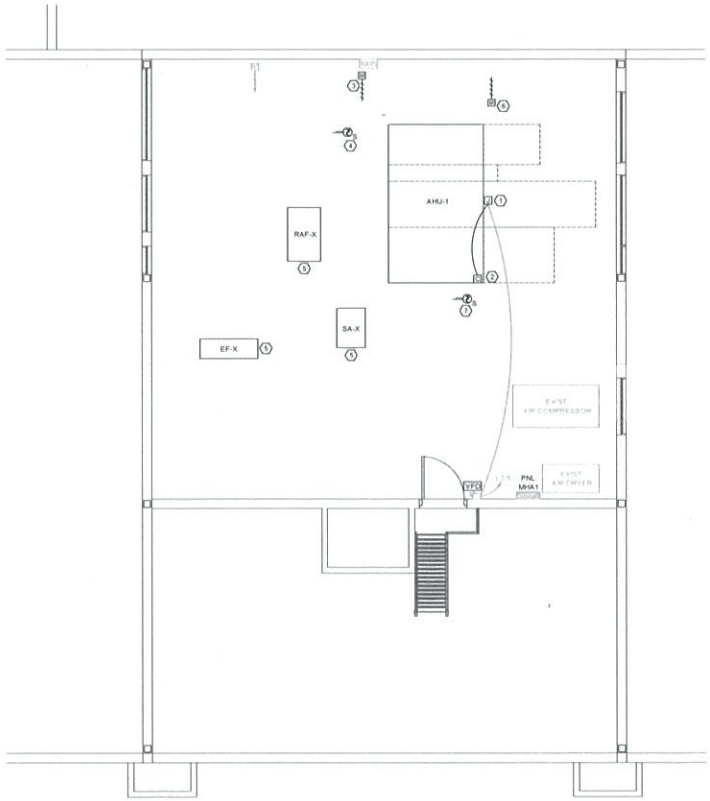
SHEET NO: E0.011

GENERAL NOTES

1. VERIFY FINAL HVAC EQUIPMENT LOCATION WITH MECHANICAL INSTALLER PRIOR TO ROUGH-IN.

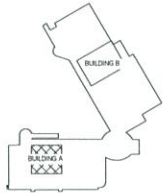
REFERENCE NOTES

1. PROVIDE CEILING MOUNT JUNCTION BOX SIZED PER NEC.
2. EXTEND EXISTING CONDUIT AND PROVIDE NEW CONDUCTORS TO NEW AIR HANDLING UNIT 'AHU-1' POWER CONNECTION. REFER TO EQUIPMENT FEEDER SCHEDULE ON SHEET E4.101 FOR CONDUIT AND CONDUCTOR INFORMATION.
3. CONNECT NEW MOTORIZED DAMPER TO EXISTING MOTORIZED DAMPER CIRCUIT. COORDINATE CONNECTION WITH MECHANICAL INSTALLER.
4. CONNECT NEW DUCT MOUNTED SMOKE DETECTOR TO EXISTING SMOKE DETECTOR CIRCUIT. COORDINATE CONNECTION WITH MECHANICAL INSTALLER.
5. RECONNECT HVAC EQUIPMENT SAVED BY MECHANICAL INSTALLER DURING DEMOLITION. COORDINATE CONNECTION WITH MECHANICAL INSTALLER.
6. EXTEND/REWORK EXISTING MOTORIZED DAMPER CIRCUIT TO NEW MOTORIZED DAMPER LOCATION.
7. EXTEND/REWORK EXISTING DUCT MOUNTED SMOKE DETECTOR CIRCUIT TO NEW DUCT MOUNTED SMOKE DETECTOR LOCATION. COORDINATE CONNECTION WITH MECHANICAL INSTALLER.
8. CONNECT NEW VARIABLE FREQUENCY DRIVE FOR 'AHU-1' TO EXISTING CONDUIT(S). DEVICE FURNISHED BY MECHANICAL INSTALLER.



1 E1.101 NEW FLOOR PLAN - BUILDING A - ELECTRICAL
1/4"=1'-0"

GRAPHIC SCALE
0 1 2 4



KEY PLAN

HOUSEMAN ARCHITECTURE
931 S. SEMORAN BLVD. #0948 WINTER PARK, FL 32792
321-972-8446 ARIZONA LICENSE NO. 74110

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
NEW FLOOR PLAN - BUILDING A - ELECTRICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

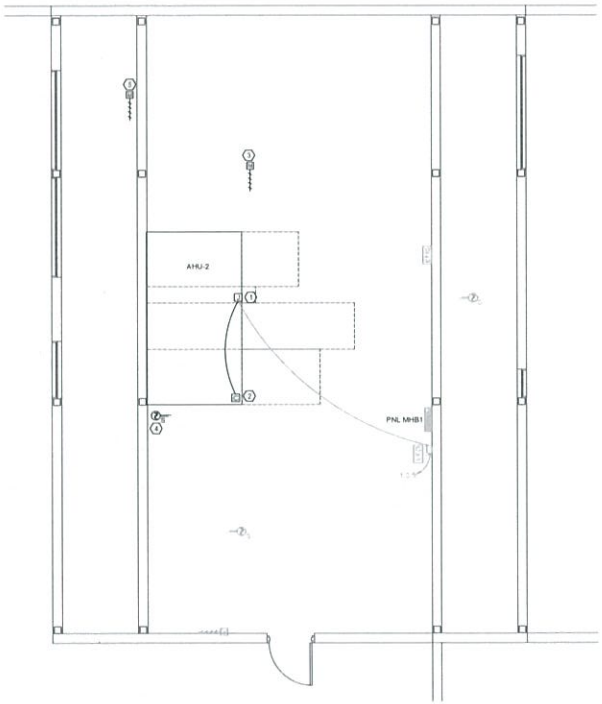
SHEET NO: E1.101

GENERAL NOTES

1. VERIFY FINAL HVAC EQUIPMENT LOCATION WITH MECHANICAL INSTALLER PRIOR TO ROUGH-IN

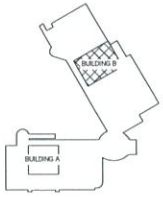
REFERENCE NOTES

1. PROVIDE CEILING MOUNT JUNCTION BOX SIZED PER NEC
2. EXTEND EXISTING CONDUIT AND PROVIDE NEW CONDUCTORS TO NEW AIR HANDLING UNIT "AHU-2" POWER CONNECTION. REFER TO EQUIPMENT FEEDER SCHEDULE ON SHEET E4.101 FOR CONDUIT AND CONDUCTOR INFORMATION.
3. CONNECT NEW MOTORIZED DAMPER TO EXISTING MOTORIZED DAMPER CIRCUIT. COORDINATE CONNECTION WITH MECHANICAL INSTALLER
4. EXTEND/REWORK EXISTING DUCT MOUNTED SMOKE DETECTOR CIRCUIT TO NEW DUCT MOUNTED SMOKE DETECTOR LOCATION. COORDINATE CONNECTION WITH MECHANICAL INSTALLER
5. EXTEND/REWORK EXISTING MOTORIZED DAMPER CIRCUIT TO NEW MOTORIZED DAMPER LOCATION.
6. CONNECT NEW VARIABLE FREQUENCY DRIVE FOR "AHU-1". DEVICE FURNISHED BY MECHANICAL INSTALLER



1 E1.102 NEW FLOOR PLAN - BUILDING B - ELECTRICAL
1/4"=1'-0"

GRAPHIC SCALE
0 1 2 4



KEY PLAN

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321-972-8446 ARIZONA LICENSE NO. 74110

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22-0807

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DAYTONA STATE COLLEGE

AHU REPLACEMENT

1155 Co Rd 4139, DeLand, FL 32724

SHEET NAME:
NEW FLOOR PLAN - BUILDING B - ELECTRICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807

SHEET NO: E1.102

VOLTS L-N: 277
VOLTS PH: 480
PHASE: 3
MOUNTING: SURFACE
MFR: SIEMENS
TYPE: S2

MAIN OPTIONS REQUIRED
S.E. RATED: N/A
GFI PROT: N/A
SHUNT TRIP: N/A

PANEL : MHA1
MCB: N/A AMPS
MLO: 60 AMPS

EXISTING PANEL TO REMAIN
BOLD ITEM TO BE RENOVATED
AIC RATING (FULLY RATED OR SERIES RATED): 14 KA (MINIMUM, SEE SPECIFICATIONS)

ENCLOSURE DATA
NEMA: 1
SECTIONS: 1
WIDTH (SECT.): 20
DEPTH: 5

NOTES	DESCRIPTION	LOAD CONN	AMPS A	AMPS B	AMPS C	C.B. AMPS	C.B. POLES	CKT NUM	CKT NUM	C.B. POLES	C.B. AMPS	AMPS A	AMPS B	AMPS C	LOAD CONN	DESCRIPTION	NOTES
1,2,3	AHU-1	8	4			15	3	1	2	3	20	8			8	RAF-1	
	---	8		8		-	-	3	4	-	-		8		8	---	
	---	8			8	-	-	5	6	-	-			8	8	---	
	COMPRESSOR	26	26			60	3	7	8	1	20	3			900	LIGHTS	
	---	20		20		-	-	9	10	1	20		0			SPARE	
	---	20			20	-	-	11	12	1	20			0		SPARE	
	SPARE		0			20	1	13	14	2	30	6				SPD	2,3
	SPARE			0		20	1	15	16	-	-		0			---	
	SPARE				0	20	1	17	18	-	-			0		---	

45 AMPS PHASE A
42 AMPS PHASE B
42 AMPS PHASE C

ACTUAL CONN. LOAD: 45 AMPS, 39 KVA
NEC DEMAND: 42 AMPS, 36 KVA

PANEL NOTES:
1) REFER TO EQUIPMENT FEEDER SCHEDULE FOR CONDUCTOR AND CONDUIT REQUIREMENTS
2) REMOVE EXISTING CIRCUIT BREAKER MADE SPARE BY DEMOLITION TO ALLOW NEW CIRCUIT BREAKER INSTALLATION
3) PROVIDE NEW CIRCUIT BREAKER AND CONNECT NEW LOAD INDICATED.

VOLTS L-N: 277
VOLTS PH: 480
PHASE: 3
MOUNTING: SURFACE
MFR: SIEMENS
TYPE: S2

MAIN OPTIONS REQUIRED
S.E. RATED: N/A
GFI PROT: N/A
SHUNT TRIP: N/A

PANEL : MHB1
MCB: N/A AMPS
MLO: 50 AMPS

EXISTING PANEL TO REMAIN
BOLD ITEM TO BE RENOVATED
AIC RATING (FULLY RATED OR SERIES RATED): 14 KA (MINIMUM, SEE SPECIFICATIONS)

ENCLOSURE DATA
NEMA: 1
SECTIONS: 1
WIDTH (SECT.): 20
DEPTH: 5

NOTES	DESCRIPTION	LOAD CONN	AMPS A	AMPS B	AMPS C	C.B. AMPS	C.B. POLES	CKT NUM	CKT NUM	C.B. POLES	C.B. AMPS	AMPS A	AMPS B	AMPS C	LOAD CONN	DESCRIPTION	NOTES
	SPARE		0			20	1	1	2	1	20	0				SPARE	
	SPARE			0		20	1	3	4	1	20		0			SPARE	
	SPARE				0	20	1	5	6	1	20			0		SPARE	
2,3	SPD		0			30	3	7	8	1	20	0			0	UNKNOWN CIRCUIT	
2	---			6		-	-	9	10	1	20		0		0	UNKNOWN CIRCUIT	
3	---				9	-	-	11	12	1	20			2	800	LIGHTS	
	RAF-1	11	11			20	3	13	14	3	20	12			12	AHU-2	1,3,4
	---	11		11		-	-	15	16	-	-		12		12	---	
	---	11			11	-	-	17	18	-	-			12	12	---	

31 AMPS PHASE A
31 AMPS PHASE B
28 AMPS PHASE C

ACTUAL CONN. LOAD: 29 AMPS, 24 KVA
NEC DEMAND: 29 AMPS, 24 KVA

PANEL NOTES:
1) REFER TO EQUIPMENT FEEDER SCHEDULE FOR CONDUCTOR AND CONDUIT REQUIREMENTS.
2) REMOVE EXISTING SPARE CIRCUIT BREAKER TO ALLOW NEW CIRCUIT BREAKER INSTALLATION
3) PROVIDE NEW CIRCUIT BREAKER AND CONNECT NEW LOAD INDICATED.
4) REMOVE EXISTING CIRCUIT BREAKER MADE SPARE BY DEMOLITION TO ALLOW NEW CIRCUIT BREAKER INSTALLATION.

EQUIPMENT FEEDER SCHEDULE

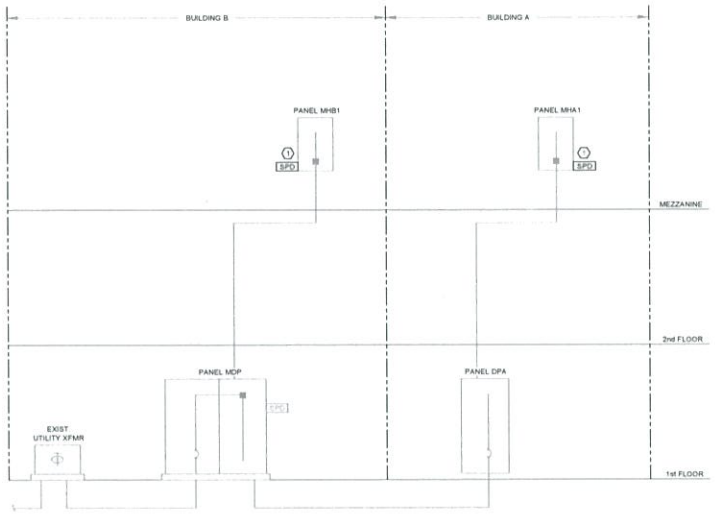
JOB NUMBER: 22080017 — DATE: 8/1/22

EQUIPMENT DESCRIPTION	VOLTS	PH	NEUT Y OR N	MOTOR LARGEST H.P.	MOTOR LARGEST F.L.A.	ADDITIONAL MOTORS H.P.	ADDITIONAL MOTORS F.L.A.	HEATER OR LIGHTING LOAD KW	HEATER OR LIGHTING LOAD AMPS	MISC AMPS	TOTAL AMPS	PNL C.B. SIZE AMPS	DISCONNECT SIZE AMPS	DISCONNECT FUSE SIZE	STARTER SIZE NEMA	STARTER TYPE	VOLTAGE DROP	WIRE PER PHASE	NEUT WIRE	GND WIRE	# OF RUNS	CONDUIT SIZE	NOTES
AHU-1	480	3	N	10.00	8.00						8	15					0.34%	#12		#12	1	1/2	4Tg
AHU-2	480	3	N	10.00	12.00						12	20					0.32%	#12		#12	1	1/2	4Tg

GENERAL NOTES:
(1) - PROVIDE DISC. SW. AT ALL PIECES OF EQUIPMENT, UNLESS OTHERWISE NOTED ON THIS SCHEDULE
(2) - C.B. STARTER, DISC. & FUSE SIZES SHOWN FOR REFERENCE ONLY. SIZE AS RECOMMENDED BY EQUIPMENT MANUFACTURER. VERIFY REQUIREMENTS WITH APPROVED EQUIPMENT SHOP DRAWINGS.
(3) - PROVIDE NEMA OUTDOOR RATED ENCLOSURES FOR ALL DISC. SWS MOUNTED OUTDOORS
(4) - COORDINATE STARTER TYPE WITH EQUIPMENT PROVIDER
(5) - E.C. TO VERIFY THAT C.B.'S FOR MOTOR(S) ARE SUFFICIENT TO ALLOW STARTING OF MOTOR. IF REQUIRED FOR STARTING C.B.'S TO BE INCREASED TO A MAX OF 300%OF LARGEST MOTOR F.L.A.
(6) - INCREASE CONDUCTOR SIZES AS REQUIRED TO MAINTAIN A MAXIMUM OF 3%VOLTAGE DROP BASED ON ACTUAL CIRCUIT LENGTHS AS INSTALLED
(7) - TOTAL AMPS SHOWN DO NOT INCLUDE NON-COINCIDENTAL LOADS

ABBREVIATIONS:
MCP = MOTOR CIRCUIT PROTECTOR C.B.
MMS = MAN. MTR. STARTER 25A 3Ph (WITH O.L. AND PILOT
MES =MOTOR STARTING 25A SW. (WITHOUT O.L.
VFD = VARIABLE FREQ. DRIVE UNIT
CSMC = CONB. DISC.&CPT. AND MAG. (MOTOR STARTER&MAG.)
MMC = MAGNETIC MOTOR CONTROLLER W/O L.
N.F. = NON-FUSED
O.L. = THERMAL OVER LOAD ELEMENT
I = NEMA 1ENCLOSURE
3R = NEMA 3R ENCLOSURE
4SS = NEMA 4 W.P. STAINLESS STEEL ENCL.

NOTES:
(a) - CONNECT VIA LINE VOLTAGE T'STAT FURNISHED BY MECH. CONTRACTOR
(b) - CONNECT VIA CONTROL DEVICES FURNISHED BY MECH. CONTRACTOR
(c) - CONNECT TO LOCAL LIGHTING SWITCHES FROM OCCUPANCY SENSOR
(d) - CONNECT VIA VFD FURNISHED BY MECH. CONTRACTOR
(e) - CONNECT VIA UNIT MTD DISC. SW. FURNISHED WITH EQUIPMENT
(f) - CONNECT TO EXISTING DISCONNECT SWITCH
(g) - ENSURE WIRE SIZING COMPLIES WITH ASB 102 COORDINATE WITH MECHANICAL INSTALLER FOR VFC INFORMATION



1 E4.101 **PARTIAL POWER RISER DIAGRAM**
NOT TO SCALE

GENERAL NOTES

1 SCREENED ELECTRICAL ITEM IS EXISTING TO REMAIN

REFERENCE NOTES

1 PROVIDE SURGE PROTECTIVE DEVICE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

HOUSEMAN
ARCHITECTURE
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SHEET NAME:
POWER RISER DIAGRAMS AND SCHEDULES - ELECTRICAL

DATE	HISTORY	REV.
08/31/2022	PERMIT SET	

PROJECT NO: 22-807
SHEET NO: E4.101